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Developing an augmented stock pricing framework capturing
micro, macro, and behavioral perspectives:

An empirical study on the Egyptian Stock Market

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Abstract

Starting from the emergence of the stock markets, researchers and investors have become interested in understanding how the stock markets work and how to achieve the best return from these markets under future uncertainties. That had led to the development of various theories and approaches, starting with the efficient market theory and the Capital Asset Pricing Model (CAPM) moving to Arbitrage Pricing Theory (APT) and different microeconomic models, while recently the behavioral and neurological theories have been introduced. However, none of these theories are sufficient to provide full coverage regarding the factors affecting stocks' pricing. Additionally, the developments witnessed in the stock markets all over the world and the changes shown in human nature increased the necessity of considering rational and irrational sources of risk while making investment decisions. Yet to date, there is not a model that considers both sources of risks. Accordingly, this thesis is intended to develop an augmented framework that captures stocks' pricing determinants. The introduced framework represents an integration of the microeconomic, macroeconomic, and behavioral finance theories after extracting the most significant variables. The microeconomic model employed in this study is the Fama and French five factor model, which involves market beta, size, value, profitability and investment. The macroeconomic model includes five selected variables, three of which are domestic macroeconomic variables and two global factors: exchange rate, inflation rate, industrial production index, federal fund rate, and global commodity index. As for the behavioral model, the variables were gathered by conducting a systematic literature review on the behavioral studies.

To reach this aim, the study adopted an empirical study on the Egyptian stock market as a leading emerging market through employing two quantitative methodologies. The microeconomic and macroeconomic models were analyzed using Ordinary Least Square (OLS) method to determine the most significant variables on portfolios' excess return while using monthly data for the period from June 2010 to June 2020. The behavioral conceptual model was tested using a structured survey. The survey data were analyzed using SEM and multiple regression analysis to validate the built conceptual behavioral model and extract the most significant variables affecting the Egyptian investors' investment decisions.

The results of the microeconomic model analysis revealed the significance of the size (SMB), value (HML), and profitability (RMW) variables while the macroeconomic model analysis showed

the significance of the industrial production index (IPI). The SEM results detected the significance of representativeness, availability, anchoring, and overconfidence bias.

The results of this study have both theoretical and practical contributions. The theoretical contribution is highlighted in the developed augmented conceptual framework, which represents a foundation stone subject to updates in further work, in addition to enriching the literature of the three theories: micro, macro, and behavioral. The practical contribution is also shown in the developed augmented conceptual framework, which can be examined in various markets to develop a customized applied framework to fit each economy solely. Moreover, financial advisors can use these results to improve the financial advice provided, while policy makers and government can enhance the investment environment.

Keywords: stock pricing theories, stock pricing determinants, microeconomic variables, macroeconomic variables, domestic variables, global variables, behavioral finance, behavioral variables, individual investors, investment decision, emerging markets.

Dedication

This thesis is dedicated to my dad who passed away just a few days after my thesis viva. You stood by my side throughout this journey and motivated me to achieve my dream and reach this step. I just wish you could attend my graduation ceremony but I know you will be watching me.



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Declaration

I declare that the work in this thesis was carried out in accordance with the regulations of the University of Nicosia. It is a product of original work of my own, unless otherwise mentioned through references, notes, or any other statements.

Signed

Date



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Abbreviation Index

CAPM	Capital Asset Pricing Model
APT	Arbitrage Pricing Theory
IPI	Industrial Production Index
GCI	Global Commodity Index
OLS	Ordinary Least Square
SMB	Small market capitalization Minus Big
HML	High book to market ratio Minus Low
UMD	Up minus Down
RMW	Robust stock Minus Weak stock
CMA	Conservative stocks Minus Aggressive stocks
FF5	Fama and French five factor
EXR	Exchange Rate
InfR	Inflation Rate
FFR	Federal Fund Rate
CPI	Consumer Price Index
BE/ME	Book Equity to Market Equity ratio
OP	Operating profit
EGX	Egyptian Exchange
EGP	Egyptian Pound
CFA	Confirmatory Factor Analysis
SEM	Structural Equation Modeling
GFI	Goodness of Fit Index
RMSEA	Root Mean Square Error of Approximation
NCP	Non-centrality parameter
NFI	Normed Fit Index
CFI	Comparative Fit Index
PNFI	Parsimony Normed Fit Index

CHAPTER 1 INTRODUCTION



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1.0 Introduction to the research topic

One of the ways to predict the future is analyzing the past. Over the past 60 years, researchers have been trying to reach the best model that explains market anomalies. It first started with Markowitz (1952), who put the basic principles of asset pricing theory. Then, it was the Capital Asset Pricing Model (CAPM), developed in the early of 1960s by Sharpe, Treynor, Lintner and Mossin; it relates return to one single factor, market beta. CAPM has been an important breakthrough; it was even criticized because of its unrealistic assumptions and the insufficiency of market beta to cover the variation in stocks' return (Merton, 1973; Black, 1972; Jensen *et al.*, 1972). In order to cover the insufficiency of CAPM, Ross (1976) introduced the Arbitrage Pricing Theory (APT). The APT model considers a number of macroeconomic sources of risk with fewer assumptions than CAPM. Afterwards, Fama and French (1993) introduced the three-factor model (market beta, size and book to market ratio) as an extension for CAPM; one of the factors is market beta while the other two factors are size measured by market capitalization and value measured by book to market ratio. The three factors model was developed to capture the relation between size and average return and between book to market ratio and average return. Fama and French extended their original model using other researchers' work and recommendations and introduced the five-factor model in 2015 (Fama and French, 2015). The five-factor model adds investment and profitability to the three-factor model based on evidence provided by Novy-Marx (2013) and Titman *et al.* (2004).

In the late 1970's, a different breakthrough emerged called behavioral finance (Cheung, 2010). This approach is different as it is based on how investors actually behave and does not assume the full rationality of investors (Cheung, 2010). Behavioral finance combines elements of psychology, sociology and finance and is regarded as the most vital research area nowadays (Metwally and Darwish, 2015). It explains that some of the anomalies presented in markets are because of psychological and cognitive biases resulting in irrational decisions (Wong and Nwude, 2018).

Under the existence of these theories, it is of great importance for the financial markets users to figure out stock return's determinant while considering the rational and irrational perspectives. There are studies that tried to combine both perspectives but to a limited extent (Soydemir *et al.*, 2017). Accordingly, this study will introduce a framework of stock pricing determinants that considers both perspectives. The framework represents an integration of three

major theories: micro, macro and behavioral finance. Each of the three theories used represents a contribution made by different researchers to develop a model able to capture the stock price determinants; however, the analysis of the literature revealed that none of these three theories on its own is sufficient to capture stock return's determinants.

The rest of the chapter is organized as follows: section 1.1 will present the research aim and objectives. Section 1.2 will cover the methodological tools that will be employed to achieve the research objectives. Research originality will be covered in section 1.3, and finally section 1.4 introduces the thesis structure.

1.1 Research aim and objectives

Based on the above discussion, the aim of this study is to develop an augmented framework capturing stock pricing determinants by integrating three different theories (micro, macro and behavioral finance). The aim of the study will be achieved through applying the following objectives:

- To determine the most significant microeconomic variables and their impact on stock prices of the Egyptian stock market using Fama and French five-factor model.
- To identify the most significant macroeconomic variables and test their effect on the Egyptian Stock Market using preselected macroeconomic variables.
- To present and analyze comprehensively the literature and topics related to the effect of investors' psychology on stock market returns as a prelude to this research.
- To identify the most significant behavioral variables and test their impact on the investment decision with respect to the Egyptian individual investors.
- To develop an augmented framework that integrates the most significant variables from the three tested theories.
- To explain the validity of the applied augmented stock pricing framework developed in this study.

1.2 Research methodology

This study follows a deductive approach by employing a quantitative methodology. The steps and phases of the research methodology that will be employed to achieve the research aim and objectives are presented below.

1- Determining the most significant microeconomic variables:

The microeconomic variables employed in this study are based on the most recent five-factor model developed by Fama and French which needs further empirical examinations to explain its explanatory power as recommended by literature where, there are not sufficient studies that examined the newly added variables: investment and profitability especially in the emerging markets, which resulted in a lack in the studies that support Fama and French (2015) five factor model. To conduct this examination four firm specific variables (size, value, profitability and investment), in addition to market beta, will be run against portfolios' excess return to extract the most significant variables. This investigation is done through an empirical study on the Egyptian stock market- a class of the emerging markets.

2- Identifying the most significant macroeconomic variables:

An extensive review of the empirical studies published in this area is conducted, such that five macroeconomic variables are specified in advance to be examined and to test their impact on portfolios' excess return. The significant macroeconomic variables are identified with respect to the Egyptian stock market.

3- Analyzing comprehensively the literature and topics related to the effect of investors' psychology on stock market returns:

A systematic literature review is conducted on published articles that investigated the impact of the investors' psychology on the investment decision to build the theoretical model and then develop the conceptual behavioral model.

4- Identifying the most significant behavioral variables:

A standardized survey is conducted to test the behavioral conceptual model and to provide evidence of the most significant behavioral variables affecting the Egyptian investors' investment decisions.

5- Developing the augmented framework, based on the integration of the three theories:

The findings of the previous steps will result in determining the most significant variables affecting stocks' prices with respect to each theory. These variables will be integrated together to develop the framework to be introduced in this study.

6- Explaining the validity of the proposed framework:

The developed applied framework has been subject to validity tests throughout its formulation stages that are to be explained in this step.

The steps mentioned above will be implemented based on data gathered from primary and secondary data. Primary data are collected from the structured survey answered by Egyptian investors engaging in the Egyptian Stock Market. The secondary data used to measure stock return, accounting and macroeconomic variables are collected from Thomson Reuters DataStream, World Bank data and Federal Reserve Bank of St. Louis. The data are analyzed using EVIEWS software version 10 for the micro and macroeconomic data, while LISREL 8.8 statistical package is used to analyze the behavioral model's data.

1.3 Research originality

Based on the vast literature that considered different asset pricing theories, it can be concluded that there are various explanations for stock price movements, ranging from efficient market theory and its rational assumptions to fundamental analysis to technical and trend analysis, and to behavioral and neurological analysis. These different explanations- all - exist and even used at the same time on the same trading desk; yet, they are used separately. Additionally, no approach is sufficient to provide a complete comprehensive explanation of the factors that cause variation in stocks' return (Lu *et al.*, 2018; Medhioub and Chaffai, 2018; Haron and Jaiyeoba, 2016; Fenzl and Pelzmann, 2012).

This research provides an original contribution to knowledge by introducing a technique through which a framework capturing stock pricing determinants is developed. The framework will take into consideration the rational expectations as well as investors' irrational biases. This work is an effort to reach a more compatible, applicable way covering three different notions: micro, macro and behavioral finance theories.

Moreover, the analysis of the macroeconomic literature showed that most of the studies have focused on examining the effect of domestic macroeconomic variables without paying attention to the effect of global macroeconomic factors (Šimáková *et al.*, 2019; Ramadan *et al.*, 2016). Thus, this study will consider the impact of two prominent global factors (the federal fund rate and the global commodity prices index), in addition to the domestic variables. As for the microeconomic model, it represents another notion regarding the variables that affect stocks' prices. The model employed in this study represents the most recent work developed by Fama and French in 2015, which needs further empirical application to examine its validity.

Regarding the behavioral finance notion, the study introduced a theoretical behavioral model that involves all the behavioral factors that were examined in previous articles, starting from the inception of the behavioral thought till 2018. Also, the analysis of the behavioral literature detected that the maximum number of behavioral variables examined in a single study were eight (Chandra and Kumar, 2012), while this study examines a conceptual behavioral model that merged 41 variables into 13 main variables to be tested for their impact on the individual investors' investment decision.

The methodological steps that are going to be adapted in this study will end up by introducing the technique through which an augmented framework capturing stock pricing determinants will be developed by conducting an empirical study on a representable emerging market.

The study chooses an emerging stock market for testing the proposed framework because of the increased focus on inspecting the performance of the emerging markets, as they provide better investment options for the international investors than the developed market (Graham *et al.*, 2016). The chosen emerging market is the Egyptian stock market as it is positioned among the top emerging markets; also, the World Bank has declared that the Egyptian stock market has witnessed great progress since the adoption of the economic reform starting in 2013. In addition to its similarity with other emerging markets in risk return relationship (Lyocsa and Baumohl, 2015). These reasons encouraged the nomination of the Egyptian stock market to be the stock market under investigation in this study. Additionally, the analysis of the literature has shown a lack in the empirical work studying the asset pricing theories in the emerging markets specifically the Egyptian stock market, which increases the novelty and the originality of this study.

1.4 Structure of the thesis

The thesis encompasses the following chapters:

Chapter 1 – Introduction: this chapter provides an overview of the aim, objectives, methodology and originality of the research conducted.

Chapter 2 – Literature review: this chapter reviews different pricing models, starting from the evolution of asset pricing theories to critically reviewing some theories and assumptions upon which theories are based, while focusing on the three main theories covered in this study. Also, the chapter presents the reasons for choosing the Egyptian stock market to be the market under investigation in the current study in addition to reviewing the asset pricing studies conducted in this market.

Chapter 3 – Philosophy, methodology and methods: In this chapter, the research scope, research design including the philosophy, approach, methodology and strategy, upon which the theoretical framework is built, are presented. The methodology followed to achieve the research's six objectives is described.

Chapter 4 – Empirical study- Micro and macroeconomic models results: this chapter starts the implementation of the study's methodology on the Egyptian stock market. It presents the results of running the regression analysis of the microeconomic model followed by the macroeconomic model.

Chapter 5 – Empirical study- behavioral model results: this chapter continues the implementation of the empirical study's steps by providing the results of testing the behavioral model using the structured survey.

Chapter 6 – Conclusion and recommendation for further work: the realization of research aim and objectives; the research limitation and recommendation for further work are presented in this chapter.

Table 1.1 presents the detailed steps of the research application of this study with the related research method and thesis structure.

Table 1.1: Research application steps and structure of the thesis

Research application steps	Application method	Chapter
Determining the most significant microeconomic variables.	Running time-series regression analysis between Fama and French five-factor model and portfolios' excess return of the Egyptian stock market.	4
Selecting the macroeconomic variables.	Literature review.	2
Identifying the most significant macroeconomic variables.	Running time-series regression analysis between the selected macroeconomic variables and portfolio's excess return.	4
Developing the theoretical behavioral model.	Systematic literature review.	3
Developing the conceptual behavioral model.	Merging, aggregating and assembling the variables extracted from the systematic literature review.	3
Identifying the most significant behavioral variables.	Conducting structural surveys among the Egyptian individual investors.	5
Developing the augmented framework.	Integrating the results of the examined theories.	6

Validating the developed augmented framework.	Explaining the validity tests that the augmented applied framework has been passed through.	6
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1.5 Conclusion

This chapter started by introducing the research topic upon which the aim and objectives are settled. Then, the methodology followed to achieve the research objectives is illustrated. The chapter also described the importance and originality of this research and ends by proving the thesis structure and outline.

The following chapter will review the published articles related to the topics under investigation in order to highlight how the current study is distinct, derived and adds to the existing literature. The analysis of the previous articles and studies will lead to identifying the research gap and how covering this gap will add to knowledge. Also, this analysis will facilitate the development of the research framework and identify the best data collection techniques that fit this study.

CHAPTER 2 LITERATURE REVIEW

2.0 Introduction

When Osoba (2014) questioned the reason behind the need for inspecting and analyzing the surrounding events and the need for predicting the future, the answer was that it is the inability of human beings to bear the uncertainty inherent in future events. Thus, humans put actions that help in illustrating the future and base their predictions on facts that we are concerned about.

As a result of 2008 financial crisis and Arab Spring revolutions that started in 2010, a lot of inconsistencies and uncertainties affected the financial market all over the world, and more specifically the emerging economies. The financial markets were exposed to macroeconomic shocks and fluctuations. Under these conditions, it is difficult for the traditional classical theoretical framework alone- such as the efficient market theory, investor's rationality, full knowledge about the investment decisions taken by others and the perfect prediction for prices movement- to capture market return determinants.

The investment actions involve the conversion of cash into assets or securities released by companies with the aim of achieving the desired return. The investor can buy stocks of a specific firm to get a steady return and to generate capital gain in case of selling the purchased stocks. Similarly, if the investors decide to deposit cash in any bank, the return is a fixed interest and the amount is deposited on the due date (Lathif and Aktharsha, 2016).

The stock market is one of the places that manage and facilitate investment actions. It is the place that connects buyers of stock with their sellers, in which the sellers set the desired selling price while the buyers set the bidding price. Then, the stock market announces the minimum selling price with the maximum purchasing price to set the equilibrium point for investors. This technique allows raising funds for the registered companies through the purchase and sale of stocks and securities (Rasheed *et al.*, 2018).

This means that the stock market is the yardstick of the nation's economic health. The good performance of the nation's stock market is a reflection of its good investment environment. Stock market increase means that the country's investment environment is good. Investing in the stock market is the most preferable option to gain return compared to purchasing gold, bonds or savings (Adesanmi, 2018). Accordingly, understanding the stock market is very imperative for investors to achieve the desired gains. However, determining the factors that influence stocks' return and the sensitivity of expected return to each factor is the most pressing matter that needs to be tackled in finance.

Indeed, over the past 60 years, researchers have been trying to reach the best model in explaining market anomalies and developed various theories. It started by Markowitz, the father of modern portfolio theory (Hojat, 2015), who put the basic principles in 1952 and measured the expected returns and portfolio risks. Markowitz developed the efficient frontier used later by Tobin in 1958 to define the efficient portfolio and to allocate wealth between risky and zero risk assets. Then, Sharpe in 1964 developed the single index model, which relates stocks' return to common index's return.

Afterwards, it was the introduction of the Capital Asset Pricing Model (CAPM) in the early 1960s after the development made by Sharpe (1964), Treynor (1962), Lintner (1965) and Mossin (1966), which is regarded as the most famous starting point. The CAPM relates return to one single factor: market beta. Several extensions were made to this model; however, the basic model remained the most usable one. The CAPM worked well for a long time until it faced several criticisms because of its unrealistic assumptions and the insufficiency of market beta to explain all the market anomalies. Other theories and models introduced afterward were tested and realized a number of factors and different perspectives that explain stock market behavior. However, due to the inconsistencies and uncertainties that have accompanied the stock markets all over the world for the past few years, a necessity to develop a new stock pricing model is raised. The framework to be developed in this study captures three theories of the most prominent and widely accepted notions: the microeconomic notion based on the firm's specific characteristics studied by Fama and French (2015), the macroeconomic notion based on the Arbitrage Pricing Theory (APT), in addition to the behavioral notion represented by the behavioral finance theory.

The remainder of the chapter is organized as follows. Section 2.1 reviews the evolution of the asset pricing theories and discusses the most important ones. Section 2.2 focuses on the role of firms' specific characteristics (microeconomic variables) in explaining stocks' price movement. Section 2.3 reviews the empirical literature that examined the macroeconomic approach and displays the most influential macroeconomic variables. Section 2.4 provides insights on the theoretical background of the behavioral finance theory, its evolution, its main theories and its most examined factors. Section 2.5 presents and summarizes the research gap recognized after the analysis of the literature. Section 2.6 displays the stock pricing studies implemented in the Egyptian stock market as the market selected for investigation in this study. Finally, section 2.7 provides a summary of the current chapter.

2.1 The evolution of the asset pricing theories

Any investment decision requires three basic elements: (a) the availability of funds, (b) the expected return from the investment decision and (c) the risks associated with this technical analysis and judgment. Investment decisions are often supported by decision tools. It is assumed that information structure and the factors in the market systematically influence individuals' investment decisions as well as market outcomes. Investment decision making requires controlling, assessing, and changing the actions based on the current situation and environment. Most of the investment decisions are undertaken within the stock markets' environment using either the fundamental or technical tools (Lin, 2018) or won estimations and judgments, based on the belief that stocks' prices are affected by the factors presented in the market (Lathif and Aktharsha, 2016).

Studies about asset pricing theories started in 1952 by the Nobel Prize winner Markowitz, who put the basic principles of assets pricing theory. Markowitz's model assumes that the investor makes decisions based on risk-return relationship, where the investor will be compensated for bearing systematic risk while the unsystematic risk will be diversified away. Based on this risk-return relationship, investors are expected to work on increasing their return given a specific amount of risk or to work on decreasing risk given a desired return level; this has led to the developing of the efficient frontier (Baker *et al.*, 2018). Markowitz developed the portfolio theory and introduced it; however, the theory could not be empirically tested because of the tremendous amount of information needed for its empirical examination, such as the expected return, the deviation in return and the covariance (Coffie, 2012). Then, it was the introduction of the Capital Asset Pricing Model (CAPM), which is based on the developments made by Sharpe (1964), Treynor (1962), Lintner (1965) and Mossin (1966). It is developed out of the Markowitz theory and the Capital Market theory (1959). The CAPM solved the quantifying problem that faced Markowitz theory by introducing a linear relationship between risk and return. It explains the relationship between an asset's return and its systematic risk, where the market beta is the measure of systematic risk (Bhayo, 2015). The CAPM relied on six main assumptions: (a) all market participants have the same expectations about the economic conditions, (b) the availability of zero risk borrowing and lending at the same interest rate, (c) the rationality of all the investors, (d) the investment in the capital market is done without any taxes or transaction costs, (e) none of the investors are able to affect the pricing of the securities because of the perfect competitiveness of the market and (f) considering the risk of the securities

and their expected return as the main factors when investing (Bhayo, 2015; Chiarella *et al.*, 2013).

Jensen *et al.* (1972) and Fama and MacBeth (1973) tested the validity of CAPM and proved its significance in describing the cross-sectional stock return and the ability of market portfolio to measure systematic risk. Later, the methodology of the two-step cross-sectional regression developed by Fama and MacBeth (1973) was used as a main tool when running cross sectional regression of the stock return, after proving its econometric appeal (Bhayo, 2015). CAPM was widely accepted and used because of its simplicity and ease of forecasting the relationship between expected return and the systematic risk. Also, it was regarded as the best model because of its ability over the dividend growth model and weighted average cost of capital to calculate the equity cost and investment discount rate (Bhayo, 2015). But practically, it was limited after proving the insufficiency of market beta when nominating it as the only source of risk, in addition to the contradictory evidence reached in different markets across the world.

The empirical work that criticized CAPM's ability to cope with the sophistication of the stock market started by Fischer in 1972 (Hojat, 2015). Fischer criticized CAPM because of the unrealistic existence of the risk-free asset; thus, the researchers considered replacing it with another meaningful risk asset (Adesanmi, 2018). Black (1972) introduced CAPM after excluding the risk-free borrowing and lending through permitting the unrestricted short sale of risky assets (Bhayo, 2015). This argument added to the insufficiency of market beta to capture the market risk; accordingly, Black *et al.* (1972) added the non-zero beta as a second variable to the original model. Additionally, Fama and French (2004) criticized the unrealistic assumptions that form the theoretical basis for CAPM. The researchers debated the construction of the market portfolio since it should include financial assets, real-estate, human capital and consumption goods, which is difficult to be done. In addition, they argued that the theory does not provide evidence on whether the market portfolio construction has to be restricted to one country or can include assets from other countries. In addition to these arguments, CAPM is based on portfolio theory and Capital Market theory, which are based on unreasonable assumptions, like the focus of investors on the risk and return of the current period without taking into consideration the response of portfolio returns to other factors or to future opportunities (Coffie, 2012).

On the other side, Mackinlay (1995) attributed the failure of the CAPM to several reasons other than the insufficiency of market beta, which could be because of the data snooping, an alignment in the data used during the study, or the irrational behavior of investors.

After the introduction of CAPM, Merton (1973) introduced the Intertemporal CAPM (ICAPM), which deals with the unrealistic assumption of CAPM concerning the focus of CAPM on single period return since the assets are traded continuously. The Intertemporal model considers the current period return in addition to the future investment opportunities (Coffie, 2012). In addition, ICAPM allows the inclusion of several related variables in similar patterns. However, the criticisms faced ICAPM were its sticking to some unrealistic assumptions owned by CAPM, like the homogenous expectation of investors (Coffie, 2012). Furthermore, it was unable to deal with the supply side of the market although it dealt with the demand side, in addition to ignoring the fact that investors can achieve return through the dividends earned other than the shares' buybacks (Coffie, 2012).

There is also the Efficient Market Theory introduced by Fama in 1970, which gives description of the degree of efficiency of the stock market and describes the efforts exerted by prudent investors to use all the available information to maximize return. This theory formed the basic tenets and the ground for the asset pricing theories. The Efficient Market Theory was considered as the crown jewel of classical finance, according to Cheung's (2010) description. It assumes investors' rationality in making their investment decisions, whereas this rationality needs the investor to have access to all information, own unlimited cognitive abilities and have enough time to undertake decision. Also, it suggests that the investors should not expect to achieve exceptional return because all the information, news and the performance of the macroeconomic variables are reflected on stocks' prices (Cheng *et al.*, 2007); thus, the stocks' prices can be used as a sign for the future expected economic activity (Buyuksalvarci and Abdioglu, 2010). However, the empirical evidence proved that most of these conditions are difficult to be met (Kooreman and Prast, 2010) while Adesanmi (2018) explained the inability of the efficient market theory to reflect the reality of the stock market as it claims that the market is efficient with organized information, environment, and perfect competition and without any transaction costs. Chen *et al.* (1986)'s work criticized this theory as based on its assumptions; it is not possible to use past information to forecast future changes in stocks' return. However, Remorov (2015) explained that it fits only under specific market condition and that it is not able to justify the great decline in the stock prices pertaining to the financial crashes, which is

the reason behind the development of other theories, such as the Arbitrage Pricing Theory (APT) in 1976 by Ross.

Researchers' interest in APT started by Brennan (1971) and Rosenberg and Marathe (1976) when they criticized the usage of CAPM to a single source for risk. Brennan (1971) stated that return is described by at least two factors while Rosenberg and Marathe (1976) found that there are many variables affecting market portfolio. Then, it was Chen *et al.* (1986)'s work that have encouraged researchers to move from efficient theory hypothesis to Arbitrage Pricing Theory developed by Ross (1976). This theory moved the researchers and market participants away from the simplicity of CAPM toward considering the undetermined macroeconomic variables that are expected to explain movements in stocks' prices. The movement toward considering more than a single variable to explain stocks' prices fluctuations has encouraged researchers toward considering the impact of various macroeconomic variables.

APT is based on considering a number of macroeconomic sources of risk with fewer assumptions than CAPM. This model considers the systematic risk only, which is difficult to be eliminated by diversification. APT had been widely accepted and proved its contribution; however, its main defect is not identifying the number or the identity of the variables that should be included in the model that led to reaching contradictory results when employing this theory (Adesanmi, 2018). The advancement made in the statistical software contributed in solving this problem, by allowing researchers to include in the regression analysis against stocks' return as much variables as appropriate to determine the most prominent ones.

Apart from the macroeconomic variables, there is another notion that claims the ability of microeconomic variables presented by firms' specific characteristics to explain fluctuations in stocks' prices. The famous researchers that explained this approach were Fama and French. Fama and French series of contributions in asset pricing theories started by demonstrating the ability of firm's specific characteristics in capturing some anomalies that were not explained by CAPM's market beta. The researchers introduced two additional variables to the market beta in 1992: (1) size, measured by market capitalization and (2) value, measured by book to market equity, resulting in the three factors model. Many extensions were added to this model, like momentum added by Carhart, four factor model (1997), and the five-factor model extended by Fama and French in 2015. Fama and French five factor model adds investment and profitability to the three-factor model based on evidence provided by Novy-Marx (2013), Titman *et al.* (2004)

Additional work was introduced by Remorov (2015) who has considered a different perspective regarding the influences on investors' decision making. The researcher introduced a kinetic model with stress on positive and negative public macroeconomic news' effect on traders' decision-making process. The developed price dynamic model is based on the implementation of the ordinary differential equations that illustrate the kinetic operation.

As most of the classical framework predicts the expected prices of stocks from the fundamental values of assets, these asset pricing theories require the use of Rational Expectations Equilibrium Framework (REEF). The REEF states that investors make decisions using logical reasoning. This logical reasoning and rationality require the right use of Bayes Law, which determines the degree of risk and belief as possibilities that depend on previous experience and updating the belief in case of the appearance of new evidence (Kilicay-Ergin *et al.*, 2012). Rationality also requires the Subjective Expected Utility (SEU) that represents a merge between utility function and traders' expectations investigation. Expectations' building requires investors to have access to newly released right information and to have sufficient information to use in building their expectations (Kilicay- Ergin *et al.*, 2012).

However, as long as the requirements of the rationality are difficult to be met during the changing environment, behavioral finance has emerged as a new breakthrough. The behavioral finance thoughts contradict the assumptions of the classical and traditional framework, as it is based on how investors actually behave (Cheung, 2010). It is a combination of psychology and sociology. It further argues that some of the anomalies presented in markets are because of psychological and cognitive biases resulting in irrational decisions (Wong and Nwude, 2018). The latest development is the area of Neurofinance, which links the psychology and the neurology behind the decisions made by investors in the financial markets (Ahmad, 2018; Sapra, 2009).

Based on the previous review of the different asset pricing perspectives, it can be concluded that there are various explanations for stock price movements, starting with efficient market theory and its rational assumptions to fundamental analysis to behavioral finance and recently the neurological dimensions. Some of these theories oppose to each other; however, they all exist and are even used at the same time.

Accordingly, this study aggregates the most prominent and widely accepted theories- the microeconomic, macroeconomic and behavioral theories- to produce a more compatible framework for measuring different market anomalies. This framework is expected to be

superior in determining different market anomalies nowadays, since the macroeconomic notion considers the surrounding economic conditions, the microeconomic factors consider the performance of the firms, while the behavioral finance takes into consideration the psychological variables and investors' attitudes affecting the trading behavior.

Because of the increased concern toward financial market integration, investing in the emerging markets has received considerable attention since they provide a great opportunity for generating high return through placing assets in areas that possess current and future growth, i.e., they provide diversified opportunities not provided by other developed economies (Neaime, 2016). Nowadays, the emerging economies are improving extremely fast that they have become leading parties of the global economic growth. Additionally, the International Monetary Fund (IMF) had declared that it is expected that the emerging markets will boom three times faster than the developed market, like the U.S. market (Qachln *et al.*, 2017).

The theoretical background and critical reviews related to the three different theories and their empirical studies are presented below, while focusing on the emerging markets studies. Each theory describes a contribution done by different researchers to develop a more comprehensive model that is able to capture variation in return. These theories worked on minimizing the restrictions imposed by the classical CAPM while providing a multifactor model. The next section reviews the ability of the microeconomic variables in explaining stocks' return as the first model employed in this study, followed by the other two theories in the subsequent sections.

2.2 The microeconomic model

Starting from the beginning of the industrial revolution, the equity market has played a vital role in the development of the industrial production. For the equity market, what matters is the time; as there is a risk associated with the time between the stock purchase and the future cash flow. Accordingly, discovering what kind of risk inherent in each stock is considered the most important challenge nowadays, which moves in line with the need for a new pricing model after the criticisms faced by CAPM on the theoretical and empirical levels. The empirical studies claimed the presence of other anomalies affecting stocks' return other than market's beta; some of these anomalies were related to accounting measures that do not result from financial theories, either directly or indirectly (Bhayo, 2015).

Basu (1983; 1977) was the first to examine the accounting measures in a study of the relationship between NYSE stocks' reaction and prices to earnings ratio using Compustat data

file for the period from 1956 to 1971. Basu calculated the return of five price-earning portfolios on monthly basis and found that the two portfolios of the lowest price-earning ratio earned average return higher than the portfolios of the highest two. The results reached are the same throughout the 14 years of study, even after considering the transaction cost, dividends, taxes or tax exempted investors. These results have awakened researchers' concerns and refusal to the claims of the efficient market theory, which explains that all the information available in the market is reflected in the stocks' prices, in addition to the inability of CAPM to determine the assets' price correctly, whatever the price earnings ratio values are. This situation of in-equilibrium increases the chances of achieving profit (Coffie, 2012).

Then, it was Banz (1981) who studied another accounting measure called market capitalization through examining its relationship with NYSE stocks' return. Banz used three market indices rather than the CAPM's market portfolio. Two of the three indices were value weighted index and the CRSP equally weighted index that are totally equity indices, while the third one is a combination of the corporate and treasury bonds' return with the value weighted CRSP index. The results retrieved from OLS and GLS regression were the same for the three indices whereas the stocks of high market capitalization achieved lower return than that of the small market capitalization stocks for all years under study. Banz also concluded that the portfolios of small market capitalization were associated with higher risk than portfolios constructed of firms with high market cap. These results provide another proof against CAPM because of its inability to capture variation in market capitalization among stocks. However, Banz's problem was that the results were not supported by any theoretical basis that could demonstrate the reasons behind the market capitalization (size) effect.

The same results were reached by Fama and French who started their work in 1992 by analyzing the performance of 9,500 stocks. They concluded that the usage of market beta represented in CAPM as a single measure of risk is not sufficient to reflect the performance of the stocks. Fama and French (1992) based their criticism after the evidence provided by Basu (1983), Banz (1981), Rosenberg *et al.* (1985), and Bhandari (1988). All those researchers provided evidence of additional variables that can explain return rather than CAPM's market beta.

In 1992, Fama and French took the firm specific characteristics proved by other researchers to have effect on average stock return, such as size, cash flow/price, past sales growth, earning/price, book-to-market equity, long-term past return, and short term past return. Fama and French took the criticisms found by previous researchers, tested them again with the

CAPM, and ended by introducing the three-factor model by adding two variables to CAPM's market beta. The added two anomalies were the most well-known during that period and were not explained by CAPM (Fama and French, 2015). The first added variable is size (market capitalization), measured as SMB, which stands for small market capitalization minus big, while the second variable is value (book to market ratio), measured as HML, which stands for high book to market ratio minus low. The size factor measures the excess return gained by small capitalization firms over big ones, and the HML measures the excess return of value stocks over growth stock. Although the variables tested in that study showed significant power when tested alone, the market capitalization and book to equity ratio were the only variables to show significant explanation ability during the multiple regression analysis against the average stock return.

This model was further supported by Fama and French's studies in 1993 and 1996. Both studies proved that the anomalies that were not captured by CAPM disappeared when using the three-factor model (Coffie, 2012). The 1993 study was on 25 portfolios sorted based on size and B/M ratio while the 1996 study was on portfolios sorted based on book to market ratio, earning to price ratio and cash flow to price ratio. The size and value factors' construction steps were introduced by Fama and French (1993). Fama and French (1993) defined the market capitalization of stocks as the multiplication of the number of outstanding shares and the stock closing price while the book value of stocks was described as the common book equity of stockholders added to deferred taxes and credit taxes on investment (if applicable) then subtracting the preferred stocks' book value. The size variable was calculated as the market value of stocks at the end of June, while the book to market ratio was calculated by dividing the book value of stocks at the end of fiscal year (t-1) by the market value at the end of December of (t-1).

However, as any new model that has just appeared on the scene, some studies supported this model while other criticized it. Rogers and Securato (2007) supported Fama and French's results after conducting a comparative study that compares the applicability of CAPM, with the three-factor model and a third model called Reward beta approach in the Brazilian Market. The results proved that Fama and French three-factor model was the best model to estimate the expected return but the book to market factor was not of great effect. Thus, the researchers concluded that market risk premium and size factors were the most influencing factor in predicting expected return.

On the other side, Black (1993) criticized Fama and French's results and claimed that these results were reached by chance. This means that Fama and French have to take another data set or another period to examine if the same results are reached again, while others criticized the model because of its inability to explain the variation in momentum variable (Chan *et al.*, 1996; Jagadeesh and Titman, 1993).

Accordingly, Carhart (1997) added momentum as a fourth variable. Carhart based his contribution on results reached by other researchers, such as Jagadeesh and Titman (1993) and Fama and French (1996) who found that buying winning stock over the past six months and selling the losing ones would increase the earnings. This approach is successful when the investor has to decide immediately which stock to buy. The momentum variable was assessed by (UMD), which stands for Up minus Down to measure the historical difference between winners' excess return and losers' (Kampman, 2011; Carhart, 1997). Carhart introduced this model as the four-factor model. This four-factor model was supported over the CAPM (Mateus *et al.*, 2019) while Pastor and Stambaugh (2003) worked on adding the liquidity variable to the three-factor model.

Fama and French continued their work in 2012 by implementing a study on 23 developed countries in four regions (Europe, Japan, North America and Asia Pacific). The study compared the achievement of the three and four factor models of a region (in which the factors were built from data of a region that involves one or many nations) with the international version (in which the factors were built from data of all regions) to illustrate the portfolios' regional return. The portfolios are sorted based on market capitalization with book to market ratio and market capitalization with momentum. The results of the study proved the existence of value premium as the size decreases in all markets, excluding Japan, and the same for momentum. The study also found that the spread in average momentum declined while going from small to big stocks. As for the performance of the integrated and segmented models, the results did not support the integrated version. However, the local model gave a sufficient explanation for portfolios' average return formed based on size and value against growth, such that the regional models were better in explaining expected return than the international one (Bhayo, 2015).

Fama and French (2012) explained that alpha resulting from both models was large, indicating the failure of the three and four factor models in illustrating the momentum and market capitalization portfolios' return. Cremers *et al.* (2012) attributed these results to errors in the methodology used in building the variables and that there was a problem with the break points

used in building the SMB and HML variables and the equally weighting of the SMB variable. Accordingly, the researchers suggested the use of the adjusted and index-based model introduced in Cremers *et al.* (2012), which showed a lower value of alpha when using it.

In 2015, Fama and French introduced two other variables to the already existing three-factor model, resulting in a five-factor model. The added two variables are operating profitability and investment strategy of the company. Fama and French chose these two variables based on the results reached by Novy-Marx (2013) and Titman *et al.* (2004), whose studies proved the insufficiency of the three-factor model to explain the variation in average return. Also, the addition of these two variables was supported by “dividend discount model”. Profitability is measured by RMW_t (return of diversified portfolios of robust stock minus that of weak stock) while investment is measured as CMA_t (return of diversified portfolio of low investment stocks minus that of high investment stocks, where low investment stocks named as conservative and high investments stock as aggressive).

Harvey *et al.* (2016) highlighted the data mining concern since hundreds of anomalies were discovered in the last years. Harvey *et al.* (2016) assessed 296 anomalies that were significant in previous articles and declared that (17%-53%) were false discoveries. They concluded that the newly discovered factor should have a t-statistics greater than three.

Fama and French work in (2017) tested the ability of Fama and French five-factor model in explaining the international stocks prices' variation based on size, value, profitability and investment. The researchers run their study on the period from July 1990 to October 2015, using the stocks' return of 23 developed countries located in four regions (North America, Europe, Asia Pacific and Japan) using global and local versions. The results of the study found a weak performance for the global version. For the three regions, except Japan, the study found an inverse relationship between investment and average return while a positive relationship was found between average return and value. As for Japan, investment and profitability were of weak impact while value was of strong relationship. The study also proved the superiority of the five-factor model in capturing return variation compared to the three-factor model. Fama and French's (2018) study tested the five-factor model using two different proxies for profitability to verify the claim that the performance of the 5FF depends on the profitability's proxy employed. The results of the study proved that cash profitability proxy is more superior than the operating profitability proxy.

Blitz *et al.* (2018) considered the 5FF as an important step toward developing a new benchmark for the asset pricing studies however, they criticized its depends on the CAPM's market beta regardless its weak explanatory power, also criticized Fama and French's ignorance to momentum role and questioned the best way that should be used to measure profitability and investment.

The current study chooses the microeconomic variables presented in Fama and French 2015 five factor model to study the role of firm's specific characteristics in explaining stocks' return variation. This model represents the most updated work for the microeconomic thought that is based on earlier studies' evidence. Also, a lack is noticed in the studies that examined the role of investment and profitability, which stresses the need for examining the explanatory power of Fama and French 5 factor model. The following section reviews the studies that have tested the validity of these factors and their role in explaining stocks' return in different markets.

2.2.1 Fama and French five-factor model empirical studies

Fama and French have tested the five-factor model in markets of North America, Europe, Japan and Asia Pacific and proved its power over the three-factor model; however, these results could be limited to this sample size at that time. Also, it should be highlighted that each region may have different anomalies, meaning that what fits in a particular region does not necessarily explain the other. Therefore, there is a need to study this model again in different markets under different times to examine its validity and explanatory power. This section reviews the studies that examined the five-factor model; it is divided into two subsections: the first subsection reviews the studies conducted in the developed markets while the second sections cover studies implemented in the emerging and developing markets.

2.2.1.1 Examining Fama and French five-factor model in the developed markets

De la O González and Jareno (2019) implemented a study to test the explanatory power of adding more variables to Fama and French three and five-factor models on the return of specific sectors of the U.S stock market. The period under study was from November 1989 to February 2014. The added variables were the nominal interest rate, real interest rate, expected inflation rate, momentum, momentum reversal, and liquidity, which have resulted in the formation of 12 models, classified into four groups based on the two main models. The results of the study confirmed that adding more variables increases the explanatory power of the models. The most significant explanatory variables in order were size and value then the profitability and investment, with a negative effect for size and momentum changes but a positive effect to value,

profitability and investments changes. On the other side, momentum reversal and liquidity showed variation in their effect from negative to positive, depending on the used model.

Nichol and Dowling (2014) proved the superiority of Fama and French five-factor model in UK over Fama and French three factor model and the three-factor model proposed by Chen *et al.* (2011), and over the CNZ3 that uses the return on assets and investments of the firm to measure portfolios' return. Both the FF5 and the CNZ3 consider the investment and profitability variables in their models; however, the difference was in the way of measuring them. The 5FF measures profitability as the yearly change in operating profit, taking into consideration the market capitalization of the stocks, while the CNZ3 measures profit as the income before extraordinary items is divided by total assets. As for the investment, FF5 measures it as the change in total assets, while CNZ3 considers only the changes in inventory and tangible assets. The researchers implemented the study on FTSE350, composed of 350 equities with the largest market capitalization in UK, using annual rebalanced data for the period from January 2002 to December 2013 while adopting the Fama and MacBeth (1973) two-step methodology.

Kubota and Takehara (2018) proved the weak impact of the profitability and investment on the cross-sectional variation of the Japanese stocks' return, such that the value variable was the most significant variable. Kubota and Takehara (2018) applied their study over the period from 1978 to 2014, using generalized method of moments (GMM). Additionally, the results of GRS test detected the weak difference between the Fama and French three-factor and five- factor model.

2.2.1.2 Examining Fama and French five-factor model in the developing markets

As for the studies conducted in the developing countries; Jiao and Lilti (2017) found through their study on the Chinese stock market that profitability and investment variables have not added any explanatory power over the three-factor model, except for portfolio constructed based on size and profitability.

While, Acaravci and Karaomer (2017) proved the validity of Fama and French five-factor model in Bursa stock market when implementing a study from 2005-2016. The results showed that profitability had the most significant impact, followed by size. Additionally, RMW had the largest average return when compared to the other microeconomic variables.

ElKhafagy and Abd ElRasol (2019) implemented a study on the Iraqi's stock market for the period from 2009 to 2017 to examine the role of Fama and French five-factor model using 34

listed companies. The results proved that the investors can get better results when establishing portfolios based on the size and profitability variables presented in the model. The researchers also added the need to add more variables to this model in order to enhance its explanatory and forecasting power.

Mosoeu and Kodongo (2020) implemented a study on six selected emerging markets (China, India, Malaysia, South Africa, South Korea and Egypt) and two developed markets (Australia and Singapore) for the period from 2010 to 2015 using weekly data. The results of their study proved the powerful role of the profitability factor for all the examined emerging and developed markets, when market excess return and size were detected as redundant factors.

Based on the analysis of the results retrieved from the previous studies, it is expected that the microeconomic variables presented in Fama and French five factor model to show significant role in explaining the variation in stocks' return. According the first hypothesis of this study is developed as follows:

H₁: The microeconomic variables presented in Fama and French's five-factor model have significant effect on stocks' return.

The next section covers the macroeconomic variables' role in explaining return.

2.3 The macroeconomic model

Changes in the stocks' prices are the most carefully examined prices in any economy because of their responsiveness to economic conditions and the possibility of their deviation away from the expected fundamental values, which may have further economic impact. Various researchers have supported the assumption that the macroeconomic variables are of great impact on stocks' prices and tested the ability of the macroeconomic variables to forecast stock's prices movement. This has driven the market participants' attention toward determining these variables and to examine how the stock prices are affected by the macroeconomic variables.

There are two different theories that debated the effect of major macroeconomic factors on stock markets: an economic theory named "The quantity theory of money" introduced by Fisher (1930). It states that the percentage change in the amount of money has an equal percentage change on price level. Also, there is a financial theory named Arbitrage Pricing Theory (APT), introduced by Ross (1976), explaining that the relationship between the main risk variables and asset prices can be used to forecast these assets' movements (Adesanmi, 2018).

APT model assumes that securities' return is measured by a model composed of multiple macroeconomic factors through measuring the sensitivity of asset's return to the anticipated or unanticipated changes in these macroeconomic variables. When Ross (1976) proposed this model, he illustrated the necessity of taking into consideration additional sources of risk that affect assets' return: the systematic risk and unsystematic risk. The systematic risk considers the factors that affect the whole economy while the unsystematic risk considers the factors that affect a specific industry. Ross explained that the greater the covariance between the source of risk and the stocks' return is, it indicates that this source of risk is systematic risk (Bhayo, 2015). APT gained advantage because of the easiness of its empirical test since it does not require the construction of market portfolio, which was required for CAPM (Roll and Ross, 1980). Additionally, it has an advantage over CAPM represented by compensating the investor for a number of risk premiums, not just a single risk premium. It also gained attention because of the relaxation of its assumption, as it accepts the possibility of disequilibrium in the market since some assets can have excess demand or excess supply. It relaxes the identical expectation assumption made by investors (homogeneity), while the market portfolio has no role in this theory (Coffie, 2012).

Using principal component analysis, Roll and Ross (1980) demonstrated the power of four pricing factors in explaining the return generating procedure for individual stocks while Chen *et al.* (1986) used APT to test the effect of a group of macroeconomic variables as a source of systematic risk. These variables were measured against equity return of New York Stock Exchange and proved their significant effect. Chen *et al.* (1986) identified that factors affecting return may involve change in industrial production, inflation rate, spread between low graded and high graded bonds, growth rate in GDP, interest rate, oil prices and gold prices, etc. Chen *et al.* (1986) tested the applicability of the APT in the US securities market using a number of domestic macroeconomic variables as a source of systematic risk and examined their effect on stock prices. All of the selected factors were regressed against portfolios' return to get the sensitivities of stock return to those variables, and then those sensitivities were used to calculate expected return for the following period. The results concluded that many of these domestic macroeconomic factors had a great importance in explaining the expected return of the stocks. The most important of these variables were industrial production, changes in risk premium, and change in the yield curve, while Nautiyal (2015) found that the most examined macroeconomic variables in the literature affecting the national and international markets were interest rate,

money supply, consumer price index, exchange rate, industrial production, and unexpected events. Adesanmi (2018) classified the domestic macroeconomic variables that were tested by most of the studies as economic forces and economic shocks. The economic shocks are sudden events that are unexpected and cannot be predicted a priori, like wars, terrorism attacks, natural catastrophes, while the economic forces are the economic events that describe the environment in which the stock market operates and can be controlled by the governments and policy makers, such as interest rate, industrial growth, exchange rate, etc.

In this study, the variables are selected based on the literature and the belief that the selected variables have the most influence on the examined stock market and future cash flow of its stocks, in addition to ensuring the data availability of these variables.

The review of the macroeconomic literature revealed that stocks' prices are more sensitive to some variables than others and that the findings reached by the previous studies were not consistent and did not follow a unified pattern. These results could avoid setting clear policies and may increase the market participants' confusion. Additionally, it is noticed that there is an insufficiency of studies that examined the effect of global macroeconomic variables on stock markets of the emerging economies, while a large number of studies have been conducted in developed markets, predominantly the U.S. market (Jiang, 2018; Jansen and Zervou, 2017; Laopodis, 2010; Bernanke and Kuttner, 2005). On the other side, most of the examined macroeconomic variables in the developing markets are domestic ones, such as inflation (consumer price index), exchange rates, interest rates, GDP, industrial production and money supply (Ajaz *et al.*, 2017; Nautiyal, 2015).

Our study selected three of the most comprehensive domestic macroeconomic factors, with two of the most prominent global macroeconomic factors, to build the macroeconomic model. The global macroeconomic factors are Federal Fund Rate (FFR) and Global Commodities price index (GCI) and the domestic variables are exchange rate (EXR), inflation rate (INFR), and industrial production index (IPI). It should be highlighted that the variables selected for this study construct the main indicators of the economic condition of the Egyptian stock market, which is the stock market under investigation in this study. Also, volatility and deviations in stock market were noticed when any announcement is made regarding these variables, while investors and other people clearly watch these variables upon any change is made related to them. The following sections are divided based on the five variables selected. A review is

covered for the articles that examined the variables in markets with different degrees of development while focusing on the emerging markets.

2.3.1 Exchange rate

Exchange rate is employed in this study as a domestic variable that measures the external competitiveness of the economy (Majid and Yusof, 2009). There are various approaches that discuss the relationship between exchange rate and stock market; the “goods market approach” or sometimes called the “traditional approach” is the first prominent approach that was discussed by Dornbusch and Fischer in 1980 (El-Masry and Badr, 2020; Alshogeathri, 2011). It elaborates how the stock market is affected by exchange rate fluctuation using the balance of trade. This approach based its discussion on the importance of international trade to the domestic economy. If the stock market of an economy is dominated by exporting firms, the decreases in the value of the local currency will increase the demand on the local goods in front of the world’s products, which will increase the exports and then will increase the cash inflow, earning and prices of the domestic stocks (Majid and Yusof, 2009), while the opposite happens in case of an appreciation in the value of the domestic currency. On the other side, if the stock market of an economy is dominated by importing firms, the decrease in the value of the local currency will make the imported products expensive, affecting the stocks’ prices of the local firms negatively i.e., a positive relationship is expected to be between exchange rate fluctuation and stock market. Thus, it is expected that the exchange rate affects the input and output of the firms and will affect their degree of competitiveness (Aydemir and Demirhan, 2009).

The second approach is the “portfolio balance approach”, introduced by Frankel in 1983 (Alshogeathri, 2011). This approach suggests a direct relationship between stocks’ return and exchange rate. The exchange rate is directed by changes in stock market, such that the increase in the values of the stocks will direct investors toward the local stocks away from the international ones, causing an appreciation in the value of the local currency and the opposite is true in case the domestic market depreciates (Aydemir and Demirhan, 2009). Governments can intervene in the economies to adjust the value of the local currency in case it is undervalued through restricting the exports while supporting the imports by imposing taxes on exports and offering subsidies on the imports (Adesanmi, 2018). In case an over-valuation happens to the local currency; this can result in balance of payment deficit leading to borrowing or a reduction in the foreign reserve. There is also “Asset market approach”, which indicates the existence of

no relationship or a very weak one between exchange rate and stock market, depending on the fact that both are directed by several factors (El-Masry and Badr, 2020).

Exchange rate is associated with volatility because of the presence of international diversification, the relationship between returns across market, the gradual elimination of the capital inflow and restrictions on foreign exchange in the developing markets (Aydemir and Demirhan, 2009). These changes worked on making the investment environment more appropriate and giving more chances for better portfolio diversification. Also, it plays a vital role in stock market development within the trade-oriented economies and changing the countries' economic development level. This has attracted the minds of economists and researchers and increased the necessity of studying exchange rate.

Indeed, there are a number of empirical studies that have tested the impact of exchange rates on emerging economies. Most of the studies that investigated the long and short term impact of the exchange rate on the stock market employed the co-integration technique for the long term relationship and the Granger causality for the short term relationship, whereas the causality relationship has one of four results: a two way relationship between exchange rate and stock market (bi-directional relationship), a one way direction either from the exchange rate to stock market or from the stock market to exchange rate, and a no relationship.

Majid and Yusof (2009) implemented a study on the Malaysian stock market. The researchers found a significant negative relationship between exchange rate and stocks' prices. Aydemir and Demirhan (2009) found the same results when they implemented a study using a causal relationship between the Turkish stock market and exchange rate. The researchers used data from 2001 to 2008 and used multiple indices, like national 100, service, industrial, financial and technology indices. The results found a negative relationship between indices of national 100, service, industrial and financial with exchange rate, and the same negative relationship was found between the integrated index and exchange rate. However, there was a one positive causality relationship found between technology index and exchange rate.

In another Turkish study, Buyuksalvarci and Abdioglu (2010) rejected the influence of exchange rate on the Turkish stock market when using the ISE 100 Turkish index. The researchers implemented a study to test the causal relationship between some macroeconomic variables and ISE 100 index of Turkey for the period from March 2001 to June 2010. That period was characterized by floating exchange rate regime. However, the results proved that the stock

market had an influence on the foreign exchange, which means that it can be used as a leading indicator for this variable.

The same results were reached by Saleem and Alifiah (2017) through their study on the Pakistani stock market for the period from 1990 to 2015, when using the Granger causality test. The researchers proved that the exchange rate cannot be used to forecast the movements in the Pakistani stock prices, while the cointegration test indicated the negative relationship for exchange rate on the KSE 100 index.

Alshogeathri (2011)'s study on the Saudi stock market from January 1993 to December 2009 found a positive insignificant relationship between the stock market and exchange rate, using Vector auto-regression and GARCH, which means that the increase in the value of the Saudi currency can attract the foreign investors toward buying local stocks. The insignificant relationship was justified by the limited availability of the foreign investors at the time of the study and because the majority of the trade activity of the Saudi economy was dominated by importing firms.

When using the asymmetric ARDL nonlinear cointegration technique, Ajaz *et al.* (2017) have proved the existence of asymmetric reaction of Indian stock prices to exchange rate, such that the depreciation of exchange rate had resulted in decreasing prices of the stocks. The researchers examined monthly intervals for the period from April 1991 to December 2015, using the BSE index as a proxy for the Indian stock prices and using average monthly Indian rupees per US dollar as a measure for exchange rate.

Ibrahim and Aziz (2003) examined the relationship between the Malaysian stock market and four macroeconomic variables, including exchange rate, while using data set of 22 years. The results proved the existence of long- and short-term relationships between the examined variables and the stock market, whereas the exchange rate showed a negative unstable relationship with stocks' prices.

From the previous studies, it can be concluded that all theories of exchange rate are supported: the portfolio balance, goods market (traditional) approaches, and the asset market approach. This means that the sign of exchange rate cannot be pre-assigned and its impact is going to be determined through an empirical test.

2.3.2 Inflation rate

Different monetary policy tools are used by different governments to establish a stable economic condition for economies' welfare. The central bank can use some monetary policy

tools to maintain prices and reach the optimal output and employment level in the country (Hojat, 2015). Tools of monetary policy adjustment could be the usage of debt instruments, such as the interest rate, consumption's adjustments and the amount of money supply (Suhaibu *et al.*, 2017; Hojat, 2015).

It is argued that for the monetary policy tools to be of good economic effect, they have to affect the prices of the stocks, as stocks' ownership represents the future demand for output (Patelis, 1997), while Suhaibu *et al.* (2017) described financial markets as the connecting bond that allows transmitting the monetary policy actions to the nations' economy.

Also, it should be highlighted that the changes in the stocks' prices are used to measure the country's degree of economic development and to give a review to the central banks about how the private sector sees the future of the major macroeconomic variables.

The government's choice for the monetary policy techniques to be followed has to be taken with great concern, as it affects the way investors decide to allocate their wealth among the available assets. For investors to decide which stocks to buy and sell, they have to take into consideration three factors: firstly, the uncertainty expected to occur for the current and future firms' dividends; secondly, the sources of risk associated with any assets' investment; and thirdly, interest rate changes in the short run (Hojat, 2015). Accordingly, it is very essential to understand how the monetary policy affects the financial markets and especially the stock markets.

Change in inflation rate is picked to be tested in this study as one of monetary policy tools. It is expected that whenever the money supply increases, the inflation rate will increase, as the increase in the amount of money circulated in the economy will decrease the purchasing power of the currency. This means that the central bank uses money supply to control the level of inflation, such that the inflation rate is reduced when decreasing the lending rate while raising the borrowing rate (Adesanmi, 2018). The stock market is sometimes beneficial to hedge against the rise in prices caused by inflation.

Inflation is explained as the changes occurring to the prices of goods and services existing in an economy. It is expected that the increase in inflation means a raise in living costs, causing a shift away from stocks' purchase to consumable products. This decreases the demand on stocks, followed by a drop in trading volume and thus a decrease in stocks' prices (Suhaibu *et al.*, 2017).

Previous studies that have examined inflation rate proved its significant impact on stock market as a monetary policy tool. Prior work of Fisher's assumption has claimed the positive relationship between inflation and stock return (Suhaibu *et al.*, 2017). Fisher's studies explained that on the long run, the nominal interest rate should be on the same line with expected inflation, while later empirical work proved the negative relationship between them (Šimáková *et al.*, 2019; Mohamed and Ahmed, 2018; Fama, 1981).

The contradiction in the results motivated the researchers to justify the existence of the negative relationship to the "tax effect" explained by Feldstein and Horioka (1980) and the proxy effect explained by Fama (1981). Also, Hatemi-J (2009, cited in Alshogeathri, 2011) explained that this negative relationship is based on the inverse relationship between inflation and economic growth that forces investors to deviate away from the purchase of stock to another profitable investment opportunity.

From the studies that tested the inflation rate impact is a study by Šimáková *et al.* (2019). The researchers implemented a study to examine the relationship between three macroeconomic variables: GDP, inflation and interest rate with stock markets of 12 European Union countries with different degrees of development. Their study focused on food and drinks' companies only as it argued the stability of this sector, whatever the surrounding conditions are. The countries under study were Poland, Lithuania, Italy, Spain, Ireland, Germany, Cyprus, UK, Austria, Croatia, Denmark, and Finland and were examined for the period from the 4th quarter of 2005 till the 4th quarter of 2015. The inflation rate was measured by food price index (FPI) and proved to have an inverse relationship with the performance of food and drink companies' stock prices when using correlation analysis. This means that the increase in the input material of these companies would have a bad impact on their profit and accordingly on their stocks' prices.

Also, Jareno *et al.* (2019) implemented a study on the stock market of six countries with varying degrees of development (Germany, Italy, Spain, France, UK and US) to test the empirical power of the selected macroeconomic variables: Gross domestic product, consumer price index (CPI), the industrial production index and unemployment rates. The results proved the low significance of the industrial production and CPI. the significant negative role of the unemployment rate while the significant positive relationship of the GDP variable. As for the studies conducted in the emerging economies Akbar *et al.* (2018) tested the long-term relationship between the inflation rate with six macroeconomic variables on the Pakistan's

stock market. The period under study was from 1992 to 2012 while employing three econometric tools to evaluate the linear relationship: the OLS, the ARDL Co-integration and the Vector Error Correction Mechanism. The results proved the significance of the current and lag values for inflation rate measured by consumer price index (CPI). The inflation rate was of a negative influence during the current month and positive in the next month and negative again after two months. The results of the econometric tools confirmed the long-term relationship between the variables and the KSECAP, while confirming the ability to return back to the known relationship in case any deviation occurs because of temporary shocks.

Mohamed and Ahmed (2018) examined the effect of inflation rate with other five macroeconomic variables on the Jordanian stock market for the period from 1976 to 2016, whereas the examined variables were industrial production, interest rate, money supply, inflation rate, GDP and imports' prices. The results proved the significance and positive impact of industrial production and money supply, along with the significance and negative impact of the inflation rate along with import prices.

Suhaibu *et al.* (2017) tested the impact of monetary policy tools represented in money supply, interest rate and inflation rate on stock markets of 12 African nations with different monetary policy strategies, using data from 1997 to 2013. Since the majority of the African nations are cursed by various economic shocks, they became an important area of study. It was found that the inflation rate increases when there is a shock in the market that affected the stocks negatively. Also, the results indicated the existence of a two-way direction between inflation and stock market i.e., the inflation level affects and is affected by the stock market.

Alshogeathri (2011) implemented a study in the Saudi stock market using CPI as a measure of inflation rate and proved the negative relationship between the two variables for the period from 1993 to 2009. The researcher justified these results by demonstrating that the Saudi stock market did not provide the investors with enough hedges against fluctuation in inflation rate, which made the investors move their investment toward more real assets.

However, Dayyat and Freihat (2017) proved that CPI granger caused the Amman Stock market when studying the relationship between five macroeconomic variables and stock market in Jordan. The variables examined were industrial production index, discount rate, money supply, foreign exchange reserve, in addition to Consumer Price Index during the period from 2002 to 2015.

On the other side, Ramadan (2012) proved the insignificance of inflation rate when testing its impact on Amman Stock Exchange (ASE) with other variables to determine the best factors explaining changes in stock return. The researcher used six variables: four macroeconomic variables: interest rate, inflation, money supply and risk premium, and two market indicators variables: dividends yield and industrial productivity. These variables are tested against 12 industrial portfolios. The regression analysis found that there was a great difference in the ability of variables to explain changes in stock return due to the availability of market indicator variables with other variables. The results showed that four variables explained 84% of changes in stock return while the other two factors (inflation and dividend yield) did not have a significant effect; the researcher analyzed and explained these results by stating that this may be due to the investors' ability to predict those variables accurately.

The same results were reached by Saleem and Alifiah (2017) through their study on the Pakistani stock market for the period from 1990 to 2015 while using the Granger causality test. The researchers proved that the inflation rate cannot be used to forecast the movements in stock prices, while the cointegration test indicated the negative relationship for inflation on the KSE 100 index.

Recently, Molefhi (2021) implemented a study to test the impact of inflation rate with other macroeconomic variables on stock market development of Botswana from 2006 to 2017. The short-term analysis revealed the positive impact of inflation rate, money supply and real output (GDP) on stock market's development while in the long run, only GDP showed a positive significant influence.

Given the various empirical findings reached above and the dominant results about the inflation rate's effect on stock market, the researcher concluded that the expected sign for inflation rate effect on stock market is to be negative.

2.3.3 Industrial production index

Industrial Production Index (IPI) is the most famous proxy used for measuring the economic growth of any country, while other researchers used it in case of the unavailability of the GDP, as it is able to show variation in production of short terms (Geetha *et al.*, 2011). It is a cyclical indicator that assesses the production performance of the industrial sector within a nation (Jareno *et al.*, 2019). It measures the real production output of various industry, such as manufacturing, mining and utilities and takes into consideration the changes in adjusted price of outputs; accordingly, it assesses the real performance of each country's economic activity.

The industrial production index is affected by the economic state of a nation; thus, a rise is shown in periods of economic boom while the opposite in recession periods. Also, it has a direct influence on the cash flow of companies; therefore, it is expected to have a positive impact on the prices of the stocks of the related country. When industries in a specific economy are doing well and there is a progress in their productivity and profitability; the prices of their stocks would go up. The IPI was among the macroeconomic variables that were examined in Ross's (1976) study in U.S market and proved to be significant, and it was tested by Chen *et al.* (1986) in their studies in the New York Stock Exchange market. Also, Fama (1990) proved through his study on New York Stock Exchange that more than half of the variation in return was explained by changes in industrial production output. Moreover, Fama (1990) concluded a positive relationship between the future industrial production growth rates and stock returns. The same is for Lazarus's (2017) study for sectorial level when using 8 sectors from Kenneth French's 17 industry portfolio data set.

Balvers *et al.* (1990) studied the claim that stock return can be predicted based on the forecasts of the industrial output using data from 1947 to 1987 in UK, Canada, US and Japan. The results found that stock return can be predicted using lagged industrial output, confirming that the industrial production output of the current period can forecast return for the following period for the examined markets. Also, it was found that the industrial production output was of stronger impact on stock return than the dividends.

Ibrahim and Aziz (2003) examined the dynamic linkage and causal relationship of a group of macroeconomic variables and Kuala Lumpur Composite Index using co-integration and vector auto-regression. The period under analysis was monthly data from January 1977 to August 1998, and the industrial production index was chosen to reflect the real output activity within the country. The results found a positive long-term relationship between industrial production index and stock prices while the variance decomposition results found a positive lagged response of the stock prices to changes in industrial production index.

Buyuksalvarci and Abdioglu (2010) used granger non-causality test to examine the impact of industrial production index with other macroeconomic variables on Istanbul Stock Exchange-100 while employing monthly data for the period from March 2001 to June 2010. The results revealed the existence of a unidirectional long-term causality relationship that the historical change in stock prices caused a significant change in industrial production index.

In Adesanmi's (2018) study on the stock markets of MINT countries from 1993 to 2014, the granger causality results proved that the industrial production index was the second important variable after the exchange rate, among the tested macroeconomic variables on Mexico's stock market. Also, the test revealed a unidirectional relationship between industrial production index and stocks' return of Indonesia. The short- and long-term analysis of the model proved the existence of a positive short-run and a negative long run relationship between industrial production and both the Mexican and Indonesian stock markets, while the opposite results were found in Turkey as negative short and positive long relationships were found.

Dincergok (2016) tested the impact of industrial production index on different indices of Turkish stock market for the period from 2000 to 2008. The examined indices were BIST National Industry, Technology, Service and Financial Sectors Return Index. The results of the study revealed the insignificance of IPI on the industrial and financial sector while it affected the service and technology sectors negatively. These results were not as what was expected, and this may be due to the proxy or the method employed for measuring the IPI in that study, while Dincergok suggested that the use of co-integration analysis would be more appropriate. Also, Amarasinghe (2016) tested the effect of industrial production index on different sectors of Colombo Stock Exchange in Sri Lanka through focusing on food, beverage and tobacco industries. The analysis was applied using Augmented Dickey-Fuller and Phillips Perron Test of E-Views software and Granger Causality test for examining the casual relation, for monthly data from 2001 to 2014. The results indicated the existence of a one-side causality relationship: that the IPI affected positively the stock return of the selected sectors.

Jareno *et al.* (2019) implemented a study to examine the potential correlation between the stock markets of six countries and some macroeconomic variables, including the industrial production index using quarterly data for the period from 2000 to 2014. The results of the study proved the existence of a positive relationship between the industrial production index and the international stock markets employed in the study, but the relationship was of low significance. Another study was implemented on the stock market of Jordan by Dayyat and Freihat (2017) to test the impact of IPI on Amman stock Exchange for the period from 2002 to 2015. The study employed the unit root and the Granger causality tests. The results found that the Amman stock market did not granger cause the industrial production index, and also the IPI did not granger cause the stock market. However, when Mohamed and Ahmed (2018) used Autoregressive Distributed Lag (ARDL) to test the effect of the industrial production index on Jordanian stock

market, the results proved its positive significant impact, using annual data for the period from 1976 to 2016.

Recently, Ali (2021) examined how the volatility of industrial production and consumer price index, Treasury bill rates and foreign remittance inflow led to volatility in the Bangladesh stock market. The period of analysis was from 2005 to 2018, where the results proved that the increased volatility in the industrial production led to a decrease in the stock market volatility while the increased in volatility of the other variables led to an increase in stock market volatility. The review of the previous studies highlights the importance of the industrial production index as a measurement of the real output and the economic growth of any nation and its expected positive impact on the stock market. Accordingly, it is nominated to be examined in this study to enrich and update the existing literature of its impact on the stocks' return.

2.3.4 Federal fund rate

The economy of U.S.A is one of the biggest economies; any changes in its economic or financial policies will be transmitted to the developing nations, which were proved after the effect of the 2008 global financial crisis on the world's different nations. It is expected that the unanticipated movements in stock markets of the emerging economies is justified by changes in U.S. policies (Adesanmi, 2018).

As a result of the 2008 global crisis, the federal fund rate decreased close to zero, whereas the federal rate is the overnight interest rate charged by a bank to another bank when loans exceed the reserve; it is used as a tool for controlling the economy. Decreasing the federal rate had increased the capital flow to emerging economies and attracted investors to invest in the emerging stock markets (Marwah, 2015). Despite the existence of exchange rate risk and default risk, investors are still attracted to invest in the emerging stock markets because of the high return associated with the high level of risk. This indicates the existence of an inverse relationship between the federal fund rate and the developing stock markets. After the 2008 global crisis, the emerging economies had received around 50 percent of the global capital inflows because of the low interest rates adopted in the developed economies from 2009 to 2012. Majid and Yusof (2009) explained that the developing economies have observed a huge inflow from international investors and are viewed as competitive investment alternative. Alongside the capital inflow, equity and bond prices rose higher while currencies appreciated

in value as it became cheaper to borrow, and investors sought yield outside of developed countries' borders.

After getting the advantage of decreasing the Federal fund rate¹, the Chairman, Mr. Ben Bernanke announced in May 2013 the tapering of the quantitative easing. The most obvious among the used tools of tapering was lowering the bond buying from 85 billion dollars a month to 15 billion a month (Marwah, 2015). That tapering had resulted in increasing the interest rate, depreciation in currencies of the emerging countries and capital outflow from the developing markets, while the most affected countries are those of large current account deficit and great borrowing in foreign currency (Eichengreen and Gupta, 2015). Eichengreen and Gupta (2015) found through their study on 53 countries for the period from April 2013 to August 2013 that some of the emerging countries showed depreciation in exchange rates. This depreciation was noticed from the end of April to the end of July, such that the depreciation for half of the countries was more than 5.5% while Brazil recorded the largest depreciation with 12.5%. Also, a decline was witnessed in the foreign reserve, where the Dominican Republic and Indonesia showed the greatest decline. However, the impact of this tapering on the stock markets of the examined countries was different as 40% of the countries either had not shown a decline or showed a small appreciation.

The most affected emerging countries of this tapering were the countries that had appreciated the real exchange rates and had an increase in the current account deficit in the period prior to the quantitative easing. Additionally, countries with large markets' size witnessed an increasing pressure on their stock markets, exchange rate and foreign reserve (Eichengreen and Gupta, 2015). In 2015, the U.S. Federal reserve announced that there would be another increase in interest rates as a reflection of the economic improvement that had resulted in increasing the value of the U.S. dollar. This had increased the bad impact on the banks, companies and households that get loans in dollars and spend in another currency (Kuepper, 2019).

Adesanmi (2018) implemented a study to test the impact of changes in Federal fund rate before and after the financial crisis on the MINT countries (Mexico, Indonesia, Nigeria and Turkey). Several statistical tools were used to examine the relationship, including impulse response function, Granger causality test and variance decomposition, while the period under study was

¹The decisions about applying an expansionary or tightening money supply and changes in interest rates are made by FOMC (Federal Open Market Committee) through buying or selling treasury securities (Hojat, 2015)

monthly data from 1993 to 2014. The results revealed variations with respect to each country, such that for Indonesia there was a negative relationship on the short term, but on the long term a positive relationship was observed. For Nigeria and Mexico, the relationship was negative in both the short and long terms, while for Turkey the results were positive on the long and short terms.

Majid and Yusof (2009) implemented a study to test the impact of the U.S monetary policy changes on the developing economies, especially the ones that adopt the Islamic rules in their financial system as Malaysia, and how these changes are transmitted through the federal fund rate channel. The study tested the long- and short-term relationship between the Malaysian stock market and the federal fund rate as an international interest rate for the period from 1999 to 2006 (post 1997 financial crisis). The results showed the increasing demand on the domestic Islamic stocks (Shari'ah stocks) as the federal fund rate increases. This relation can be justified by the fact that most of the Muslim people consider that too much interest rate is not right, according to what is stated in the Holy Qur'an (2:27). The Malaysian investors believe that any amount of money above the principal is considered as "riba" and is not acceptable; thus, they did not rush toward searching and investing in higher interest rate instruments.

Cihangir (2019) implemented a study on some emerging markets (Turkey, Brazil, Mexico, Indonesia, Russia and India) to investigate the impact of federal fund rate in addition to gold volatility index and oil volatility index on market index of these markets. Using daily data for the period from 2010 to 2018; the results found that the change in FED rate did not affect the index of the examined stock markets,

The review of the previous studies revealed that the most frequent impact is the negative influence of the increase in federal fund rate on the stock markets of the emerging studies but the studies implemented are still inadequate to generalize this impact on all markets. The review of the literature detected limited studies that examined the impact of the US federal fund rate on the stock market of the emerging economies which stresses the need for more studies so that an appropriate policy could be developed regarding the impact of FED rate on the stock market of the emerging markets.

2.3.5 Global commodities index

Since the price of the stocks is the present value of the future expected cash flow, the prices of the stocks are affected by any event that could affect future cash flow as the prices of oil, which is considered as a basic component of most output products.

The global commodity index composes of the prices of non-fuel and fuel commodities, but the most famous commodity is the oil. The oil price represents the most examined among the other commodities because of its strategic importance and its reference to the growth level of the economies (Adesanmi, 2018). It was examined by Chen *et al.* (1986) against US stock market return as a measure of economic risk.

Various studies have tested the direct influence of oil price through accessing its effect on final products' cost, which could have an unfavorable effect on the stocks' prices in case an increase in its price, while the indirect impact was verified through measuring the oil effect on the discount rate, because of the latter's influence on inflation rate. There is a direct relationship between inflation and discount rate whereas the increase in oil prices is translated as an increase in inflation rate and in turn decreases the stocks' prices, ending with an ultimate inverse relationship between oil price and stocks' return (Alshogheathri, 2011).

Also, it should be highlighted that the effect of oil prices depends on whether the nation is an exporter or an importer of oil whereas the effect on stock markets for the importing economies is expected to be negative and positive for the exporting ones.

Moreover, Adesanmi (2018) added that the changes in commodities index is expected to impact the exchange rate of the country, such that the increase in commodities price index will increase the value of the local currency for the commodity-exporting economies. That was supported by Alshogheathri (2011) who found a significant positive relationship between oil prices and Saudi stock market; however, the results were not the same across the examined period. This means that the relationship between oil prices and stock market depends not only on whether the examined nation is a net exporter or importer of oil but also on the degree of development of the nation and its institutional structure (Cunado and Garcia, 2005).

Also, Singhal *et al.* (2019) tested the impact of oil in addition to gold on the Mexican stock market index. The study employed daily data for the period from January 2006 to April 2018, while using ARDL bound testing co-integration approach. The result proved that international gold prices had a positive relationship with the Mexican stock prices; as for oil prices, it was of an inverse relationship, which could be justified by the fact that Mexico is an exporting country of gold, but for oil it exports its original form and then imports the petroleum products.

Adesanmi (2018) tested the impact of the whole commodity index as a global factor on the stock market of four emerging economies. The analysis of the long- and short-term

relationships has revealed that all the examined countries had a positive relationship with GCI in the short and long terms.

Manurung *et al.* (2015) implemented a study between Jakarta Composite Index of Indonesia and Global Commodity index, using the VECM model with monthly data from November 2000 to December 2012. The results of Granger causality test indicated that the commodity index, composed of oil, gold, coal and crude palm oil, did not have a significant effect on the Jakarta Composite Index, while the results of the impulse response function indicated that the coal, crude palm oil and oil had a negative impact, but the gold had a positive impact on Jakarta Composite Index.

Akkoc and Civcir (2019) examined the spillover from the international oil and gold prices to the stock market in Turkey after the financial crisis, using structural VAR-DCC-GARCH approach. The results of the analysis proved the significant spillover effect from the international crude oil to the BIST100 return, whereas the correlation between the oil and stocks' return was low and more volatile than the relationship between gold and stocks' return while international gold prices had a powerful and a positive relationship with the stocks' return.

After the analysis of the literature, the inadequately of the studies that studied the impact of changes in global commodities index on the emerging economies stock market is viewed. Moreover, the implemented empirical studies were more concerned with the oil and gold prices, ignoring other commodities. This has raised the concern toward studying the impact of other commodities on the emerging stock market. This is important nowadays, especially when oil prices have decreased and the majority of countries that depend on oil are trying to move toward non-fuel commodities, like agriculture, food products and metals. It should also be highlighted that most of the developing countries that are food importers have doubled their food imports since 2000 (Adesanmi, 2018). Thus, it is important to consider the impact of both fuel and non-fuel prices in this study.

Table 2.1 shows a summary of the main findings regarding the impact of each of the selected macroeconomic variables on different stocks' return.

Table 2.1: A summary of the macroeconomic studies

The variables	The researchers	The tested markets	The main findings	The expected sign.
Exchange Rate	Ajaz <i>et al.</i> (2017)	India	The depreciation of exchange rate resulted in decreasing prices of the stocks.	Positive relation
	Ramadan <i>et al.</i> (2016)	Egypt and Tunisia	The results of the study indicated the existence of either a long term or a causal relationship between the Exchange rate and the stock markets.	
	El-Masry and Badr (2020)	Egypt	The results proved the existence of a significant causal relationship between the different indexes and exchange rate and between the market capitalization and exchange rate in both directions before the 25 th revolution, while after the revolution, this relationship did not exist	
	Alshogeathri (2011)	Saudi Arabia	The analysis found a positive insignificant relationship between the stock market and exchange rate, using Vector auto-regression and GARCH.	
	Buyuksalvarci and Abdioglu (2010)	Turkey	The results rejeted the influence of exchange rate on the Turkish stock market, when using the ISE 100 Turkish index.	
	Aydemir and Demirhan (2009)		The researchers found a negative relationship between exchange rate and Turkish stock market.	
	Majid and Yusof (2009)	Malaysia	A significant negative relationship was found between exchange rate and stocks' prices.	
	Ibrahim and Aziz (2003)		The exchange rate showed a negative unstable	

			relationship with Malaysian stocks' prices.	
Inflation Rate	Simakova <i>et al.</i> (2019)	Poland, Lithuania, Italy, Spain, Ireland, Germany, Cyprus, UK, Austria, Croatia, Denmark, and Finland	The inflation rate had an inverse relationship with the performance of food and drink companies' stock prices, when using correlation analysis.	Negative relation.
	Jareno <i>et al.</i> (2019)	Germany, Italy, Spain, France, UK and US)	The results found low significance for CPI on the stock markets of the examined countries	
	Akbar <i>et al.</i> (2018)		The inflation rate was of a negative influence during the current month and a positive one in the next month and negative again after two months.	
	Saleem and Alifiah (2017)	Pakistan	The Granger causality test proved that the inflation rate cannot be used to forecast the movements in stock prices, while the cointegration test found a negative relationship for inflation on the KSE 100 index.	
	Mohamed and Ahmed (2018)	Jordan	The results found a significance negative relationship for the inflation on Amman stock market.	
	Dayyat and Freihat (2017)		The CPI granger caused the Amman Stock market.	
	Ramadan (2012)		The inflation rate did not have a significant effect.	
	Suhaibu <i>et al.</i> (2017)	12 African countries	The results indicated the existence of a two way-direction between inflation and stock market.	
	Abouwafia and Chambers (2015)	Egypt, Saudi Arabia,	The results showed that the changes in inflation rate	

		Oman and Kuwait and Jordan.	were more significant for Kuwait and Egypt.	
	Alshogeathri (2011)	Saudi Arabia	A negative relationship was found between the CPI and Saudi stock market.	
	Buyuksalvarci and Abdioglu (2010)	Turkey	The results rejeted the influence of inflation rate on the Turkish stock market but proved that the stock market had an influence on the inflaton rate.	
	Molefhi (2021)	Botswana	The short term analysis revealed the positive impact of inflation rate on stock market's development.	
Industrial Production Index	Balvers <i>et al.</i> (1990)	UK, Canada, US and Japan.	The industrial production output of the current period can forecast return for the following period for the examined markets.	Positive relation.
	Ibrahim and Aziz (2003)	Kuala Lumpur	The results found a positive long-term relationship between industrial production index and stock prices while the variance decomposition results found a positive lagged response of the stock prices to changes in industrial production index.	
	Buyuksalvarci and Abdioglu (2010)	Turkey	The results revealed the existence of a unidirectional long-term causality relationship that the historical change in stock prices caused a significant change in industrial production index.	
	Adesanmi's (2018)	MINT countries	The short- and long-term analysis of the model proved the existence of a positive short-run and a negative long-run relationship between	

			industrial production and both the Mexican and Indonesian stock markets, while the opposite results were found in Turkey as negative short and positive long relationships were found.	
	Dincergok (2016)	Turkey	The results of the study revealed the insignificance of IPI on the industrial and financial sectors while it affects the service and technology sectors negatively.	
	Amarasinghe (2016)	Sri-lanka	The results indicated that as IPI increases, the stock return of the selected sectors increases.	
	Jareno <i>et al.</i> (2019)	Germany, Spain, Italy, UK, France and US	The results of the study proved the existence of a positive relationship between the industrial production index and the international stock markets.	
	Abouwafia and Chambers (2015)	Kuwait, Egypt, Oman, Saudi Arabia and Jordan	The results found that the shocks in stocks' prices led to an increase in output in Egypt, measured by the IPI.	
	Ali (2021)	Bangladesh	The results proved that the increased volatility in the industrial production led to a decrease in the stock market volatility	
	Dayyat and Freihat (2017)	Jordan	The results found that the Amman stock market and the industrial production index did not granger cause each other.	
	Mohamed and Ahmed (2018)		The results proved the positive significant impact of IPI on Amman stock market.	
Federal Fund Rate	Adesanmi (2018)	MINT countries	For Indonesia, there was a negative relationship on the	Negative relation.

			short term, but on the long term a positive relationship was observed. For Nigeria and Mexico, the relationship was negative in both the short and long terms, while for Turkey, the results were positive on the long and short terms.	
	(Abou-Zaid 2013).	Egypt, Israel and Turkey	A negative relationship was noticed between the Egyptian stock market and the changes in federal fund rate, while the Israeli and Turkish stock markets did not respond to changes in FFR.	
	Majid and Yusof (2009)	Malaysia	As the federal fund rate increases, the demand on domestic Islamic stocks increases.	
Global Commodity Index	Singhal <i>et al.</i> (2019)	Mexico	The result proved that international gold prices had a positive relationship with the Mexican stock prices; as for oil prices, there was an inverse relationship.	Negative relation.
	Adesanmi (2018)	MINT countries	All the examined countries had a positive relationship with GCI in the short and long terms.	
	Manurung <i>et al.</i> (2015)	Indonesia	The results of the Granger causality test indicated that the commodity index did not have a significant effect on the Jakarta Composite Index. The results of the impulse response function indicated that the coal, crude palm oil and oil had a negative impact, but the gold had a positive impact on Jakarta Composite Index.	
	Alshogeathri (2011)	Saudi Arabia	A significant positive relationship was found	

			between oil prices and Saudi stock market.	
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To conclude, the previous studies showed that the macroeconomic variables have a significant effect on the stock return, but what differs is the degree of significance of each variable. Also, it is proved that there is more than one significant factor explaining stocks' return and that the factors selected in each study were based on the economic theory and the conditions of each market. Additionally, the empirical studies revealed variation in results; this variation could be justified by the sample or period under study, the economic cycle of the country, the methodology or the statistical tool used. Consequently, more studies are still needed to show the effect of different macroeconomic factors on each stock market. This study will add value to the literature of the developing countries as they constitute half of the top 20 economies of the world in the global investment opportunities (Graham *et al.*, 2016). This leads to the development of the second hypothesis in this study:

H₂: The selected five macroeconomic variables have a significant effect on stocks' return.

2.4 The behavioral model

‘Traditional finance assumes that we are rational, while behavioral finance assumes that we are normal’ Meir Statman (Curtis, 2004, p.16)

Being rational is the logical thinking; it is the dependence on logic, rules, reasoning and standards in all your actions, beliefs and judgments, based on Webster's New World Dictionary (Mathuraswamy and Rajendran, 2015). That is the main pillar of the classical theories that assume the full rationality of investors. The rationality depends on achieving two main conditions: basing the investment decision on the expected utility theory and making decisions with fairness and without any biases (Kumar and Goyal, 2016; Thaler, 1990).

The financial modern thoughts that were built on the rationality and efficient market assumptions were proved to be incapable of expressing the market behavior (Medhioub and Chaffai, 2018) because of the presence of various anomalies and irrationalities that restricted these theories from achieving their target. The traditional asset pricing theories failed to explain the irrationality and failed to portend and reflect real performance of markets, which made the emergence of behavioral finance a savior for this failure by highlighting the irrationality behind this unexplained trading behavior. It can be seen that investors do not accidentally deviate from

acting rationally; however, according to the psychological proofs, it was found that investors' behavior deviates in similar ways (Fenzel and Pelzmann, 2012).

Although the presence of these evidences in real economic life, the existing prominent economic approaches follow the ordinary paradigms and ignore the psychological part inherent in human behavior that humans own limited cognitive abilities and power in this crowded and quickly changing environment (Kumar and Goyal, 2016)

The following sections will introduce the behavioral finance model; it is divided into two main subsections. First, the evolution of the behavioral finance theory is introduced, with the main principles that form the basis for this theory. Second, a review is presented for the empirical studies that measured its effect on stocks' return.

2.4.1 The evolution of the behavioral finance theory

After the introduction of the Efficient Market Hypothesis, the market considered it as the crown jewel of classical finance (Cheung, 2010). This theory assumes investors' rationality in making their investment decisions, which requires investors to have access to all information, to own unlimited cognitive abilities and to have enough time to undertake decisions. It also claims that if there are irrational investors, their actions will be cancelled by the actions of other irrational investors, or the arbitrageurs will return the prices back to their fundamental values. It adds that the target of investors is to maximize their subjective utility functions. However, the empirical evidence proved that the previously mentioned conditions are difficult to be met (Medhioub and Chaffai, 2018; Kooreman and Prast, 2010).

Also, Simon (1990, p.7) described rationality as *"A pair of scissors whose two blades are the structure of task environments and the computational capabilities of the actor "*.

Studies about the behavior of investors started by Klein in 1951 when the researcher introduced a section called "Studies in Investment behavior" in the book "Conference on Business Cycles" (Ahmad, 2018), while the arguments opposing the standard thoughts started by the concept of bounded rationality, developed by Simon (1957) who explained that the knowledge of all information and all possible outcomes is restricted and limited to the cognitive abilities of the investor, in addition to the doubts about the external and internal factors influencing the market. Tseng (2006) has explained that human beings may act somehow irrational in situation when the information available is not complete or under risky and complex conditions and that leads to the bounded rationality concept.

Then, Simon (1997, p. 292) explained that:

“The term ‘bounded rationality’ is used to designate rational choice that takes into account the cognitive limitations of the decision-maker, limitations of both knowledge and computational capacity. Bounded rationality is a central theme in the behavioral approach to economics, which is deeply concerned with the ways in which the actual decision-making process influences the decisions that are reached”.

Based on the explanation provided by the bounded rationality, Tseng (2006) proposed the following modification for the efficient market hypothesis. Firstly, the assumption of investors’ rationality should be modified to bounded rationality or to what was called by Rubinstein (2001, cited in Tseng, 2006) the “minimal rationality”. Also, the assumption about the arbitrageurs’ ability to fix any mispricing in the market, was contradicted by “Limit to arbitrage”, explained by Shleifer and Vishny (1997). As for the assumption that claims the availability of several alternatives, among which the investors choose what maximizes their own utility and the availability of enough time to make the best choice, it is difficult to be met in real financial markets (Tseng, 2006).

After the explanation of the bounded rationality concept, Tversky and Kahneman (1974) explained that investors do not have to gather all the information before making a decision, as they depend on the "rule of thumb" and the already available information to make their investment decisions more easily and more quickly than using complicated methods. Then, Kahneman and Tversky (1979) developed the “Prospect Theory”, which is presented as a modification to the utility theory; it explains the way investors make decisions under risk, whereas the investors react differently to risk based on whether the expected results are gains or losses using a reference point. The utility theory was firstly explained in terms of net wealth while the prospect theory in terms of gains and losses (Tseng, 2006). It explains that the suffering felt by investors when realizing losses is greater than the joy felt from achieving an equal amount of gain (Kahneman and Tversky, 1979). Under prospect theory, the level of risk accepted by investors increases when achieving prior gains and decreases when achieving prior losses, making investors risk-averse (Tseng, 2006).

Wuthisatian *et al.* (2017) described the prospect theory as a value function based on the quantity and direction in relation to a reference level and introduced a modified version that represents a merge of prospect theory with a social interaction term called “the feelings of gain attraction”, which describes that individual is often affected by others’ gains when they compare their own decisions and others’ gains. This newly introduced model describes the jealousy and envy felt

when other people succeed and realize gains, which forces individuals to work on minimizing the difference between personal gains and the others' gains. Moreover, this model describes that investor uses the gains realized by successful traders as a destination point and as a new reference point, which accordingly increases their risk acceptance level.

After the development of the prospect theory, another theory called "Theory of Planned Behaviour" was introduced by Ajzen in 1985 (Akbar *et al.*, 2016). This was regarded as the most crucial theory in social psychology and was empirically supported by previous studies and literature. It is based on the "Theory of Reasoned Action (TRA)" introduced by Ajzen and Fisgvein in 1980, which states that the behavior of individuals is directed by the behavioral intention (Akbar *et al.*, 2016).

DeBondt and Thaler (1985) explained that the investors' irrational behavior is the major cause behind the failure of CAPM, that behavior is the result of investors' overrespond to spectacular announcements and sudden events. DeBondt and Thaler (1985) found through their study on the stocks listed in NYSE contradictory results to the dominant proposition that the higher the price-earnings ratio, the higher the return, and also that higher value equities earn higher return than that of high growth equities. The researchers formed winner portfolios and loser portfolios, using stocks that have performed outstanding gains or losses for a period up to five years. The analysis of the 20 years from 1962 to 1982 revealed that the loser portfolios performed better than the market by 19.6%, while the winner portfolios performed worse than the market by 5%. These results strengthened DeBondt and Thaler (1985) overreaction propositions.

Lakonishok *et al.* (1994) made the same argument against CAPM; the researchers argued that the credulous analysis of investors - like assuming that a certain historical trend will continue in the future, the overrespond to good or bad announcements or depending on companies' good reputation in making investment decisions without taking other concerns into consideration- will increase the purchasing pattern of historically good stocks (called glamour stocks) while decreasing the purchase of the historically bad ones (called value stock that have low historical and expected growth rates) (Coffie, 2012).

These main arguments led to the development of a new breakthrough called behavioral finance in the late of 1970 (i.e., 20 years after the birth of Efficient Market theory) (Cheung, 2010). This emerged thought contradictions to the assumptions of the classical traditional theory, as it is based on how investors actually behave not on how they should react. The behavioral finance has emerged after proving the limited cognitive abilities and the bounded rationality owned by

investors, which affect their investment decisions. It is trying to understand the investment decision making process, and since it is a newly introduced discipline, researchers have not reached a single definition. However, the most common definition emerges from defining the relationships among its main pillars: traditional finance, psychology and sociology. It is able to explain some of the anomalies presented in markets, especially those that stem from psychological and cognitive biases (Wong and Nwude, 2018). Kumar and Goyal (2016) and Kourtidis *et al.* (2017) considered it as a special mix between finance, economic, psychology and sociology. They illustrated that behavioral finance explains that the changes happening in the stocks' prices are a result of investors' unintentional and spontaneous actions. These inappropriate and spontaneous actions are based on some biases and heuristics, like risk aversion, optimism, framing, anchoring, mental accountancy and other deviations that lead to an increase in the supply or demand for a limited time and then a mispricing for some stocks (Ahmed M, 2017).

While Komba (2016) defined behavioral finance as a field under study, which involves heuristics, biases and sentimental sides with the financial part and aims at understanding the investment decision making process and its influence on the financial markets, Saxena *et al.* (2016) added that behavioral finance is able to minimize and to eliminate the differences found between the realized and expected returns, resulted from fundamental errors. They also illustrated that the presence of some anomalies - like delayed reactions to profit proclamation, the small size effect, the value versus growth- have resulted in the development of behavioral finance.

The behavioral thought views investors as two categories: the rational investors (or arbitrageurs as called by some market participants) and the irrational investors (or sometimes called noise traders). The first category represents the investors who form their investment decisions using logical reasoning and analysis while the second category represents the investors who are subject to biases and make their investment decisions based on their emotions and heuristics (Vieira, 2016).

That was not the case under the classical thoughts' umbrella, which considered the existence of rational investors only. The classical theories claimed that if the prices deviate away from the rational value because of investors' mistakes, the arbitrageurs or the rational investors will take advantage of that mispricing and force the prices back to their rational values through selling short the overpriced stock and buying long the underpriced ones. Kahneman and Tversky

(1979) and Shleifer and Vishny (1997) explained that the mispricing error that happened to stocks is because of the psychological forces reacted by investors. Also, there are “limits to arbitrage”, which prevent arbitrageurs from achieving their targets, which involve the uncertainty and restrictions inherent in the long and short positions, the high cost of their execution and the mispricing made by the irrational investors, which could be too large that cannot be covered by arbitrageurs (Ahmed M, 2017; Kilicay-Ergin *et al.*, 2012; Shleifer and Vishny, 1997). Shleifer and Vishny (1997) denied the existence of the arbitrage opportunities and debated their influence on the financial market by maintaining the market’s efficiency as described by the classical financial theory.

Barberis and Thaler (2003) also explained the limits to arbitrage and clarified that even if the arbitrage worked, the prices prediction might not work effectively. The same opinion was introduced by Vissing-Jorgensen (2003), who documented the behavioral finance achievement in asset pricing theories, by proving its capability to capture variations in stocks’ prices that were not explained by traditional views. He also discussed that arbitrage done by rational investors may be unable to return prices back if it veers away because of the irrational behavior of investors. These additional criticisms decreased the accuracy of the classical thoughts and highlighted the role of the behavioral theory.

Behavioral finance is able to overcome the obstacles faced by traditional researchers through discussing various heuristics’ variables, biases and behavioral forces, like loss aversion, overconfidence, regret aversion and others as in Kahneman and Tversky (1979). Heuristics describe the behavioral anomalies that are not explained by the conventional theories; it describes a situation of making decisions very quickly and in a thrifty way, using the bounded rationality concept without using the whole information available or using sophisticated tools (Lobao *et al.*, 2017; Gigerenzer and Gaissmaier, 2011), while Akbar *et al.* (2016) illustrated that it involves the usage of the trial-and-error method to make decisions. The heuristics’ variables cause the investors to act irrationally, resulting in multiple errors in the decision-making process (Tversky and Kahneman, 1974).

These behavioral forces affecting decision making process explain how the investors make their buy and sell decisions. These factors are able to illustrate how investors think to make the investment decision (Lathif and Aktharsha, 2016); while Akbar *et al.* (2016) explained that the psychological variables are the reason behind the departure from the expected utility theory when analyzing risk.

Chandra and Kumar (2012) explained the steps that pass by investors' minds to make investment decisions, representing the follow of some heuristics, cognitive biases and psychological factors. Firstly, each investor chooses a reference point, uses it as an anchor basis and is overconfident about reaching it. Secondly, the representativeness heuristics feature affects the investor's behavior and directs him/her, while making mental accountancy in mind by grouping and categorizing the money. Thirdly, the investor follows availability attribute and recalls to mind the easily accessible information; this step could also involve the herding and society effects on decision making since they represent easily accessed information. Finally, the investment decision making is affected by the asymmetric pattern of information utilization and division.

After reviewing the main principles that formed the basics of the behavioral finance thought, the following section will present the studies that have examined the effect of different behavioral variable on investment decision making and on stocks' return.

2.4.2 Previous studies on behavioral variables

Starting from Keynes's (1936) description regarding the investors' "animal spirit", researchers have been interested in studying abnormal markets' deviation and prices' volatility (Yang, 2014). Recently, the economists have become interested in understanding the impact of psychological factors on investors' decisions, which have led to the development of the behavioral finance era. This branch was developed as a complementary to fill the gap left by the traditional models.

The necessity of studying the psychological behavior increased after noticing that investors may respond more forcibly to a specific piece of information and less forcibly to another one, which could be driven by biases, heuristics, seasonality or neuro factors. Several psychological variables that cause over or under reaction have been studied and tested for their impact on investment decision.

The following section reviews the impact of different psychological variables that were extracted using systematic review methodology, which will be explained in details in the following chapter. The systematic review used the following keywords: "behavioural factors affecting stock return", "psychological factors affecting stock return" and "Investors' sentiment and stock market" with different reliable databases for the period from 1970 till 2018. After extracting the variables from the relevant articles, certain categorization and consolidation is done. Each of the following subsections shows a consolidation of a group of variables; these

variables are in some way interrelated or interwoven or reflect the same behavioural attitude. In the upcoming section, a justification is provided, illustrating the logic behind the consolidation of each group of variables. Additionally, a review for the empirical studies that examined the extracted variables is provided.

2.4.2.1 Investor sentiment

This variable represents a consolidation of the following terms: overconfidence, optimism, risk tolerance, risk appetite, breakeven, internal locus of control, perception of regulator, subjective financial literacy, investor competence, investor ability, pessimism and risk aversion.

The most examined behavioral factors are the investors' sentiment and self-confidence (overconfidence). Researchers have defined sentiment in various ways; Huang *et al.* (2014) and Baker and Wurgler (2006) considered investors' sentiment as a systematic risk categorized into investors' optimism and pessimism, whereas the investor feels pessimistic in case of a decrease in market's return and optimistic in the opposite case. This feeling appears when the information already known and available is not sufficient to justify future return and stocks' price movement, and then the feeling is translated to reactions toward price movement (Liston, 2016; Abdelhédi-Zouch *et al.*, 2015; Baker and Wurgler, 2006). Kaplanski and Levy (2010) explained sentiment as a misperception that leads to a pricing error. Yang (2014) also defined investor sentiment as a sensation toward the market or the psychology of its participants, determined by deviation in securities' prices traded in the market, which is why it is sometimes called market sentiment.

Investor sentiment existing in the capital market is the most dominant factor driving the economy, the cash flow and the volatility of stock market. Investor sentiment is reflected in the degree of confidence felt by the investor and accordingly is reflected in financial transactions (Abdelhédi-Zouch *et al.*, 2015).

Baker and Wurgler (2006) identified that there are two main channels behind the effect of investors' sentiment on stock market: limit to arbitrage and the difficulty in valuing stocks; these two factors have more effect on the stocks or assets that are sensitive to the sentiment factor. They also explained that the sentiment affects the demand on the stock that is exposed to speculation.

Huang *et al.* (2014) and Jitmaneeroj (2017) described that there are two measures of investors' sentiment: a direct and indirect one. The direct approach is survey based while the indirect approach is market based. Examples of the survey based represent the American Association

of Individual Investor (AAII), Investor Intelligence, the University of Chicago Consumer Sentiment Index and the UBS/Gallup Index for Investor's Optimism. AAI survey is used to measure sentiments of individual investors, prepared weekly by asking randomly selected investors about their expectations for the stock market for the coming six months. It gathers the responses weekly and names them bullish, bearish or neutral and publishes them monthly (Liston, 2016). The Investor Intelligence survey is for institutional investors, which labels the investors as either bullish, bearish or correction (hold) (Liston, 2016).

Bello *et al.* (2017) implemented the division of investor sentiment into institutional and individual in their study, whereas the usage of two sentiments' proxies emerged from the fact that each one owns a different point of view regarding the sources of risk and the factors affecting return. Brown and Cliff (2004) considered the survey of the AAI and Investors Intelligence as the most convenient measures for investor sentiment; however, this approach was criticized to be insufficient, as it is not able to provide full coverage for investors' responses and is exposed to subjective views (Huang *et al.*, 2014).

The other measure (the indirect one) is more commonly used and is based on the market ratios, like trading volume and dividend premium. An example of this approach is the index developed by Baker and Wurgler (2006). The researchers used six variables: the average closed-end fund discount (CEFD), NYSE share turnover (TURN), the number on Initial Public Offerings (NIPO), average first-day returns on Initial Public Offerings (RIPO), the equity share in new issues, and the dividend premium to establish the index, using principal component analysis. However, some researchers who followed the same approach in measuring investors' sentiment used different variables to construct this index, depending on the data availability in each country. Also, this approach can be measured on the firm, industry and market levels (Jitmaneeroj, 2017), like the trading volume used by Baker and Wurgler (2006) and the closed end fund discount used by Lemmon and Portniaguina (2006).

As for overconfidence, it is recognized as a bias in personality feature owned by some investors, regarding the belief in their own knowledge, abilities and justifications (Komba, 2016). Based on this bias, investors overestimate their skills and enter into risky deals, claiming that everything is controllable, especially when they feel that the public information moves in the same line with private information (Tseng, 2006). Various literatures (Rasheed *et al.*, 2018; Chandra and Thenmozhi, 2017; Graham *et al.*, 2009) illustrated that this bias is directed by feelings of miscalibration, unrealistic optimism, better than average and illusion of control or

self-attribution; also, it can result in “hand sight bias” and “illusion of knowledge bias” (Akbar *et al.*, 2016). Traders experiencing this behavior exaggerate their own skills when achieving gains and reprove others when realizing losses (Akbar *et al.*, 2016). However, Kourtidis *et al.* (2017) proved through their study that overconfidence was associated with an increase in stocks’ trading performance, which means that the overconfidence experienced by investors could be directed by knowledge, experience and solid background about the stock market, not a false belief in their own skills.

Ciner (2014) had explained that there are two ways of showing the effect of confidence; the first is its reflection on the degree of household spending, which is one of the major economic indicators, so it can be joined with firms’ profit. The second way is the effect of investors’ confidence on the behavior of the market’s participants whereas the increase in confidence is associated with short term increase in prices apart from their fundamental values. However, the arbitrage will cause the prices to return back on the long run, resulting in limited return. These explanations provide a clue that during periods of high sentiments, the financial market will face a long period of low return.

The reason for consolidating the investor sentiment with overconfidence, optimism and pessimism in this study is that, Tan *et al.* (2016) demonstrated, overconfidence and optimism provide the same psychological analysis behind investor reaction, while Baker and Wurgler (2006) showed that optimism and pessimism are categories of sentiments felt by investors. Optimism appears when the mean expected return exceeds the actual one, which means that the investor has hopeful, cheerful feeling and positive expectations regarding the future (Dhaoui, 2013). Pessimism is the opposite case, which is always associated with risk aversion and caution (Redhead, 2011). Pessimism happens when the expected return is less than the actual one, which occurs when the investor has bad and negative feeling about future return and there is a thought that it will get worse than the current situation (Dhaoui, 2013).

Other two terms that give the same impact as confidence and result in increasing investors’ confidence level are subjective financial literacy and perception of regulators. Subjective financial literacy is related to the possessed financial knowledge and the confidence to use it. It works on increasing the investors’ personal empower that enables investors to invest confidently in the stock markets. The same phenomenon is shown by the “perception of regulator” whereas the confidence here comes from government’s regulations and supervision over the capital markets. It describes the trust and the belief in governmental supervision over

the financial market, which in turn is translated to an increase in investors' confidence and involvement in stock markets (Sivaramakrishnan *et al.*, 2017). Sivaramakrishnan *et al.* (2017) proved the significant impact of subjective financial literacy when implementing a study to test the effect of financial literacy on investors' decision-making process through using mixed methodologies (qualitative and quantitative).

There are also the risk tolerance and risk appetite, which are always associated with high levels of self-confidence. Risk tolerance is defined as the greatest degree of risk that can be afforded by humans when making investment decision (Sivaramakrishnan *et al.*, 2017). As the investors' confidence level increases, they become more urged toward risk. Kourtidis *et al.* (2017)'s study on the Greek stock market proved that as the levels of overconfidence, sociability and risk tolerance increase, the investors' stocks trading frequency increases.

Similarly, the breakeven effect, which was described as a situation in which the investor accepts as much bets as possible to erase prior losses' effect in a way to return to breakeven position, can result in making more risky decisions and becoming more risk seeker (Wong and Nwude, 2018).

Investor ability is also much related to confidence; it measures the extent to which the investor feels confident about the owned ability in making the right investment decision.

Lathif and Aktharsha (2016) proved the positive relationship between investment ability, and risk appetite with investment decision making and highlighted the prominent role of investor ability among the examined behavioral variables.

There are an increasing number of studies that examined investor sentiment and overconfidence theoretically and empirically; the difference among these studies was the proxy used to measure these variables. These studies have improved the researchers' and market participants' understanding of the role of investors' sentiment in the financial market, tested its effect on stock market prices and examined its predictable power on markets with different degrees of development. Also, there are some researchers that tested the factors that affect and drive this behavioral variable. A review of studies that tested investors' sentiment are presented next, whereas the studies that are implemented in developed market are presented first then the studies implemented in the developing markets.

Uhl (2014) had measured the ability of investor sentiment to predict prices' movement of Dow Jones Industrial average index, using 3.6 million Reuter's news articles that are examined in a vector auto-regression model. The results demonstrated the ability of Reuters' sentiment to

forecast return more than the macroeconomic variables presented by Conference Board Leading Economic Indicator, whereas the negative sentiment is able to predict stocks' return more than the positive sentiment. Ciner (2014) explained that the best way to capture the effect of variation in sentiment on return is the frequency domain method. Accordingly, the researcher employed the frequency method, introduced by Ashley and Verbrugge (2008), to study the effects of sentiments' changes in the short, medium and long term on indexes return. Ciner (2014) measured market sentiment, using Conference Board Consumer Confidence index and University of Michigan Consumer Sentiment index while measuring large firms' return using S&P 500 and NASDAQ composite, and small stocks' return using S&P small cap 600. The results proved the significant effect of consumer confidence changes on future return of small companies, but not the big ones. It was noticed that in the short term and the long term, the variation in sentiment is associated with positive future return while in the medium term it is associated with negative return. These results are of significant importance and can be used to access future performance of small companies' indexes return.

Also, Huang *et al.* (2014) tested the effect of investors' sentiment on the Chinese stock market for the period from January 2005 to January 2013, using Baker and Wurgler (2006) index with few changes. The researchers found that the positive value of investor sentiment index, which indicates the optimistic practice of investors, has a positive significant effect on the return of the majority stocks. When it is negative indicating the pessimism of investors, it has not shown that significant effect on stocks' return, since the investors in the second case will decide to hold the stocks and not to sell them, trying to prevent further losses with the hope of prices rebound.

Abdelhédi-Zouch *et al.* (2015) measured investors' sentiment using VIX, VXN and put-call ratio against S&P 500 index, where the VIX is the most widely measure among the used ones. The VIX measures the predicted variation in S&P 500 index for the following 30 days. It is able to estimate the fear felt by investors and commonly known as "Fear Gauge", while the VXN is responsible for measuring the volatility in NASDAQ 100 for the subsequent 30 days and is determined by Chicago Board Options exchange. As for the put call ratio, it is used to measure pessimism and optimism, in which the high ratio is a pessimistic indicator and low ratio is an optimistic one. The results proved a negative relationship between the index and sentiment; pessimism feelings were found in the bear market, and optimistic feelings were

found in the bullish market. Also, the results proved that the variation in sentiment led to volatility in the index, especially during the crisis intervals.

Dhaoui (2015) introduced a new measure for determining the relationship between U.S investors' sentiment, represented by optimism and pessimism, and trading behavior through a VECM model. The researcher concluded the market is more responsive to the pessimism attitude than to the optimism one, which means that the U.S market is more sensitive toward the bad news than the good ones.

There is also the 52-week high effect, which was used by Chang (2011) as a proxy for optimism feelings. It is justified that as the market experiences an increase in stocks prices, the investors' expectation for having future gains will increase, and this expectation will cause a raise in the stock market index. The results of this study proved the positive effect of sentiment on Taiwan stock return when using the 52-week high effect through the panel model, as the panel model overcomes the problems associated with distinguishing between the winners and losers' stocks in portfolios in relation to the momentum effect. Also, it was discussed that as the stock market index experiences a decrease below the average for the previous 52 weeks, then the 52-week will have a negative impact on the return, but the positive effect of the 52-week high on stock return was lasting (Chang, 2011). The results also proved that the firm characteristics can be used as proxies for hidden kinds of risks and represent an interest for investors.

Liston (2016) tested the effect of sentiment (individual and institutional) on specific kinds of portfolios formed of sin stocks for the U.S. companies that trade in alcohol, tobacco and gaming. The researcher used American Association of Individual investor and Investors Intelligence survey as measures of individual and institutional sentiments, respectively. The results proved the positive significant effect of both kinds of sentiments.

Other studies have tested the effect of investors' sentiment and confidence with some macroeconomic variables, like Spilioti (2016), who implemented a study on London Stock exchange to examine the ability of behavioral factors beside the macroeconomic factors to determine the deviation between the expected value of the stock and its realized one for the period from 1987-2012. The used macroeconomic variables were Gross domestic product (GDP), exchange rate between British pound and US dollar, inflation rate, public deficit, external debt, money supply and balance of payment with only two psychological variables, which are investor sentiment and consumer confidence. The results proved that consumer confidence and economic sentiment of investor captured larger parts of the difference between

the predicted and realized return. The results also proved the role of the macroeconomic factors in affecting the psychological variables.

Iyer and Harper (2017) implemented a study to test the effect of investor sentiment on two kinds of portfolios- risky and safe- that were classified using cash flow volatility. The Investors Intelligence survey data were used as a measure of investor sentiment, which produces the Advisors sentiment report, which involved the percentage of bullish and bearish. The firms used in portfolio construction were derived from the firms that publish quarterly income statements from 1980 to 2014 on Compustat. The reached results found no significant relationship between the formed portfolios and investor sentiment measure; however, when individual stocks replaced the portfolios, a negative relationship was detected between the sentiment and future return.

Jitmaneeroj (2017) proved the significant relationship between sentiment and P/E ratio when using trading volume, advanced-decline ratio and price volatility as measurements of investor sentiment during a study applied on US industries for the period from 1998 to 2014, while employing the latent variable models that take into consideration the existence of measurement errors and time invariant attributes, while Vieira (2016) tested the effect of investor sentiment on future stock return for family and non-family companies of Portuguese stock market during the period from 1999 to 2011, using European Economic Sentiment Indicator. The researcher proved that there is a negative relationship between the investors' sentiment and future stock return and added that the relationship is stronger for bigger, newly established and medium sized companies. The same results were reached by Baker and Wurgler (2006), whereas the low sentiment interval was followed by high return and interval of high sentiment was followed by low return. This means that during the period of low sentiment, stocks are underpriced and then increase while the opposite happens during the period of high sentiment. Baker and Wurgler (2006) found that this conclusion could be helpful to predict the price movement for stocks that are hard to be valued (stocks of firms with small size, more volatile stocks, without dividends, limited profit, limited intangible asset and rapidly growing firms).

As for researchers' contribution in the emerging economies, Tas and Akdag (2012) tested the role of investor sentiment on Istanbul Stock Exchange and measured it using market volume as a proxy. The study argued that as the number of self-confident investors increases, the investors' sentiment will also increase, causing an increase in trading volume and trading liquidity. The researchers explained that the investors increase their trading frequency when

they feel that their information move in the same line with their trading activities. This means that an increase in trading volume reflects an increase in overconfident investors.

Dash and Mahakud (2013) applied a study on the Indian market to test the empirical power of sentiment on the cross sectional of stock return for 14 different industries after controlling for five fundamental factors that are market excess return, size, liquidity, value, and momentum. The sentiment factor was measured using aggregate Indian investor sentiment index with 11 ISPs since there is no evidence on the exact number of proxies that should be used to construct an index. The results found that seven industries were more sensitive to sentiment measure, which gives an opportunity for investors to invest in the other seven industries.

Dhaoui (2013) tested the effect of investors' sentiment presented in optimism, pessimism, overconfidence, rational expectation and spontaneous reactions on trading volume of 12 countries with different degrees of development. The stock markets analyzed were those of U.S (Nasdaq), Japan (Nikkei225), U.K. (FTSE100), France (CAC40), Switzerland (SSMI), Malaysia (MLSE), New Zealand (NZSE), Seoul (KS11), Shanghai (SCE composite), Hong Kong (HIS), Bombay (BSE) and Australia (All ordinaries), for the period from August 2001 to the mid of November 2011. The results revealed that the animal spirit represented by the spontaneous manner is the major working variable whether the period is stable or volatile while rational expectation has no power in this model. Dhaoui (2013) explained that investor behavior can contribute as one of the reasons behind the economy dysfunction, especially during the absence of governmental control. When the government delays its intervention in the economy, this could result in extravagant impacts on the trading behavior, as non-rational investors will keep trading even when the market is not healthy, which in turn increases the accumulation of biases and will result in market failure.

Tuyon and Ahmad (2018) revealed the positive relationship between sentiment and price changes using data of the Malaysian stock market. Sentiment was measured using Business Sentiment Index and Consumer Sentiment Index and by employing the quantile regression to estimate risk better than the ordinary least square method.

Tabassum *et al.* (2021) implemented a recent study on the Karachi stock market to test the role of investor sentiment, overconfidence, under and over reaction and herding behavior on investment decision making behavior. Tabassum *et al.* (2021) employed a structured survey and analyzed the responses of 98 investors, using multiple regression analysis. The analysis

revealed the insignificant role of investor sentiment, overconfidence and herding behavior while the only significant variable was the over / under reaction variable.

By analyzing previous findings about investors' sentiment, it can be concluded that high (low) sentiment will results in over (under) pricing for the sensitive stock in the current period and low (high) stock return in the subsequent periods. Also, the results proved the predictable power for investor sentiment. It should be also highlighted that the current study will test the impact of overconfidence and pessimism instead of using investors' sentiment to examine the impact of each variable solely.

2.4.2.2 Representativeness

This variable represents a consolidation of the representativeness heuristic with investors' attention and the linguistic fluency of some stocks.

Representativeness was introduced by Tversky and Kahneman (1974); it describes a situation when investors deal with the investment decision making process with simplicity and naivety, without taking into consideration the rules of probabilities or the surrounding variables and events (Park and Sohn, 2013). When predicting future circumstances, people are most likely to use the events in recent history and ignore that there is a weak probability of having this short history again (Tseng, 2006). This bias forces the investors to commit mistakes by categorizing the stocks, using similarities even if theses similarities are not sufficient nor apparent ones; this error is called "base-rate neglect" (Akbar *et al.*, 2016; Komba, 2016). Literature proved that the past return of the stock is the most used representable point for the future prices (Ahmed M, 2017). Komba (2016) provided an example for this representable point when investors get confused between the stocks of good companies and those of good investments. The good companies' indicators are price earnings ratio and increase in sale, while the good investment stocks indicator is represented by the expected increase in future prices over other stocks. Also, DeBondt and Thaler (1985) illustrated that the representativeness bias can be represented by investors' reaction to new information while disregarding the basic values. This sometimes can result in drawing the attention to the past losing stocks and increasing their values at the expense of the winning ones (Ahmed M., 2017).

Rasheed *et al.* (2018) proved the role of representativeness bias in explaining stocks' return when testing the effect of representativeness with another behavioral variable called availability. The researchers aimed to study the behavior of investors in the financial markets and the reasons of the departure of investors from the rational thinking. The results of the study

proved that investors in the Pakistani stock market are affected by the representativeness and availability bias, as the traders are more directed toward stocks whose information is already available instead of searching for all relevant information and doing a comprehensive analysis. Moreover, the investors selected the stocks based on the similarity between their features and their expected return. The results revealed a surprising matter that the use of these heuristics' variables was made by experienced and well-educated investors, who ignored their knowledge and the utilization of the professional statistical tools and decided to follow their intuition.

The reason for merging the representativeness variable with the investor's attention in this study is the explanation provided by previous researchers, such that Chandra and Thenmozhi (2017) described representativeness as a bias that happens when the investor focuses personal attention on specific information considering it the most important one neglecting all other information. In this case, representativeness gives the same meaning to investor attention, which was described by Behrmann *et al.* (2004, p. 212) as: "*A cognitive operation where the input is filtered and a part of information is selected for preferential processing*". In addition, Yang *et al.* (2017) explained that in order for investors to update their investment behavior, they have to access the most updated information precisely and on timely basis, which is a very difficult task. The same was explained by Herbert Simon, who mentioned that "a wealth of information creates a poverty of attention" (Da *et al.*, 2011). Accordingly, investors' attention is directed toward the most prominent information, which means that representativeness is urged by investor's attention.

Several researchers became interested in measuring investors' attention and how it influences the stock market, as Barber and Odean (2008) who explained that an increase in investors' attention will result in an increase in stocks' prices. However, a major problem that faced the researchers is how to estimate it; accordingly, proxies were used like extreme return, trading volume, news and headlines and search volume intensity using Google trends (Chen, 2017; Hou *et al.*, 2009; Barber and Odean, 2008). Li *et al.* (2016) quantified the investors' attention transmission through measuring interactions in the social web, as the researchers found that the pull power is of a great impact on directing investors' attention. Yang *et al.* (2017) explained that investors' attention proxies are classified into direct and indirect; while the indirect approaches involve the trading volume, turnover rates and exceptional returns, the direct approaches involve the search volume index, the social network blogs, press and news wording analysis. However, most of these measures, either the direct or the indirect, were used by other

researchers as proxies for other behavioral variables, like investors' sentiment in Baker and Wurgler (2006) and Dhaoui (2013) studies, herding behavior in Litimi (2017) study and overconfidence in Tas and Akdag (2012) study.

Then, Yang *et al.* (2017) recommended a more reliable measure named IAVS that quantifies investors' attention to test for its forecasting role. IAVS measures the daily increase in the number of times in which the stock has been selected and added to the investor's watch list in the stock market platform. The results of the study proved the significant relationship between IAVS and CSI100 return; also, the results demonstrated the significant correlation between CSI100 turnover and IAVS.

Itzkowiz and Rothbort (2016) illustrated that some investors focus their attention on the early alphabetical stocks and explained that there are two factors that led to this effect: the satisfaction and status quo bias. It happens when the investor is exposed to various choices with various characteristics, whereas the investor feels satisfied when reaching the first acceptable option although other acceptable options may appear when proceeding with the searching process (Simon, 1956). Accordingly, it is explained that investors' attention is at its maximum level for the first stocks options, which are arranged alphabetically, and because of the limited humans' cognitive power; the investor's attention is spent on the early alphabetical names or symbols before reaching the last alphabetical stocks, resulting in bias toward early alphabetical stocks. Itzkowiz and Rothbort's (2016) study proved the investors' execution to this bias; they found that the early alphabetical stocks have a higher liquidity, a higher book to market ratio and a higher Tobin Q. The researchers studied another behavior which claimed that investors' attention is directed toward the early stocks and the least ones known as primary and recency effects. However, the results found that the pattern of the last alphabetical stocks is not the same as that of the beginning stocks. This means that investors stop their search before reaching the last alphabetical stocks, which was explained by satisfaction behavior. Also, the results demonstrated that the use of information is only limited to the salient one. Additionally, the study compared the execution of this bias by the individual and institutional investors. The results proved that individual investors are biased toward the early alphabetical stocks, but as the institutional investors possess more experience, they are not prone to this bias.

Furthermore, another claim was examined that some investors' attention is directed toward the easily linguistic stocks. Accordingly, Peterburgsky (2017) tested the prominence of the ticker fluency of the stocks during their initial public offering on investors' selection decision. The

results of the study proved that the investors do not differentiate between the stocks based on their linguistic fluency, whereas the investors did not pay extra for the stocks with linguistic fluency over the stocks with non-linguistic fluency. Also, the results proved that the investors did not pay any attention to stocks' ticker fluency when choosing between risky and non-risky stocks.

From the previous studies, it can be concluded that representativeness and attention provide the same psychological justification behind the usage of investors to some information rather than others when making their investment decisions.

2.4.2.3 Anchoring

Anchoring is merged in this study with framing and mental accountancy affecting investors' behavior and reaction. Tversky and Kahneman (1974) discussed the anchoring phenomenon as the investors' attitude toward relying on an anchor point. When the 'initial values' or the 'starting point' are not known, the investor chooses an anchor point that could be the initial impression, a feature, a prominent characteristic or a piece of information (Komba, 2016). In Tversky's and Kahneman's (1974) experiment, the estimation process started first by choosing an arbitrary anchoring point and then changing the estimates depending on the available and reachable information to get the final decision.

The researcher considered the framing phenomenon as a factor that affects the selection of the anchoring point and triggers it, as Komba (2016) had illustrated that the choice of the anchoring point could be intentionally based on the framing of the situation under inspection, although it may result in inadequate adjustment (Tversky and Kahneman, 1974). Akbar *et al.* (2016) had illustrated that the practicing of the framing phenomenon depends on the investors' sophistication degree. In Akbar *et al.* (2016) study, the results proved that the decisions made by the Pakistani investors were based on the way of framing information and justified this to their less sophisticated nature.

Mental accountancy is considered as an example of the framing effect (Howard, 2012; Kooreman and Prast, 2010). It was developed by Thaler in 1985 and was beneficial in explaining a part of the market anomalies (Chandra and Kumar, 2012). It refers to the process of categorizing investments in separate sections in one's mind randomly and reacting accordingly (Akbar *et al.*, 2016). It represents a way of using money based on the categorization happening in one's mind. Thus, investors may decide to use the same amount of money won in

a gamble in another gamble leaving the other sources of money apart from this gamble deal (Howard, 2012).

Abdin *et al.* (2017) examined the impact of the anchoring variable on investment performance of individual investors in Pakistani stock market, while using fundamental and technical anomalies presented in the stock market as mediators. The researchers used primary data collected from 324 questionnaires and proved the insignificant effect of anchoring on investment performance. In addition, Chandra and Kumar (2012) had proved the powerful role of anchoring when implementing a study to examine the effect of some psychological and contextual factors on investors' decision making in the Indian market. Chandra and Kumar (2012) considered the impact of eight behavioral factors with five variables suggested by professionals, like brokers, consultants in finance and investment advisors. The researchers applied a cognitive approach and conducted a structured survey; they also used the most famous approaches of inferential analysis, in addition to the principal component analysis, and applied the Varimax rotation with the Kaiser criterion to elicit the factors from the questionnaire survey. Based on the above discussion, it can be understood that framing and mental accountancy affect the choice of the anchoring point and trigger the execution of the anchoring phenomena, which justifies the reason behind their aggregation in this study.

2.4.2.4 Disposition effect

In this study, this variable is grouped with the prospect theory, regret aversion and loss aversion. Kahneman and Tversky (1979) firstly introduced the prospect theory as a substitute of the expected utility theory, which showed how investors make choices under uncertainty and risk. Prospect theory was developed after the failure of CAPM's assumption concerning the expected utility theory maximization with the risk aversion. It considers that investors' decisions are based on the loss aversion and changes in wealth (Levy, 2012, cited in Hojat, 2015). The prospect theory illustrates how humans behave toward risk and how investors respond toward gains, or losses in specific, illustrating that this response varies among investors. It explains that investors are more sensitive toward losses than toward equal amounts of gains. These feelings force the investors to be afraid of loss (more loss aversion) (Kahneman and Tversky, 1979) and deviate away from being rational.

Then, Shefrin and Statman (1985) originated the disposition effect by merging the prospect theory with the regret aversion and self-control. It is described as a tendency to realize gains more rapidly than realizing losses (Braga *et al.*, 2017). However, Odean (1998) explained that

through his study to the accounts of 10,000 individual investors that investors are more prone to realize gains than losses, but they are keen to realize losses of December to get benefit of the tax reduction.

Rau (2015) explained that the regret feeling is one of the main reasons behind the disposition effect which was proved to be executed by individual and institutional investors, professional traders, householders and even the students in different financial markets across the world (Birru, 2015; Rau, 2015). Also, Loomes and Sugden (1982, cited in Cao *et al.*, 2021) proved that regret is an essential element of the prospect theory. Regret is felt once an individual makes a decision that results in unwanted outcomes. It is the unfavorable feeling felt when the individual realizes that a different way of thinking and acting could have led to better results. Zeelenberg (1999) concluded that some resolutions may cause regret, and the fear of this regret may affect the decision-making process. The fear of regret prevents the investors from making decisions that are expected to have undesirable outcomes. Accordingly, in case an increase in stocks' prices happened, investors may decide to sell the winning stocks to prevent the regret feeling if the prices decrease. At the same time, some investors may postpone selling the losing stocks looking forward for an increase in prices.

While the loss aversion feeling describes the sensation felt by individuals when realizing losses, it describes the pain felt by investors when realizing losses and recognizing that this pain is greater than the joy felt from realizing the same amount of gain (Kahneman and Tversky, 1979). The magnitude of the pain felt from realizing losses depends on whether the investor achieved prior gains or losses; when a prior gain is realized, this will encourage the investor to enter into a gambling game but this is not the case if a prior loss is realized (Komba, 2016). Also, Barberis and Thaler (2003) explained that the pain felt from realizing consecutive losses is more than the pain felt from realizing a gain followed by a loss, as in the latter case, the prior gain covers part of the current loss.

Previous studies had clarified that there are three syndromes associated with the loss aversion feeling. The first is the status quo bias, described by the action of doing nothing while keeping the position fixed to the latest decision although facing many attractive opportunities (Tversky and Kahneman, 1991). This can result in losing the chances of realizing gains since the investor is adhered to the original position and refuses to adjust the owned portfolio (Komba, 2016). The second syndrome is the endowment effect, which is related to individuals' sensitivity toward losses more than gain. It explains that the pain felt from losing the advantage of an

owned object is more than the pleasure felt from getting the same object (Kahneman *et al.*, 1991). It means that the individual may decide to sell an object with a price more than the price he is willing to pay for it if he has the option to purchase it, as it is of a higher value to him. The third syndrome is the disposition effect, which also clarifies the gains and losses recognition.

Komba (2016) illustrated that previous studies had justified investors' tendencies to realize gains as they increase their self-confidence and prove that they were on the right track, while they postpone realization of losses as it increases their regret feeling (Chen *et al.*, 2007).

Birru (2015) explained that the stocks that had experienced an increase in prices will face a rush in their sales by investors to achieve gains. This excess in sales will push down the prices, resulting in a slight decrease in their fundamental values with higher return, and then the prices will return back to its fundamental value, while the opposite case is associated with the decrease in stocks' prices. Ahmed M (2017) illustrated that this short-term mispricing, caused by the investors that are more subject to cognitive mistakes, can be beneficial for the rational investors. This requires motivating the rational investors to focus on firms that draw the irrational investors' attentions, like the higher accumulated capital gain firms.

The previous explanation opposes Barberis *et al.* (2001) view who explained that as the investors experience investment gains. Their degree of risk aversion falls down because they depend on current gains to supersede future loss. This thought will increase the investors' buying behavior leading to a significant increase in prices. However, Roxana (2015) illustrated that the degree of risk aversion increases after achieving gains as the investors become more conservatives and afraid of losing the realized gains.

Chandra and Kumar (2012) presented a study that tested the impact of loss aversion, regret aversion, and mental accountancy with other behavioral variables on the Indian Stock market. The data were collected using survey instrument and the results of its analysis proved the significant role of the behavioral biases on the decisions made by investors with the prominent role of the regret aversion behavior.

Thus, the previous discussion illustrates the link between disposition effect, prospect theory, regret aversion and loss aversion.

2.4.2.5 Availability

This variable represents a consolidation of availability bias, herding, sociability, home bias/familiarity and perceived investment of significant others.

The availability heuristic depends on remembering and recalling of information to one's mind; it is regarded as a gradual distinction between the subjects presented in memory. It is measured based on speed and order by which the items come to mind (Lobao *et al.*, 2017).

Availability heuristic is a situation when the investor depends on information that is already available and the easily accessible ones (Park and Sohn, 2013; Howard, 2012; Redhead, 2011). Tversky and Kahneman (1974) have pointed out that what affects the degree of availability practice are the familiarity, novelty and importance level of the event, whereas familiarity represents the amount of information and knowledge owned by a person for a certain topic (Lobao *et al.*, 2017) and the extent to which humans are well-informed about something (Komba, 2016). Familiarity works on minimizing the level of doubt and uncertainty felt by investors during decision making process. Also, it is noticed that investors who practice familiarity tend to overvalue the most salient information and undervalue the relevant and valuable one. This action can be depicted as laziness of investors while making their investment decision, since they do not exercise any effort to consider all the relevant information. In contrast, the rational investors tend to consider all kinds of information before making any decision.

Another aspect that affects the availability bias is the recency of the event; Komba (2016) described the recency bias as the event when the latest situation is the closest one to human's mind, forcing him to make biased and false decisions. The tendency of investors to follow this bias is stemmed from the use of short-term memory and easily recalled information, whereas the investors wrongly use the same information assuming that the same results will be reached (DeBondt and Thaler, 1985). Also, it was noticed that humans focus on the most prominent, easily memorable events to make decisions even when they have more appropriate information (Rabin, 1998, cited in Tseng, 2006)

As long as the investors have the tendency to depend on the easily accessible information and the most salient one, they will have a great tendency to herd. Herding behavior is described as the decision of following the actions of the majority believing that it is the right way, while ignoring the personal opinions and marbles (Litimi, 2017). Qiao *et al.* (2014) viewed that the action of imitating others emerges from the belief that the information known by other participants is of high quality and more reluctant. This can be justified from the psychological perspective as a lack of confidence in personal abilities and underestimating the owned knowledge or could be as a result of fear of loss or greed in others' profit or excitement. Also,

Qiao *et al.* (2014) added that the herding phenomenon is a non-static phenomenon that varies with other variables, like policy changes and external surprise events.

Additionally, Zafar and Hassan (2016) explained that the nature of the human being accepts to be part of the crowd to overcome the feeling of being alone and left out. Another reason explained by Zafar and Hassan (2016), which could be the motive to mimic others' behaviors, is the high cost of information required to make appropriate judgments; accordingly, the investors feel it is more cost-saving to mimic others, while Saxena *et al.* (2016) justified through their study that the miss-confidence is one of the reasons behind the herding attitude since the investors have lost the ability and are afraid of making their own decisions. In addition to the previous reasons, the investors may follow others with the aim of protecting their own reputation and properties. The same for speculative investors who enter the market just to achieve a quick return, those investors imitate others' actions in order to achieve more gains (Saxena *et al.*, 2016).

However, it should be noticed that if the outcomes were successful, the investor will repeat the same actions, causing the numbers of herders to increase eventually, which will push the prices away from the fundamental value. But if it resulted in bad results, the appearance of any new information will have a backfire effect.

Lakshman *et al.* (2013) and Saxena *et al.* (2016) made the following conclusion. They explained that herding behavior can be either rational or irrational. The rational view was introduced by Christie and Huang in 1995. Christie and Huang explained that the mimicking investors are subordinated to other investors' actions intentionally, even if they are not convinced with that and ignore their personal estimates and judgments. This behavior is triggered by the belief that there is some missed information known to others; the excessive worry about personal assets and reputation and the difficulty in compensating the losses, while the irrational view is the activity of imitating others' actions blindly, convinced that their own estimates are better while following them like a lemming (Litimi, 2017; Lakshman *et al.*, 2013). The latter perspective provides a contrary illustration to what was introduced by the efficient market theory that claimed that all investors have the same access to information; accordingly, the stock prices represent a reflection of the information known in the market (Fama, 1970). Both the rational and irrational herding behavior will make the stocks' prices to deviate away from the fundamental values.

Other studies have shown that herding could happen unintentionally, and the reason could be that investors share the same background as the case of institutional investors who own the same characteristics, like work experience and educational background. Their actions give an impression of herding behavior; however, it is a coincidence and not intended (Qiao *et al.*, 2014). Qiao *et al.* (2014) showed that financial institutions may do herding in a different manner through responding to the same indicators at the same time. Also, it is noticed that investors can act in the same way when they are driven by the same motivation, share the same features and are exposed to similar environmental circumstances. This will increase the probability of investors to analyze, elucidate and react in a similar manner, which will appear as a herding signal (Komba, 2016).

The herding behavior is able to control human's reaction; for example, the number of investors can increase by announcing that most of the community is trading in the stock market. The same could happen when investors make mistakes in their financial decisions after authenticating informative news without verifying its validity and without trusting in their own private information (Litimi, 2017; Komba, 2016).

The domino effect and informational cascade are terms describing the same phenomena like herding: when all the posterior investors decide to do the same as the prior investors, although they own information that can result in different actions. Komba (2016) argued that the usage of the posterior investors to the former investors' information may result in different actions for each investor and lead to undesirable outcomes.

Based on the previous illustration of the herding phenomenon and other biases of equivalent effect, the prices of the stock can diverge from the fundamental temporary values; also, the level of risk associated with stocks' trading can increase on the long run; this requires the interference of the concerned authorities to correct the market and minimize the prospect of huge losses of investors.

The herding phenomenon has attracted researchers' attention and has been studied in different terms, as sociability, perceived investment of significant other, familiarity, social learning, social interaction, peer pressure and neighborhood effect (Sivaramakrishnan *et al.*, 2017; Komba, 2016). Sociability can result in excessive exchange of knowledge, experience and feelings, while perceived investment of significant others (PISO) is illustrated as the powerful role of public influences on one's behavior, as the public influences proved their significant

impact on investors' purchasing decisions due to the presence of recommendation groups composed of companion and friends (Sivaramakrishnan *et al.*, 2017)

Lakshman *et al.* (2013) informed that the most prominent test of the herding behavior was done by Lakonishok, Schleifer and Vishny in 1991, who defined herding as the statistical correlation between a specific group of traders working in the market. Since the market is based on the supply and demand rules, it is difficult to expect that all the traders will herd; accordingly, the herding can be investigated only for a particular group of investors. Litimi (2017) used trading volume as a measurement for the herding phenomenon, while, Qiao *et al.* (2014) illustrated that the most famous measure used for accessing the herding behavior without having access to private information measures is the statistical measure: cross sectional standard deviation (CSSD) used by Christie and Huang (1995) and cross-sectional absolute deviation (CSAD) used by Chang *et al.* (2000) between the market and individual stock return. These two measures are based on the knowledge of average return of all the stocks in the market. If there is a deviation between an individual stock and the average market return, then it is an indication of a profit-making opportunity (Komba, 2016).

The CSSD was firstly developed by Christie and Huang (1995) as a measure of the herding behavior through analyzing the degree of divergence of the individual stock return from the market return. If the divergence is low, this proves the availability of the herding behavior. However, the CSSD was criticized because of its usage limitation to the periods of market's extreme condition with strict rules for identifying these periods. Accordingly, Chang *et al.* (2000) introduced the CSAD, a quadratic regression model (Komba 2016). However, CSAD is not able to justify whether the investors take the same actions because they imitate each other while ignoring their private information or because they respond similarly to the same information. Thus, researchers are moving toward the usage of financial market labs with financial experts and using trades' correlation to capture the herding behavior (Qaoi *et al.*, 2014).

Komba (2016) applied a study using the previous two measures for determining the herding behavior of ten African countries (Botswana, BRVM, Ghana, Kenya, Namibia, Nigeria, Tanzania, Uganda, Zambia and Zimbabwe). The study period was from January 2000 to July 2015 through analyzing the degree of trade correlation. The results proved the existence of herding behavior in all the countries for the whole period under analysis. The results justified the existence of herding behavior to the simplicity and the naivety of the domestic investors

dealing with the stock market who have limited power to access all the information. Also, the citizens of these countries are not well educated to analyze and evaluate the choices to make the best decisions; therefore, they tend to follow the institutional investors.

Qiao *et al.* (2014) have used Chang *et al.* (2000) method to implement a study that tests the time varying relationship between herding behavior and nine Asian stock markets using linear and non-linear causal relationships of Kalman-filter based model. After analyzing the daily data from 1996 to 2009, the results of the study found a strong relationship between herding and stocks' return of the countries under study in two directions. Moreover, at the period of great price volatility, the results observed a negative nonlinear relationship existing between CSAD and market return, whereas the negative coefficient means the existence of herding behavior among investors.

Also, Medhioub and Chaffai (2018) tested the herding behavior under different environments, like that of the Islamic countries using CSAD. The researchers used the methodology employed in Chiang and Zheng (2010) to test the presence of the mimicking phenomenon in five Islamic countries: Bahrain, Kuwait, Qatar, Saudi Arabia and UAE. The period under analysis was from January 2006 to February 2016, and the results proved the existence of herding behavior in Saudi Arabia and Qatar only.

Saxena *et al.* (2016) proved the effect of herding phenomena on the volatility existing in the market using questionnaire technique. The researchers found that the herding actions of the retail investors in Indian stock market depend on the confidence, awareness levels in addition to the reputational factors, speculation, volatility in global markets, bandwagon effect and social proof.

Cao *et al.* (2021) implemented a study on Vietnam stock market to examine the impact of some heuristic's variables, prospect factor, market factor and herding behavior on the individual investors' investment decisions and investment performance. The study employed a structured survey distributed via social network and collected 250 responses. The analysis of the results declared that the employed variables had a positive significant impact on investment decisions and investment performance, where the prospect factors had the most powerful impact on investment decision and investment performance while the market factors had the least impact. From the previous discussion and studies, it can be concluded that there is a link between availability heuristics and herding behavior that represents the dependence on the already available and easily accessible information. Also, the importance of this behavior attracted

researchers' interest to study it under different terms, like sociability, perceived investment of significant other, familiarity, social learning, social interaction, peer pressure and neighborhood effect.

2.4.2.6 Seasonality variables

This variable considers the behavioural variables affecting investment decision, depending on environmental and weather changes in addition to the weekend vs. weekday's effect. Li and Peng (2016) explained that some of the environmental and seasonality variables were examined by behavioral finance researchers due to their impact on investors' decisions. The reason behind this is the claim that these variables result in mood swings affecting the investment decision making process. This claim was proved by Li and Peng (2016) through their study about the effect of air pollution on the Chinese stocks' return, whereas the researchers found a present negative relationship and a lagged two-day positive relationship between air pollution and stocks return. The researchers also explained that a depression resulting from the air pollution was the reason of the mood swing and stocks' return deviation.

Also, Goetzmann *et al.* (2015) tested the effect of weather on the behaviour of institutional investors, who had proved their possession to some cognitive biases like the individual investors that in turn affected their financial decisions and trading patterns. Goetzmann *et al.* (2015) tested this relationship, using data that are fit to ZIP code-level weather station data, whereas the measurements used are the "deseasonalized cloud cover" and the survey data of Yale international center of finance, which measures the impression of institutional investors toward the stocks' investment, in addition to the data that measure the daily activities made by institutional investors. The results proved that while employing the Yale international survey, the deseasonalized cloud cover caused an increase in the purchases made by institutional investors toward individual stocks and Dow Jones Industrial Average, which resulted in the overpricing phenomenon. The results of employing the trading pattern of institutional investors were the same as those of the survey, which showed that as the exposure to the deseasonalized cloud cover decreased the buying behavior increased. Finally, the researcher concluded that this relationship is a short-lived phenomenon.

Moreover, Shim *et al.* (2015) proved that the volatility occurring in the Korean stock market responded to weather changes as the volatility increased with the increase in the cloudy, humid and chilly days and decreased in the shining, summery times. The study examined the historical instabilities determined by the extended GJR-GARCH that gathers the asymmetric instability

with weather effect in addition to the hidden effects free model extracted from KOSPI200 options.

Sariannidis *et al.* (2015) implemented a study to test the effect of daily seasonality (weekend vs weekdays effect) with the power of foreign markets and the debit crisis on the volatility of the Athens stock market for the period from January 2007 to December 2012. The researcher employed daily index prices for the FTSE/ASE 20 index and measured the power of the foreign markets using the Hang Seng, China (Hong Kong) as a representative of the Asian markets and DAX30 Germany as a representative of the European Union. The results were opposite to what was expected regarding the weekend-weekdays effect, such that the Friday's returns were less than those for Monday and Thursday; this was justified by the effect of US mortgage crisis and the Greek debit crisis that made the investors expect to face bad information during weekends, so they decided to sell stocks on Friday and to buy on Monday.

From the previous studies, the researcher can conclude that the seasonality variables presented by either the weather variables or the weekend weekdays effect have an impact on the performance of the stock markets in different ways regardless of the economy's level of development; however, further studies are still needed to highlight their impact on different markets.

2.4.2.7 Mood

This variable is a consolidation of the mood effect, emotions, social media and newspaper sentiment, sports sentiments / sports fan loyalty, negative social mood and fear on investment decision.

Mood is considered as an emotive state that results from external incident, previous emotional experience or personal situations (Cohen–Charash *et al.*, 2013). It can be classified to more than good or bad to reflect the furious and cheerful feelings. Moreover, Cohen-Charash *et al.* (2013) explained that there are theoretical models that boost the relationship between mood and decision-making process, like “information model”, “associative network theory” and “the evolutionary theory of hedonism”.

The effect of mood on investment decision is extracted from the assumption of the classical theory that rational investors' actions impact the stock market; consequently, the mood of those investors naturally will impact their way of thinking and accordingly will impact the stock market return (Narayanamoorthy *et al.*, 2015). Kaplanski *et al.* (2015) derived from the

literature that mood is an emotional feeling that lasts just for some minutes or hours and that it is of a great impact on the investment decision making process.

As for emotion, Elster in 1960 defined it as an excitement feeling arises from the mental trust in a matter (Mathuraswamy and Rajendran, 2015), while Mathuraswamy and Rajendran (2015) explained emotion as the inclination toward something that you feel good about and the aversion from something that you feel bad about. It is also associated with excitement in the autonomic nervous system with some psychological changes that are felt by investors toward stock markets.

Elster (1998, cited in Tseng, 2006) explained that emotion is defined based on six features: “cognitive antecedents, intentional objects, physiological arousal, physiological expressions, valence and action tendencies”. Emotions are connected to the cognitive antecedent; motivated by observed psychological indications (Tseng, 2006). The results of the cognitive psychology showed that emotions may affect humans’ memory in additions to personal judgments (Tseng, 2006). It is claimed that using emotions in making decisions will have bad outcomes; however, this is not the case under surprising, misunderstanding and hardly solved conflicts when perfect rationality cannot work. The usage of emotions under these conditions is worthy and important since it enables humans to take the most appropriate decisions (Tseng, 2006).

Tseng (2006) explained that emotion is composed of hot feelings, like fear, anxiety, greed and courage in addition to cold feelings, like calmness, whereas the difference between them is called the empathy gap. Tseng (2006) added that investors have a great tendency to make bad decisions under the hot states; however, if they are able to minimize the empathy gap, they can make decisions that have long term financial satisfaction. Because of the emotions’ close relationship with psychology, physiology and neurology, they have a direct impact on decision making process, either under rationality or bounded rationality (Tseng, 2006)

Besides the emotions, there is another term called intuition. Intuition is determined by Francis P. Cholle (2011, cited in Mathuraswamy and Rajendran, 2015) as the way of doing specific actions, sometimes without relying on reasons or analytical skills. It closes the gap between what is perceptible and what is not in humans’ mind and closes the difference between the logic and the sense.

Various research studies were interested in studying the impact of mood on stock markets’ performance, such as Kaplanski *et al.* (2015), who proved the significant importance of investors’ mood, measured by the general variable feeling ranging from “feels very bad to feels

very good” on expected future return in Netherland. Also, the results proved that the general mood during weekend is much better but that did not result in prices’ increase as what was expected, while Shen *et al.* (2017) built an index for market-level emotions from Thomson Reuters MarketPsych Indices (TRMI). This index is based on analyzing and interpreting the texts in news of internet and social media that involves a number greater than 2 million articles and posts on a daily basis. The researchers tested the sentiment and three documented feelings that are optimism, fear and joy and their impact on commodities return. The results of the study proved the significant impact of news sentiments and news events on future return of commodities.

Cohen-Charash *et al.* (2013) examined the ability of collective emotions presented in press to forecast stock prices’ movements. The researchers gathered the words that represent the emotions of investors, marked them based on their position on an affective circumplex then built an index of mood for every trading day. The researchers based the mood on four quadrants: “High activation and pleasantness (e.g., enthusiasm), low activation and pleasantness (e.g., calmness), low activation and unpleasantness (e.g., depression) and high activation and unpleasantness (e.g., anxiety)”. Then, a time series regression was employed to determine whether the index describing investors’ mood per trading day is able to forecast the opening prices of stock on the next trading day. The results of the study found that the most significant effect was for good mood, which forecasted a raise in NASDAQ while the upsetting mood forecasted a reduction.

Xu *et al.* (2017) measured the effect between social media sentiment and Chinese stock market. The researchers classified the microblogs used by Sina Weibo - a social media instrument like twitter used only in china- into anger, fear, disgust, joy and sadness. The results of the wavelet coherency analysis found a positive relationship for the five sentiments and stock market with a powerful role for the sadness sentiment over the others, whereas the most powerful relationship was for a period around 10 days. When classifying the sentiments into two pools: positive and negative, the results demonstrated that the detailed sentiment carries more information than the merged classification.

In addition to news and social media sentiments, sports events are also used as a proxy for measuring the effect of mood on stock market (Cohen – Charash *et al.*, 2013); for example, the human’s mood can be affected by the results of the favorite team, which was proved by Berument *et al.* (2013). Berument *et al.* (2013) found that the results of sports matches had a

big effect on fans' mood and accordingly on the investment decision of investors in Istanbul stock market.

In addition to the studies that examined the emotions and mood, special studies were implemented to test the impact of fear on stock markets' performance. Fear was viewed by some as an irrational feeling; however, it can also be rational resulting from the wrong behavior in the economic fundamentals (Soydemir *et al.*, 2017); accordingly, the fear can be analyzed into rational and irrational. Soydemir *et al.* (2017) implemented a study to examine the role of fear derived by rationality and irrationality on stocks' return, taking into consideration the time span and magnitude. The researchers used two discrete vector auto regression functions, and the study reached several results: firstly, the rational fear was well explained by the risk factor presented in Fama and French three-factor models and Carhart four-factor model. Secondly, the fear driven by risk factor and irrationality was proved to have a significant negative impact on S&P 500 return; this great effect is in terms of time span and speed. Thirdly, the results proved the significant power of fear driven by irrational behavior over the rational fear, which was not explained by the known financial theories. Fourthly, the negative response of the market (S&P 500) to the irrational fear was double that of the rational fear, which increases the necessity of adding the irrational variables to the fundamental variables affecting the stock market.

Choi (2016) measured the effect of negative social mood determined by suicide rate on U.S. stock market, as the increase in suicide rate is of a great bad effect on humans' mood of the same community, which in turn will affect the investors' investment decisions. The results confirmed the existence of a relationship between the social mood and the stock markets' return. This relationship is lagged for one month, whereas the suicide rates in one month are able to forecast the stock market return of the next month; the results also showed that the female suicide rates are of a greater impact on stock market. The final results are that domestic suicide rates are of much more influence than the outside suicide rate.

Kaplanski and levy (2010b) used the aviation disaster as a proxy for the anxiety (negative mood) effect on stock market whereas the results proved a significant negative effect of aviation disaster. The data used were covering a period of 58 years with 14,678 trading days, from January 1950 to December 2007 while using the NYSE composite index return. The analysis of the results explained that investors responded negatively after the disaster news; then after two days they returned back to the normal behavior. It was estimated that the market losses

resulted from the media announcement about the aviation disaster are approximately \$60 billion for each aviation disaster on average, as for the maximum level of the actual economic loss is 1 billion per disaster. However, there is a reversal effect on the third day after the event had occurred. The reversal effect achieved returns half the amount of losses that occurred in the first day. The reversal effect will last for days, and then the whole market will get back to its normal situation after 10 days from the event announcement and market decline.

The previous literature illustrates the division of humans' mood and emotions into several statuses rather than good and bad, and the powerful role of the negative status over the positive one, in addition to the different proxies that were used to study the impact of mood on the investment decision making process and accordingly on the stock market's performance.

2.4.2.8 Gambler's fallacy

It describes a situation when the human believes that something will not happen in the future just because it happened frequently in the past. Amin *et al.*'s (2010) study had proved the existence and effect of gambler's fallacy in Lahore stock market through running a questionnaire. The number of participants who run the survey was 40 investors trading in Pakistani stock market. This indicated the necessity to raise the investors' awareness toward their investment decision.

2.4.2.9 Neuro-psychology variables

Neuropsychology is known as a branch of psychology that studies how the brain and the rest of the nervous system influence a person's cognition and behaviors. Srivastava *et al.* (2020, p.425) explained it as

"an umbrella term to study the intersection of fields of neurology and psychology.

Neuropsychology can inform financial decisions through the use of psychology theory and neural processes."

Based on this explanation, the study gathered three variables studied in the behavioral literature to be part under the umbrella of this construct: neurotransmitters, personality trait and emotional intelligence. The study named it neuro-psychology after the neuropsychology branch. This section will show the relationship between neurotransmitters, personality traits and emotional intelligence and the reason behind proposing them to be under the same construct.

As there are great distinctions among humans, with respect to their degrees of risk aversion, optimism, preferences, the world had started moving toward determining the basis of these distinctions neurologically since 2005 (Sapra, 2009). The advancement in technology is making

a great progress in neuroscience fields toward determining the neurons responsible for the decision-making process (Sapra, 2009). After the progress made by behavioral finance in explaining that the decisions made by humans are based on their cognitive ability, there is now a neurological explanation for this ability (Sapra, 2009; Tseng, 2006). Neurology describes the special parts in the human's brain responsible for different behavioral aspects and explains the interaction between mind's regions, which motivates our behavior and decisions (Sapra, 2009), while Neuroeconomics is a mix of neurology, psychology and economics, working on closing the gap between the logical acting and the behavioristic acting through determining the brain's parts that are most active during decision making (Sapra, 2009). Neuroeconomics has proved that humans are in a certain way neurologically connected, which opposes what was mentioned by hyper-rationality. It has a subfield called Neurofinance, which is working on discovering the psychology and the neurology behind the decisions of investors in the financial markets, as most of the behavioral biases have neural basis (Ahmad, 2018; Sapra, 2009). However, behavioral finance revolves around the relationship between behavioral psychologies of financial markets' participants and their activities and the financial markets; it also tries to understand how people react when making decisions and then explains these reactions based on some psychological roles. Neurofinance is trying to understand the reasons behind the psychological biases by observing the brain's signals and hormonal changes (Tseng, 2006). Neuroeconomy explains the psychological reasons behind the economic decisions while neurofinance focuses on the financial markets. Neurofinance can help in reaching the optimal strategy to be followed and in achieving the desired investment targets and making a better investment performance. Neurofinance is named as the medical finance since the functions made by the brains are based on the healthiness of the brain and the effect of drugs (Tseng, 2006). After the technological advancement and the development of new equipment, like "Positron Emission Tomography" PET and "Magnetic Resonance Imaging" (FRMI), researchers were able to make experiments that measure the brain's actions and the psychophysiological features while making financial decisions (Tseng, 2006). The importance of the neurofinance has increased because of the changes made in the financial system as well as the concentration on profit and loss actions; these achievements are great steps toward developing procedures that enhance the investment decision making process. Tseng (2006) explained that neurofinance is able to provide a better understanding for the investment decision and trading behavior by identifying some physiological traits.

The first variable proposed as a dimension neuro-psychology is the neurotransmitters. Neurotransmitters are neurological facets; they are the chemical signals that move from one neuron to another (Lodish, 2000), composed of serotonin, norepinephrine, epinephrine and dopamine, which were claimed to have an impact on the behavior of investors (Ahmad, 2018). The second variable is the personality traits, which are considered as a major determinant of individuals' behavior. Studies proved that neurotransmitters are of a significant impact on shaping the personality trait of individuals, such that Hamer *et al.* (1999) had proved through their psychometric analysis that serotonin (one of the neurotransmitters) influences the level of social disaffiliation of humans, which could affect one's exposure level to others' opinion. Psychologists defined personality traits as differences in patterns of traits, which can be summarized using a small number of factors that represent the main personality facets (McCrae and Costa, 1997). Cloninger *et al.* (1993) defined personality as a complex hierarchal system that is composed of two main aspects: temperament and character, whereas temperament differs among people when they respond unexpectedly to external stimuli that involve emotional reactive patterns, directed by stimuli as anger, exploration and attachment. The most famous representation for the trait structure is that provided by the five basic dimensions named: (a) neuroticism versus emotional stability; (b) extraversion or surgency; (c) openness to experience or intellect, imagination or culture; (d) agreeableness versus antagonism and (e) conscientiousness or will to achieve.

The third variable is the emotional intelligence, which was described as ones' capability to use emotion in down beating circumstances (Mayer *et al.*, 1999). MacCann *et al.* (2014) described emotional intelligence as the way of gathering the feelings needed to control the thinking process and it is the feelings required to boost humans' being power. Also, Daniel Goleman defined it as "*The capacity for recognizing our own feelings and those in others, for motivating ourselves, for managing emotions well in ourselves and in our relationships*" (Dhiman and Raheja, 2018, p. 89). It is considered as a trait positioned at the lower level of the personality hierarchy, which involves the personal aspects related to emotion (Petrides *et al.*, 2007). Petrides *et al.* (2007) considered that individuals with high emotional intelligence are more capable of managing stress.

Tauni *et al.* (2017) used the well-known five personality traits- openness, conscientiousness, extraversion, agreeableness and neuroticism- to examine the personality features of the investors trading in the Chinese market. The researchers aimed to study the effect of various

information sources on the trading behavior through analyzing the impact of the personality features in the Chinese futures markets. The personality traits were measured using the NEO-Five factor inventory, in which each trait is measured by twelve items, and each item is measured using a five-point Likert scale. The five personality traits explanations are (a) Neuroticism, which represents the greatest level of stress, worry and instability; (b) Extraversion, which shows high levels of assurance, chatter, confidence and activity; (c) Openness is a great level of fantasy, diversity preference, wide cultural concern and inquisitiveness; (d) Agreeableness, which represents the level of collaboration, empathy to others and selflessness and (e) Conscientiousness, which is the high degree of accuracy, dependability, arrangement, willpower and owning a strong tendency². The results of Tauni *et al.* (2017)'s study confirmed the role of the personality traits in moderating the relationship between trading patterns and the sources of information.

Ahmad (2018) has proved through his study on the Pakistani individual investors that neurotransmitters are able to explain investment decision, while emotional intelligence and personality traits were not of a significant impact on investment decision. The results also highlighted the powerful role of dopamine and epinephrine as dimensions of neurotransmitters on the decision made by the Pakistani investors when using a questionnaire answered by 455 investors trading in the Pakistan stock Exchanges.

Sattar *et al.* (2020) implemented a study to test the impact of personality characteristics along with some heuristics variables and prospect theory where the results showed that the heuristics variables had the most significant impact on investment decisions over the personality traits and the prospect theory.

The above literature views that over the past 35 years, behavioral finance has improved our understanding of the actual behavior and is still expected to achieve more. Additionally, investors' behavior is proved to be a main component in the financial markets and acts as a crucial engine toward establishing investment strategies that increase the economic prosperity. The evolution of behavioral finance and its great contribution had made what was called under the efficient market hypothesis "the anomalies" or the "abnormalities" a normal. This leads to the development of the third hypothesis in this study:

² Adapted from "Investment management and personality type," by Mayfield *et al.* (2008, cited in Tauni *et al.*, 2017)

H₃: The investors' behavioral variables have a significant effect on stock's return.

The review of the empirical studies of the three theories revealed that the stock markets' participants act more than the bounded rationality but away from the explained by efficient market hypothesis. This highlights the necessity of developing a model that adds the irrational sources of risk presented by the behavioral variables to the rational sources of risk measured by the macroeconomic and microeconomic model.

2.5 Research Gap

The review of the microeconomic literature proved the role of different firm specific characteristics in explaining the variations in stocks' return, while contradictory results were reached regarding the role of investment and profitability, and highlighted the insufficiency of the empirical studies that tested them in the emerging markets. This confirms the need for more studies to examine the explanatory power of Fama and French five factor model with respect to each market's condition.

As for the macroeconomic literature, the review revealed an insufficiency in the studies that examined the impact of the global macroeconomic variables especially in the emerging markets while, most of the examined variables are domestic ones. Moreover, the review revealed the importance of the domestic variables: exchange rate, inflation rate and industrial production index that were examined in several markets and proved their role, which emphasizes their inclusion in this study as a part of the augmented stock pricing framework. The global variables selected are the federal fund rate which is used to show how the changes in the U.S monetary policy will impact the stock market of the emerging economies in addition to the global commodity index which composes of the prices of non-fuel and fuel commodities. The review of the literature showed that the focus of previous studies was on examining the impact of oil and gold as the most prominent commodities while ignoring the other commodities which highlights the necessity of considering the impact of the whole commodity index.

As for the review of the behavioral finance literature, the empirical studies deduced the capability of the behavioral finance achievement in explaining the variations in stocks' return more than the traditional pricing models. Also, the review proved that there is a lack in standardizing and categorizing the behavioral variables that prevented the development of a complete psychological model (Howard, 2012). Moreover, the literature lacks a way that can be used for selecting the behavioral variables to be examined in certain economy while most of the examined variables are investors sentiment, overconfidence and herding (see table 3.6) in

the developed economies with limited studies in the emerging ones. This raised the call for gathering all the behavioral variables that were examined in the previous empirical studies in order to develop a complete psychological model that can be used as guidance in the further upcoming studies.

As the emerging economies provide great opportunities for the international diversification and they become leading parties of the global economic growth (Neaime, 2016), the current study selected an emerging market to conduct the analysis. Among the fast-growing emerging market is the Egyptian market, which is selected to be among the Next 11 countries by the Goldman Sachs (Qachln *et al.*, 2017), in addition to its affiliation to the frontier emerging markets' groups CIVETS (El-Masry and Badr, 2020). Also, Boako and Alagidede (2016) proved through their study on some African countries, among which Egypt, that having portfolios with stocks from the examined African markets with percentage more than 50% would offer a sufficient hedge against risk. With the above in mind, because of Egypt's geographical position and its remarkable role in enhancing the political stability of the Arab world and its large population, the Egyptian stock market is selected to be the market upon which the empirical analysis of this study is applied. The following section provides justification and more reasons for nominating the Egyptian stock market to be the market under investigation in this study.

2.6 The Egyptian stock market

The Egyptian Stock Market is at the top of the financial markets among the emerging ones. During the last few years, it was ranked the fourth highest growing emerging market with 19% growth rate, according to Morgan Stanley review (Metwally and Darwish, 2015). Also, Egypt was selected to be one of the Next 11 countries (N-11). The N-11, are countries charterzied by their fast-growing economies and they own promising investment environment for the next years, determined by Goldman Sachs (Qachln *et al.*, 2017). The standards used in this evaluation were the stability in macroeconomcs, political maturity, openness and good investment policies. This makes the Egyptian Stock Market worth more care, especially after proving its inefficiency and proving the existence of noise and speculative activities (El-Ansary and Atuea, 2012; Omran, 2007). Moreover, implementing a study on the Egyptian stock market will provide guidance to other emerging markets as Lyocsa and Baumohl (2015) explained that there is a smiliarity between risk-return characteristics of Egypt, Turkey, Argentina, Russia and China, which showed the highest rish-return distance, that is different from Malaysia, Mexico, Chile and Thailand which showed the lowest risk-return distance among the 18 examined

emerging markets in Lyocsa and Baumohl (2015)'s study. It worth mentioning that the Egyptian stock market is a pioneering emerging market specially in terms of the number of the listed companies which is 218 companies, the market capitalization (763 LE Bn) and trading volume (911 Mn) during 2021 (The Egyptian Exchange (EGX), 2021). Also it is deeply inherent compared with other market in the MENA region (Shaker and Elgiziry, 2014)

2.6.1 The performance of the Egyptian stock market

The Egyptian stock Market is one of the oldest stock markets world-wide; it involved two stock markets, which were then merged into one market. The first stock exchange market was in Alexandria, which was founded in 1888, and then in 1903, Cairo Stock exchange market was built. In 1940, it was ranked as the fifth most active stock exchange market among all the existed markets. In the early of 1950s there was a great drop in the activities of the market, after the nationalization of industry and polices' selection for the central planning. This resulted in deep sleep in the market activities throughout 1980s. After a recession extended for 40 years, in 1990 the market moved up again (Metwally and Darwish, 2015)

Starting from that time, the Egyptian Stock Exchange Market has been regarded as the leading capital market in north of Africa and in the Middle East Region (Mecagni and Sourial, 1999, cited in Metwally and Darwish, 2015). Rather than that, it got an award in a competition arranged by New York Stock Market in 2008 and got the second place among the best African emerging stock markets (Metwally and Darwish, 2015). Its vision is "To be a World-Class, Egypt-based exchange, which would serve best to its stakeholders in the Middle East and North Africa region" (EGX, 2021). The Egyptian stock market follows a set of rules and ethical regulations with every client, member, employee and regulator. The trading is available on weekdays from 10:30 am to 2:30 pm, except for weekends (Fridays and Saturdays) and holidays as announced by the Egyptian government. The number of companies listed in the Egyptian stock market reached 221 company in December 2015, with market capitalization of LE430 bn and 210 by the end of 2019, accroding to the Egyptian stock market's records.

The Egyptian stock market has 7 indices (EGX30, EGX50EWI, EGX70, EGX100, Nile index, S&P/ EGX ESG, and EGX30 capped). EGX30 started publishing in 1998, with a base value of 1000 points. Its value is calculated in EGP and dominated in US dollar since March 2009. This index is a free float market capitalization index that includes the most active 30 companies, in terms of liquidity and activity. As for EGX70, it started on March 2009, which gives the investor a more comprehensive view for the market performance. EGX100 started on August

2009, and it involves the companies listed in EGX30 and EGX70. While EGX 50 EWI started on July 2013, taking into consideration various industries presented in the country.

The Egyptian stock market faced periods of fundamental changes, such as from 1888-1958, 1959-1971, 1972-1992, and 1992-2010. During the first period, the stock market was mature and very active, but then from 1959-1971 the Egyptian market witnessed governmental restrictions and intervention that decreased its efficiency (Metwally and Darwish, 2015). Accordingly, there were many trials to restore the Egyptian stock market to its normal situation and enhance the situation that continues its drop. After adopting some governmental liberalization policies in 1990s, the stock market recovered and enjoyed significant changes, in addition to some governmental reforms that led to enhancing and improving the stock market. From 1997, the market enjoyed an annual growth rate of about 40 percent till 2001 (EGX, 2021). After the 25th of January 2011 revolution, the Egyptian political environment changed dramatically, leaving a tremendous effect on the Egyptian stock Market. The Egyptian Stock Exchange suffered a great failure after this political wave; it lost almost \$12 billion of the shares values during the two trading days following the revolution, which resulted in a sharp decrease in the performance of the Egyptian indices (Ahmed M, 2017). Moreover, the market turnover and market capitalization witnessed a great decrease that has never been seen before from Nasser's revolution in 1950s. Since 2011, there have been a lot of unforeseen political changes that prevented the Egyptian stock market from the full recovery from this shock. These changes constitute an important area of research as they represent extreme market phenomena. Based on the nature of the Egyptian financial system, this turmoil is the main reason behind the current foreign exchange crisis associated with the increased capital outflow and the portfolio investment outflow, putting the Egyptian market in a persistent cessation (Mertzanis and Allam, 2018).

In 2013, the Egyptian stock market decided to adopt a four-year program for improving the market, which involved introducing a derivative market, issuing sukuk (Islamic bond) in addition to enhancing the bond market and the settlement system and offering exchange traded fund (Oxford Business Group, 2019).

In 2015, EGX30 witnessed a dramatic drop that was due to several factors that occurred during that time, which involved a shortage in the foreign currency and a decrease in oil prices and the sovereign risk, and the Metrojet plane crash occurred on October 2015. On the other side, 2015

had the greatest value of IPOs in 10 years for four companies (Emaar, Edita, Orascom Construction and Orascom Hotels and Developments (Oxford Business Group, 2019).

In 2018, EGX experienced great losses with a decrease in market capitalization of about 80 billion EGP, while for the financial year ending June 2018, there was a growth of about 5.4%, as said by the Ministr of Planning, Hala Saeed (Awad, 2019). Moahmed Radwan-the Arab Finance Chairman-had claimed the pull factors, like high wages rate available in other markets, are the reasons behind the losses incurring in the Egyptian stock market. Additionally, the Executive director of HC securities and Investment of Dubai, Hassan Kenawi, had revealed that the cancellation of the three bids Egyptian treasury bonds that were supposed to be issued had discouraged some investors (the Arab and Foreign ones) from investing in the Egyptian stock market³. Securities experts added that the losses of EGX in 2018 were because of the US-China trade war and the crisis in the neighborhood emerging markets; additionally, the performance of the EGX during 2018 could be divided into two periods: the first one is from January to April, and the second is from April till December, where the first period enjoyed a hike in EGX30 index by jumping from 15,100 points up to 18,400 on April 2018. Then, from that time until January 2019, the EGX had witnessed great losses with a decrease in market capitalization (Awad, 2019).

The Head of EGX indicated that 2019 would involve great enhancement for the Egyptian stock market, such as setting the short selling rules, enhancing the e-trading system, introducing a new commodity exchange spot and enhancing the disclosure system for firms registered in the Egyptian stock market (Awad, 2019). This change in 2019 is obvious in the following chart, figure 2.1, which shows a slight improvement in the performance of the Egyptian stock market, compared to the last qaurter of 2018.

³ The three treasury bonds were cancelled by the Egyptian ministry of finance when Turkey and Argentina issued international bonds with very high interest rates (Awad, 2019)

Figure 2.1: The performance of EGX 30.



Source: tradingeconomic.com

However, this improvement did not last for long time due to the circumstances of Coronavirus pandemic, which started to show on the global stock markets on February 2020. On March 11, 2020, the World Health Organization (WHO) announced the spread of a global pandemic called COVID-19 (Chaouachi and Chaouchi, 2020). As a result of this pandemic, EGX showed a decline, starting from the first week of March, such that March 1st showed the greatest loss in one day since 2012, leading to stopping trading temporary; moreover, trading was stopped five times during that month. Also, Elsayed and Abdelrhim (2020) have proved through their study on different sectors of the Egyptian stock market that stock's return was sensitive to the reported cumulative death rates. As a way of minimizing these losses, some companies tried to buy back treasury stock to support the decline in their stocks; additionally, two of the governmental banks supplied the market with three billion EGP, while the Central Bank of Egypt purchased around 5% of the market capitalization of EGX 100 (American Chamber of Commerce in Egypt (amcham), 2020). The stock market losses were great, which reached 134 billion EGP by the end of March 2020.

2.6.2 The Egyptian stock market under changing economic conditions

After the 2011 revolution, Egypt witnessed a series of catastrophic waves as a result of increasing public resentment and the rising calls for a democratic, social and economic change. This revolution has resulted in overthrowing the previous regime and substituting it with a new regime. However, these political changes had affected every aspect within the Egyptian economy, such that the economic growth level had decreased with the decrease in GDP to 3% in the first quarter of 2015, compared to 5% at the end of 2010 (Ahmed W, 2017).

The tourism sector was exposed to an extreme crumble that affected the inflow of the foreign currency, the local businesses and tourism-based employments. Also, tourism revenues had decreased to less than the half in 2015, compared with 2010. The Egyptian pound decreased in front of the U.S dollar, from 5.8 EGP in 2011 to 7.6 EGP in May 2015. Additionally, the net foreign exchange reserve dropped to \$17.3 billion by the end of 2015, compared to \$35.2 billion in January 2011, which put the Egyptian economy in a risky position (Ahmed W, 2017). Because of the existence of several sophisticated, related macroeconomic problems, the Egyptian authority has decided to adopt some economic reforms during the last years to enhance the economic situation; these reforms depended on three main aspects (Kamal, 2018). The first aspect is related to the fiscal policy enhancement that included subsidies reforms, taxes reforms and improving the public goods pricing to minimize the budget deficit as percentage of GDP. The second aspect is related to the exchange rate policy, in which the Egyptian government had decided to change the applied regime from “fixed exchange rate” to “free floating exchange rate”, which has resulted in depreciating the value of the Egyptian pound in front of the US dollar by about 50%. It is expected that the floatation of the Egyptian pound would have a positive impact on the stock market through attracting foreign investors; however, this could cause risks in the future if the government failed to cover the foreign currency shortage. The third aspect was an attempt to enhance the position of the Egyptian pound after its depreciation, whereas the Central Bank of Egypt decided to adopt a tightened monetary policy through increasing all the available interest rates, including the overnight deposit rates, lending rates, deposit rates and discount rates, and consequently the treasury bills rates (Kamal, 2018).

The Egyptian government succeeded in passing its first plan for the macroeconomic reforms and succeeded in managing a lot of deep issues that worked on settling the economic conditions. According to world bank 2019 report, Egypt had witnessed great improvements by the end of

the financial year 2019, such that the GDP has grown to 5.6% from 5.3% in 2018's financial year, whereas the exports were the major driver. The private investment is growing slowly with a quiet increase in Foreign Direct Investment. There are some industries that contributed in the growth, such as tourism, gas extractions, constructions and the trade made by wholesalers and traders, while the unemployment rate has decreased by 2.2% in the 4th quarter of the financial year 2019, compared with this quarter of the previous year, although it was accompanied by a reduction in labor force participation (The World Bank, 2019).

The Central Agency for Public Mobilization and Statistics (CAPMAS) has declared that annual consumer price inflation rate had decreased in April 2019, compared to April 2018, while the core inflation was also showing a decrease from March 2019 to April 2019, based on central bank's reports. However, a monthly increase in inflation is shown in June and July 2019 as a result of the increase in Fuel prices.

The Egyptian Central Bank minimized the interest rate by 150 basis point in August 2019; this was claimed to affect the lending rate that would increase the cash flowed to the private sector (The World Bank, 2019). Accordingly, the inflation rate decreased to 7.5 percent in August 2019, leading to an easing in monetary tools. It also should be highlighted that the governmental debts had decreased by 9.2 as percent of GDP by the end of June 2019 from June 2018.

The adoption of the floating exchange rate system as a consequence of the 25th of January 2011 revolution, resulted in a depreciation in the value of the local currency to the extent that the US dollar reached almost 20 Egyptian pounds in December, 2016 (Central Bank of Egypt, 2019). The Egyptian market was not able to hold for the exchange rate because of the decrease in its foreign reserve. However, by September 2019, the foreign reserves increased to 44.97 billion US dollars, which led to the stabilization of the foreign position and the appreciation of the Egyptian pound against the US dollar, reaching 16.4 EGP per dollar (The World Bank, 2019). As any stock market, the Egyptian stock market is highly influenced by any surrounding events, such that during September 2019, the Egyptian stock market achieved great losses in market capitalization and witnessed significant foreign sales and a decrease in their purchases, also, EGX30 had showed a drop in a remarkable way. This drop resulted from the continuous protesting calls against the Egyptian government. This stress had forced the Egyptian stock exchange to stop trading for 30 minutes on Sunday 22nd of September 2019, the matter that did not happen since 2016 (Moneim, 2019). Beside the country's internal affairs, the world faced the emergence of a global pandemic, which is COVID-19. The first case of this pandemic

appeared in China in December 2019; however, soon it spread quickly to the whole world, leaving a severe impact on the global financial markets (Chaouachi and Chaouachi, 2020). Major market indices showed great losses during the last week of February, which were not shown since 2008 (Amcham, 2020). Despite the economic reform the Egyptian economy had witnessed, the pandemic affected every aspect within the economy. The activity of the private sector declined, affecting the creation of job opportunities in addition to the drawbacks that affected the non-fuel exports, foreign direct investment and the ratio of governmental debt in relation to GDP (The World Bank, 2021). Also, a decline was observed in the real growth rate to 3.6 % by the end of the financial year 2019/2020. Other sectors like tourism, manufacturing, fuel and gas mining and Suez Canal operations were affected by the restrictions imposed on the international travel, the turmoil of supply chain activities and the decline in demand on both national and international level. In response to these losses, the Egyptian government adopted urgent response strategies amounted 100 million EGP, which involved postponing taxes and loan repayments and reducing interest on loans. During the first and second quarters of the financial year 2020/2021, the growth rates started to recover when the restrictions regarding the social distance were minimized; also, unemployment rates decreased to some extent with the encouragement of the external finance from the International Monetary Fund (The World Bank, 2021).

2.6.3 Asset pricing studies conducted in the Egyptian stock market

After nominating the Egyptian stock market to be the market upon which the empirical analysis will be applied, the current section presents some of the studies conducted in the Egyptian stock market with respect to each of the three theories employed in this study.

2.6.3.1 The microeconomic studies conducted in the Egyptian stock market

Omran (2007) proved the role of market beta, when the results proved the positive and significant impact of market beta employed in CAPM in explaining return dynamics in the Egyptian stock market. While, Shaker and Elgiziry (2014) used GRS test to determine the best model among five alternatives that are: CAPM, Fama and French 3 factor model, Carhart four factor model, liquidity –augmented four factor model and finally the liquidity and momentum augmented Fama and French three factor model. The examination period was from 2003 to 2007 and the GRS test revealed that Fama and French 3 factor model is the best among the examined models to explain the cross section of average return.

Also, Taha and Elgiziry (2016) conducted a study in the Egyptian stock to examine the impact of Fama and French three factor model plus other five macroeconomic variables: earning to price, liquidity, momentum, dividends to price and sales to price using Fama and French (1993)'s methodology. The study used 55 Egyptian companies examined from July 2005 to July 2013. Using OLS regression, the results found a significant size, value and liquidity impact, rejected the role of momentum and proved a redundant effect for sales to price and dividends to price. The study concluded that the model composed of market factor, size, book to market, earning to price and liquidity achieved the best results compared with the other constructed models.

El Abd (2016) applied a study on the Egyptian stock market that compares four asset pricing models: CAPM, Fama and French three and five-factor models, and Carhart four-factor model. The period under analysis was from June 2005 to July 2016. The results of the study proved that the FF5 was the most eminent one among the tested models with the significant power for size, while rejecting the role of value and momentum variables. The researcher highlighted the need for reinvestigating the profitability and investments variables because of their missed results.

Ragab *et al.* (2019) compared the role of Fama and French three and five factor models in the Egyptian stock market for the period from July 2005 to June 2016 using time series regression. The results highlighted the role of size as the most significant variable, also supported the existence of investment and profitability effect however it was not of the same significant impact as size and rejected the role of value effect.

2.6.3.2 The macroeconomic studies conducted in the Egyptian stock market

As for the studies that tested the impact of the five macroeconomic variables examined in the current study, a study was conducted to evaluate the role of exchange rate on the stock markets of the Arabic countries during the Arab spring revolutions. A study was implemented by Ramadan *et al.* (2016) who examined the impact of four macroeconomic variables (exchange rate, money supply, interest rate and inflation rate) on the Egyptian and Tunisian stock markets. The examined period was from 1998 to 2014, such that the stock markets were measured by the relative market index for each country (EGX30 for the Egyptian market and TUNINDEX for the Tunisian stock market). The macroeconomic variables were measured using the most well-known proxies, such that inflation rate was measured using CPI, money supply measured by M2, deposits on interest was used as a proxy for interest rate while using the national

currency against the US dollar as a measure for exchange rate. The results of the study indicated the existence of either a long term or a causal relationship between the examined variables and the stock markets, except for the CPI that did not have a significant impact on the Tunisian stock market. The co-integration analysis revealed the positive effect of money supply, inflation and exchange rates on EGX30 while the negative effect of interest rate. As for the Tunisian stock market, all the variables showed a positive impact on the TUNINDEX.

Also, El-Masry and Badr (2020) implemented a study to examine the causality relationship between foreign exchange market and stock market performance in Egypt before and after the 25th of January 2011 revolution. The study used four different Egyptian stock market indexes and stock market capitalization as proxies of stock market performance and EGP/US dollar as proxy of exchange rate. The analysis was run on daily data using VAR Granger causality test, where the results proved the existence of a significant causal relationship between the different indexes and exchange rate and between the market capitalization and exchange rate in both directions before the 25th revolution, while after the revolution this relationship did not exist.

The review of the literature that examined the role of exchange rate highlighted its importance accordingly, it is selected in this study to measure the external competitiveness of the national economy. The current study uses EGP/US dollar as proxy of exchange rate.

Abouwafia and Chambers (2015) implemented a study to examine the impact of monetary policy changes on the stock markets of Egypt, Saudi Arabia, Oman, Kuwait and Jordan. The study used the monthly intervals from November 2003 to December 2012. The variables' measurements employed were the industrial production index as a measure of real output for Egypt and Jordan, while for the other countries it was measured using crude oil production. The other variables were Dollar real exchange rate, consumer price index and the real stock prices deflated by the related CPI. The rates used to measure the monetary position were the central bank discount rates for Jordan and Egypt, the overnight rate for Oman and the three months interbank rate for the Saudi Arabia and Kuwait. The choices of the proxies used were restricted to the availability of data in monthly intervals as required by the researchers. The results revealed that the restricted monetary regime had led to decreasing the values of stocks for the five countries, even when the regimes applied are different. The results also explained that the decrease in value was more significant for Kuwait and Egypt, which was justified by the independent monetary regime that enables a flexible exchange rate. Also, the real exchange rate for these two countries was of a significant impact on stocks while the direction of the impact

depended on whether the company is exporting or importing and the stability of the exchange rate policy. The results of the study were in favor of accepting the use of monetary policy tools to adjust the stock markets. Moreover, it was found that the shocks in stocks' prices led to an increase in output in Egypt, measured by the IPI.

In addition to the domestic macroeconomic variables affecting the Egyptian stock market considered in this study, there are also the global factors, like the U.S federal fund rate and the global commodities index that affect the performance of the stock markets. Various studies have examined the impact of changes in U.S. monetary policy tools on the developed economies stock market (Jiang, 2018; Jansen and Zervou, 2017) however, limited studies have tackled their impact on the emerging stock markets. Studying these relationships has become of great importance nowadays, notably after the increase in the global incorporation (Neaime, 2016; Abou-zaid, 2013).

Abou-Zaid (2013) has proved the sensitivity of Egyptian stock market to the anticipated changes in the US monetary policy with an inverse relationship, when examining the impact of expected and unanticipated changes in US monetary policy on stock markets of Egypt, Israel and Turkey. Abou-Zaid (2013) examined the effect of monetary policy using the federal fund rate, such that the sudden change was measured by the first day of change in price of the month before the thirty-day Federal Fund Rate contract. The expected change was measured by the federal fund rate published by the Federal Reserve. The period under analysis was from 1996 to 2007, while using the multivariate GARCH method. Israeli and Turkish stock market did not respond to federal fund rate as the Egyptian market; Abou-Zaid (2013) justified this by the fact that the exchange rate policy adopted in each country is different. Also, the surprise changes were not of impact on the Egyptian stock market, and this was justified by the fact that there are restrictions implemented by the Egyptian stock exchange on the daily prices 'change of the Egyptian stock, which is to be minus or plus 55 of the closing prices in the previous day. This limitation is of a bad effect on the ability of stock prices to reflect their new fair values, which means that it should be re-evaluated to minimize the uninformed speculative activities that can result in securities 'price inflation without any support.

2.6.3.3 The behavioral finance studies conducted in the Egyptian stock market

Mertzanis and Allam (2018) applied a to test the existence and the effect of herding behavior as one of the most important psychological variables pre and post the January 2011 revolution. The study covered the period before and after the 25th of January revolution from 2003 to 2014,

since it represents an important ground of research; also, this period involves two important events: the 2008 global financial crises and the 25th of January 2011 Egyptian revolution. Daily and monthly returns of EGX 30 were used as a proxy for market return. The results found that for the whole period under analysis, there was no herding behavior neither in the bull nor the bear markets, while an adverse herding existed. However, the monthly data analysis proved the existence of herding behavior for short time span. As for the sub periods' analysis, the results found adverse herding but with a weak effect and also proved the existence of herding in bullish market and not in the bearish. These results moved in line with those of the emerging countries and opposite to that of the developed ones. The appearance of the adverse herding behavior could be explained by the mistrust feeling felt by the Egyptian investors post the revolution toward the government and policy makers, resulting from the existing political instability and media blackout for the real situation of the country, which made the investors think more carefully and act rationally while depending on their own personal views.

Also, Metawa *et al.* (2019) implemented a study on the Egyptian stock market, using a sample of 384 Egyptian and foreign, individual and institutional investors to measure the role of demographic characteristics on investment decision through the mediating effect of four behavioral variables. Metawa *et al.* (2019) used partial multiple regression and proved the impact of herding behavior, along with investor sentiment, over and underreaction, overconfidence on investment decisions.

The review of the of the asset pricing studies conducted in the Egyptian stock market moves in line with the review conducted in the other emerging markets, which confirms: the insufficiency of the studies that examined the explanatory power of Fama and French five factor model that highlights the need for more studies to identify the role of investment and profitability in explaining the variation in stocks return. Also, Campbell *et al.* (1997) explained that the power of a multifactor model cannot be judged until sufficient new data is available to provide out of sample test for their role. El Abd (2016), Taha and Elgiziry (2016) and Shaker and Elgiziry (2014) confirmed the role of market beta, size and book to market ratio in explaining Egyptian stocks' return, while the same studies proved the weak explanatory power of momentum in explaining the variation in return of the Egyptian stocks; that explains the reason for not choosing momentum variable to be among the microeconomic variables examined in this study. Accordingly, testing Fama and French five factor model with respect to the Egyptian stock market will add value to the studies that examined the explanatory power of this model. Also,

this will highlight the microeconomic factors that are point of interest for the Egyptian investors which will provide recommendation to the financial managers and different market participants. The review of the macroeconomic studies conducted in the Egyptian stock market confirms the role of the selected domestic variables (exchange rate, inflation rate, industrial production index) to be part of the augmented conceptual model and the necessity of considering the impact of global macroeconomic variables to prove or deny the ability of the Egyptian stock market to offer diversification against global changes. The current study will use EGP/US dollar as proxy of exchange rate while inflation is measured by means of core CPI; this will be beneficial to the investors through learning the best way to assign their funds more efficiently to hedge against the increase in inflation rate. The industrial production index is used to measure how the change in the economic growth within the Egyptian economy will affect the return of the Egyptian stocks. The results of the current study will update the existing literature which shows the relationship between the macroeconomic variables and the stock market return of the Egyptian market- an African emerging market. This is beneficial for policy makers who could use the results to update the existing policies or add new ones to enhance the fitness of the capital market.

The review of the behavioral studies conducted in the Egyptian stock market highlighted the ignorance of the Egyptian policy makers and the Egyptian investors to the importance of the investors' psychology and its impact on the investment decisions that ultimately affect stocks' return. Also the literature showed a lack in the criteria that can be used to select the behavioral variables to be examined in each economy accordingly, the study decided to adopt a systematic literature review to gather the behavioral variables that were tested for their impact on stocks' return or on investment decision in order to build a complete psychological model that can be used as guidance in the further upcoming studies, while determining the significant ones according to the Egyptian individual investors will give indication to the psychological factors affecting other emerging markets similar to the Egyptian stock market as explained by Lyocsa and Baumohl (2015).

The results of this study will contribute to the international literature in general and that of the emerging markets in specific, as it will highlight whether the risk premium factors of the emerging markets are similar to that of the developed market. The results of the current study will provide insights different than what is retrieved. The emerging market are different from the developed market with respect to its small sample size which may results in low portfolio

diversification, also most of the emerging markets are characterized by its large population, political and economic instability.

Table 2.2 provides a summary for the theories and studies that support the development of our hypotheses.

Table 2.2: The link between the employed models and the research hypotheses

The theory behind the employed model	The model	The hypotheses	Studies that support the hypotheses
Fama and French Five-Factor model	The microeconomic model.	The microeconomic variables presented in Fama and French five-factor model have a significant effect stocks' return.	ElKhafagy and Abd ElRasol (2019), Nichol and Dowling (2014), Acaravci and Karaomer (2017), De la O González and Jareno (2019).
Arbitrage Pricing Theory.	The macroeconomic model.	The selected five macroeconomic variables have a significant effect on stocks' return.	Ajaz <i>et al.</i> (2017), Majid and Yusof (2009), Ramadan <i>et al.</i> (2016), Jareno <i>et al.</i> (2019), Akbar <i>et al.</i> (2018), Mohamed and Ahmed (2018), Singhal <i>et al.</i> (2019)
Behavioral Finance Theory.	The behavioral model.	The investors' behavioral variables have a significant effect on stock's return.	Huang <i>et al.</i> (2014), Jitmaneeroj (2017), Tuyon and Ahmad (2018), Yang <i>et al.</i> (2017), Chandra and Kumar (2012), Saxena <i>et al.</i> (2016), Goetzmann <i>et al.</i> (2015), Xu <i>et al.</i> (2017), Tauni <i>et al.</i> (2017), Ahmad (2018)

2.7 Discussion and Conclusion

This chapter illustrated the importance of having an updated model, capturing the determinants causing the variation in stock's prices in this rapidly changing environment. The chapter started by covering the evolution of the asset pricing theory while focusing on the most famous ones

until recently, then reviewing the literature of the three prominent theories that form the ground of this study. The framework proposed in this study is based on three theories- the micro, macro and the behavioral finance- where each theory represents a contribution made by different researchers to introduce a model that is able to describe different market anomalies.

The microeconomic literature reviewed the work introduced by previous researchers regarding the firms' specific characteristics that are able to explain variation in stocks return, while choosing the five variables presented in Fama and French (2015) five-factor model as indicators of the microeconomic variables that affect stocks' return. Fama and French model is built based on evidence provided by previous researchers; however, more studies are still needed to verify its role.

Then, the macroeconomic literature was covered. The macroeconomic literature started with discussing the main theories that explained the link between the macroeconomic variables and the stocks' return, while focusing on the Arbitrage Pricing Theory. Then, the study selected five macroeconomic variables and elaborated their importance. The variables include three domestic variables and two global variables to give a full perception regarding the influence of macroeconomic variables on stocks' return.

Subsequently, the literature covered the achievements made by behavioral finance theory since its introduction. The behavioral finance literature proved the ability of this thought to overcome the obstacles faced by the traditional models. This model proved its role in explaining the unexplained performance of several stock markets.

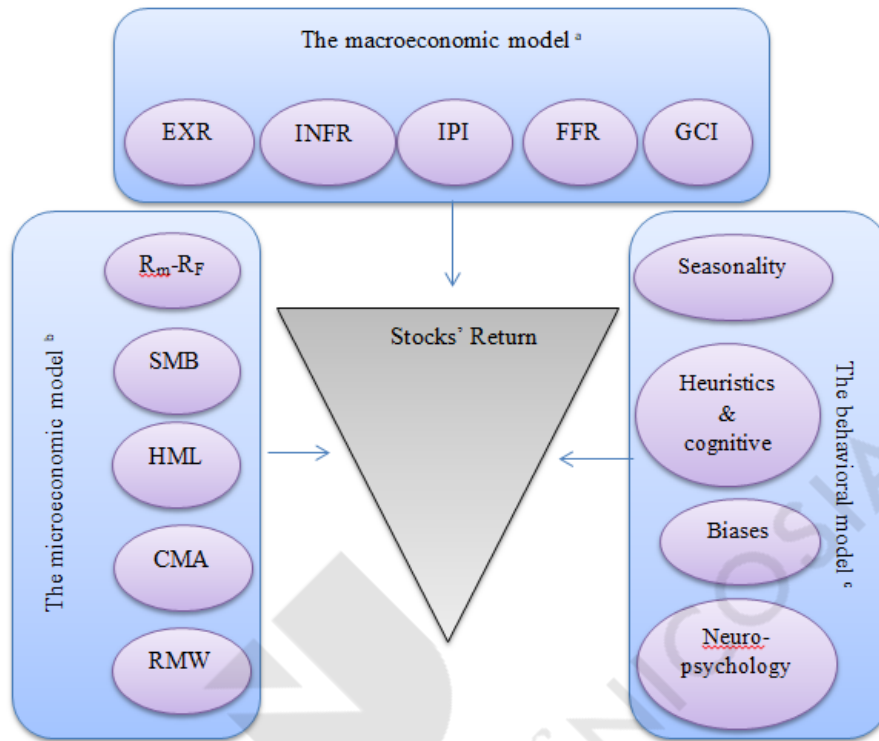
After reviewing the literature of the three theories, the chapter highlighted the research gap found by the analysis of the empirical studies conducted with respect to each theory also, elaborated the importance of the emerging markets based on their role in the financial market integration. Finally, the chapter displayed the stock pricing studies implemented in the Egyptian stock market as the market selected for applying the empirical analysis of the current study.

Each model of the three models employed in the current study is able to explain a part of the variations happening to the stocks' return, but neither one of them is sufficient to explain all the market anomalies. Accordingly, the proposed framework is expected to be more compatible and comprehensive in explaining the stocks' prices movements.

The following figure represents the conceptual framework that captures the three models (micro, macro and behavioral) that will be used in this study to test the research hypotheses and

conduct the research methodology. The next chapter will cover the methodology, followed by each model to test the research hypotheses through the empirical study.

Figure 2.2 The augmented conceptual stock pricing framework



- a: the macroeconomic variables used are EXR= Exchange rate, InfR= Inflation rate, IPI = Industrial Production Index. FFR = Federal Fund Rate, GCI = Global Commodity index,
- b: The microeconomic variables; $R_m - R_f$ = market excess return, SMB = small minus big, HML= High minus low, CMA= conservative minus aggressive, RMW= robustness minus weak.
- c: The behavioral variables extracted from the systematic literature review which will be described in details in the following chapter.

CHAPTER 3 PHILOSOPHY, METHODOLOGY AND METHODS

3.0 Introduction

In the previous chapter, the researcher presented the evolution of the asset pricing models, starting from the introduction of Markowitz theory till the development of neurological dimensions. Then, the chapter reviewed the empirical studies conducted in different market with respect to the three theories employed in the current study, also reviewed the empirical studies conducted in the Egyptian stock market as the market selected for applying the empirical analysis. After conducting the literature review, the study selected the convenient methodology that will be applied and is presented thoroughly in this chapter. The methodology followed in this chapter represents the steps followed by the researcher to develop a stock pricing model that takes into consideration the rational expectations as well as the irrational biases through integrating three different thoughts.

The chapter is divided into three main sections. In the first section, the research scope is presented. The second section presents the research design, where the choice of research philosophy, approach, and strategies adopted are illustrated. In the third section, the chapter covers the stages that will be implemented to fulfill the study's objectives through the current empirical study, involving the methodology and procedures employed to examine each theory (micro, macro and behavioral) with the data collection and sampling techniques, which will lead to the development of the augmented framework.

3.1 Research scope

The volatility associated with the stocks' prices provided a clue that the stock market is not a free space but it reacts to different factors, either internal or external or both. To this day, the literature that used multifactor models to study stocks' prices prediction used either financial ratio, macroeconomic, microeconomic or behavioral factors, which made understanding the basis on which the market participants react and make their investment decision a dilemma. This dilemma has emerged after the failure of the classical financial theories in measuring the market behavior practically, like the Capital Asset Pricing Model and the market efficiency theory. These classical theories are based on the main assumptions that investors work on maximizing their utilities; they are homogenous, rational and use all the available information to make their decisions, which are equally known to every participant in the market. Also, these traditional thoughts assume that the decision-making process requires making the optimal choice, whereas the investors are expected to act properly to any new information and that the

stock prices reflect precisely all the available information, and in case the market deviates away from the fundamental values, the arbitrage process will return the prices back to their normal path (Adesanmi, 2018).

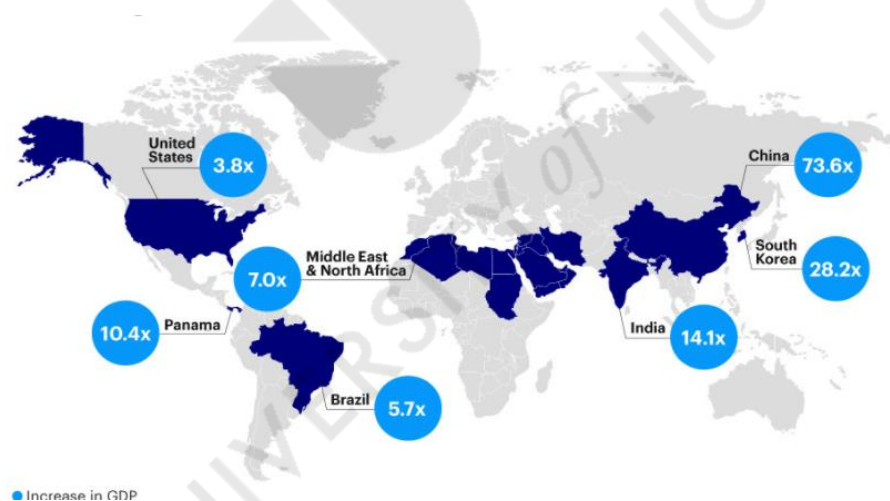
The unrealistic assumptions of these theories led to the development of different notions and thoughts, such as considering the macroeconomic variables presented in each respective economy as a reason for stock prices' fluctuations (Ross, 1976), while other researchers like Fama and French (1992, 1993, 1996, 2012, 2015) considered the microeconomic variables related to each firm characteristic- such as value, size, profitability and investment - are better in explaining stocks' return. Additionally, a new different thought was introduced by the behavioral finance, which assumes the irrationality of decision makers (DeBondt and Thaler, 1985; Tversky and Kahneman, 1974). The behavioral theory's main principle is that humans own limited cognitive abilities and have limited access to information, and they are exposed to biases and illusions. Investors who are more sensitive to biases are more subject to make biased decisions, especially during periods of market stress. Since humans have limited abilities and because the trading process is complicated and time-consuming and intellectually demanding, and since the profit opportunities will not wait for a long time, investors tend to search for ways that simplify the decision-making process and act with simplicity and naivety. That may result in repeating the same mistakes, leading to deviation in the stock prices from the fundamental values, in addition to knowing that not all the pricing errors are caused by psychological errors (Komba, 2016).

The review of the literature and the results reached by previous researchers for the three theories led the researcher to conclude that each theory provides a distinctive explanation regarding the factors affecting stocks' return, but none of these theories is by itself sufficient to explain the market's variations. This highlights the necessity for developing a framework that integrates these different perspectives and adds the irrational sources of risk to the rational sources of risk. Therefore, this study will introduce the technique through which an augmented framework capturing stock pricing determinants will be developed by conducting an empirical study on the Egyptian stock market-a representable emerging market.

The reason for choosing an emerging stock market for applying the proposed framework emerges from the increased focus on analyzing the performance of the emerging markets, as they offer better investment options for the international investors and constitute 50% of the top 20 economies of the world in the global investment opportunities (Graham *et al.*, 2016).

Furthermore, most of the emerging countries are characterized by large populations, with active and young human resources, which means that they offer different consumer classes and high purchasing power, especially in equity market. Additionally, they provide a diversified investment opportunity as international diversification minimizes the associated risk more than the domestic diversification (Boako and Alagidede, 2016), in addition to their ability to manage long term investment plans successfully (Qachln *et al.*, 2017). Also, the emerging economies have shown a great potential for future growth compared with the U.S economy, as shown in the following figure 3.1. Accordingly, an understanding is needed for the nature of the equity markets of these economies so that it can increase its benefit from the international flow. Based on the criteria mentioned above and others mentioned in section 2.6, the Egyptian stock market is nominated to be the emerging market upon which the empirical analysis of the current study is applied on.

Figure 3.1: The growth in GDP of the U.S economy and the emerging economies from 1969 to 2019



Source: World Bank (cited in *investing in the emerging markets*, no date)

3.2 Research design

According to Easterby-Smith *et al.* (2002), it is very essential to understand the relationship between research philosophy, approach, and strategy, as this relationship enables drawing and determining the best research design that copes with the needed data to be collected and how it will be interpreted; it facilitates the research design under different constraints. Also, this

knowledge can be helpful in the theory development process, which is inherent in the research design process (Pathirage *et al.*, 2008).

This section will consider the research design implemented in this study, which involves the research philosophy, approach adopted in addition to the techniques and strategies that will be implemented to achieve research aim and objectives.

3.2.1 Research philosophy

The most used and known philosophies are positivism and phenomenology (Saunders *et al.*, 2019). The emergence of positivism first started in the 19th century by Auguste Comte's as a trail to search for the truth after accusing the metaphysics and refusing the inability of technical and scientific facts to provide the truth (Neuman, 2014). Positivism is stemmed out from the ontology paradigm, whose ideology requires the researcher's independence and self-reliance from the truth. Its epistemology gives more objective results than phenomenology, since the researcher is isolated and is not interacting with the participants. That is why it is sometimes referred to as "realism" and 'objectivism' (Aliyu *et al.*, 2014). Its methodology is based on verifying the hypothesis, while the results achieved are characterized by their quantifiable nature as it follows very constrained steps during the empirical research. Positivism is based on the belief that the world changes according to the fixed laws of reasons and events and with the complete dependence on integrity, dispassion and bias freedom (Aliyu *et al.*, 2014), and that reaching reality depends on reasons and beliefs while reaching reliable and trusted results depends on observations and measurements, which will lead to conformity of results regardless of the subjects (Adesanmi, 2018). Neuman (2014, p. 97) had summarized positivism in the following quote:

"Positivist social science is an organized method for combining deductive logic with precise empirical observations of individual behavior in order to discover and confirm a set of probabilistic causal laws that can be used to predict general patterns of human activity"

As for phenomenology, it is more subjective and focuses on the details of the actions and depends on the researcher interactions with the participants, resulting in qualitative results (Saunders *et al.*, 2009). Phenomenology does not believe in the existence of unified truth, whereas the phenomenologist researchers perceive and explain concepts based on induction and recommendation. Phenomenology believes that uncommitted and unconcerned objectivity is not practical, while the methodology followed by Phenomenologist is the qualitative one. The following table presents the major differences between the two paradigms.

Table 3.1: The major differences between positivism and phenomenology

Phenomenological paradigm	Positivist paradigm
Basic beliefs	
Science is driven by human interest	Observer is independent
The world is socially constructed and subjective	Science is value-free
Observer is part of what is observed	The world is external and objective
Researchers should	
Try to understand what is happening	Focus on facts
Develop ideas through induction from evidence	Formulate and test hypotheses
Focus on meanings	Look for causality and fundamental laws
Look at totality of each situation	Reduce phenomena to simplest elements
Preferred methods	
Small samples investigated in depth or over time	Take large samples
Use multiple methods to establish different views of phenomena	Operationalize concept so they can be measured

Source: Easterby-Smith *et al.* (1994, p. 80).

Deciding which philosophy to follow is based on determining whether the data or the theory comes first; however, this issue represents the main dilemma for most studies. Based on the previous explanation for the two philosophies and based on the aim of this study, which is developing an augmented framework that represents an integration for three existing thoughts, and based on the need to generalized the reached results, this study tends to follow the positivism philosophy, as the study will focus on the facts that are obtained from data collection, which will be tested using statistical analysis.

3.2.2 Research approach

The two main known approaches are the deductive and inductive, and following any of them will work on correcting mistakes and adding new theories and more knowledge. The deductive approach was developed by Rene Descartes's theory of knowledge, who described the phenomena as a series of related and organized events; accordingly, the truth can be concluded. The deductive approach begins with the theoretical assumptions of the main theory and then moves to test the theory using hypotheses till reaching the empirical results. Science uses the results achieved to update the main theory and add to knowledge (Neuman, 2014). This approach is mainly adopted with the quantitative methodology.

The inductive approach starts with observation, noticing the world and then proceeding toward theory building and assumptions, which involves starting with a broad idea and an unclear notion and then is improved toward a more pure and accurate theory (Neuman, 2014), which is adopted under the qualitative methodology.

Following the theoretical alignment between research philosophies and approaches, the approach that is adopted for the positivism paradigm is the deductive approach. Moreover, the reason for following the deductive approach is that this study tests already existing theories through developing propositions that will be tested using the data collected (observation) to accept or reject the theory (Pathirage *et al.*, 2008; Young, 2007; Hyde, 2000) and to improve the already existing theory (Neuman, 2014). Also, the aim of the study is to examine the relationship between specific variables. The following figure 3.2 represents the distinction between the deductive and inductive.

Figure 3.2: The steps underlying the deductive and inductive approaches.

Deductive approach

Inductive approach



Source: (Trochim, no date)

3.2.3 Research methods

The methodologies followed by researchers can either be categorized as quantitative or qualitative. The quantitative analysis involves gathering and testing numerical data formulated in hypotheses or assumptions using statistical tools to describe an event. It is based on the objectivity and the freedom of researcher from any intervention (Askarzai and Unhelkar, 2017). Also, it requires a great sample size to be selected randomly and to analyze it using the statistical analysis, which allows generalizing the reached results to the whole population; moreover, the results can be used for prediction purposes (Elgazzar, 2013).

The qualitative methodology is a way of analyzing information provided in textual form, which cannot be presented in numbers, to get an insight of a specific event (Askarzai and Unhelkar, 2017). It involves subjective viewpoints and demands a small sample size to enable researcher

involvement in the data collection. There is no specific method for analyzing the data collected. Table 3.2 presents a summary of the main distinctions between the quantitative and qualitative analysis.

Table 3.2: The main distinctions between the quantitative and qualitative methods



Attributes/ Research types	Quantitative Research	Qualitative Research	Mixed Research
Goal	To predict and control	To understand (what, how, and why)	Depends on the research question
Mode of Inquiry	Structured	Unstructured	Both structured and unstructured
Scientific method	Deductive or "top-down". The researcher tests hypotheses and theory with data	Inductive or "bottom-up". The researcher generates new hypotheses and grounded theory from data collected during fieldwork	Deductive, inductive/both
Logic	Deductive	Inductive	Inductive or deductive
View of human behaviour	Behaviour is regular and predictable	Behaviour is fluid, dynamic, situational, social, contextual, and personal	Behaviour can be predictable and unpredictable
Most common research objectives	Description, explanation, and prediction	Description, exploration, and discovery	Multiple objectives
Focus	Narrow angle lens, testing specific hypotheses	Wide-angle and "deep-angle" lens, examining the breadth and depth of phenomenon	Multi-lens focus
Nature of observation	Study under controlled condition	Study under somewhat flexible condition	Study under more than one condition
When to use it?	<ul style="list-style-type: none"> - To get a broad comprehensive understanding of the situation. - To get socio-demographic characteristics of the population. - To compare relations and correlations between different issues. - When accurate and precise data is required. - To produce evidence about the type and size of problems. - When the assessor knows clearly in advance what he/she 	<ul style="list-style-type: none"> - When in-depth understanding of a specific issue is required. - To understand behaviour, perception and priorities of affected community. - To explain information provided through quantitative data. - To emphasize a holistic approach (processes and outcomes). - When the assessor only know roughly in advance what he/she is looking for. 	<ul style="list-style-type: none"> - To get a breadth and depth understanding of a phenomenon. - To answer a question from quantitative and qualitative perspectives.

	is looking for		
Form of data	Numerical	Textual	Numerical and textual
Researcher's role	Independent	Immersion	Independent and immersion
Research language	Formal, based on set definitions, impersonal voice, use of accepted quantitative words	Informal, evolving decisions; personal voice; use of accepted qualitative words.	A combination of formal and informal; use accepted quantitative and qualitative words.
Form of data collection	Surveys Questionnaires Randomized controlled trials Systematic review	Surveys and interview	Multiple forms
Data analysis	Statistical analysis, descriptive and inferential	Thematic, pattern and conceptualise analysis	Concurrent analysis or sequential analysis
Results	Generalizable	Insightful findings	Collaborative results
Paradigm	Positivist: This paradigm is characterised by empirical research. The ontological position of this paradigm is that truth is objective and the epistemologically position of this paradigm is that the researcher and the researched are independent.	Interpretive: This paradigm is characterised by interpretivism/constructivism. The ontological position of this paradigm is that truth is subjective and the epistemologically position of this paradigm is that the researcher and the researched interdependent.	Pragmatist
Assumptions	Problems can be defined a priori. The complexity of social situations can be reduced to a string of variables which are clearly operationalized. There is a reliance on controlled experimentation. Events can be explained in terms of cause and effect. There is one 'right' interpretation.	There is a focus on exploring the dynamics of interactions with the emphasis on the world as a socially constructed reality that involves multiple perspectives. The perceptions and values of all the participants in a situation are needed in order to explore the various possible interpretations.	This approach is more capable of handling the complexity of modern society and technology. The focus is on practical problems rather than on issues of reality and theories of society. It acknowledges the weakness of current evaluation tools.

Source: Askarzai and Unhelkar (2017, p. 36).

Based on the distinction provided above and, on the philosophy, and approach implemented in this study, the appropriate methodology for this study is the quantitative one. The quantitative analysis represents the most used methodology under the positivism umbrella (Aliyu *et al.*, 2014). In this study, the quantitative methodology is followed to reach the augmented framework. The macroeconomic and microeconomic theories will be examined using archival and historical reports to determine the relationship and the degree of significance of the preselected macroeconomic variables and Fama and French's five-factor model. For the

behavioral model, the quantitative methodology is firstly employed in the form of a systematic review to build the theoretical and conceptual behavioral models. Secondly, a survey is conducted to extract the most important behavioral deviations exerted by investors.

3.2.4 Research strategy

The strategy described here represents the techniques and practical ways of gaining knowledge. Under the quantitative methodology, the strategy used for data collection is using any of the following ways: survey, questionnaire, systematic review or archival records (Neuman, 2014). As for this study, the techniques used for data collection and gaining knowledge represent a mix of all these methods, whereas for the macroeconomic and microeconomic models, the used research strategies are the historical and archival data, represented in the macroeconomic variables' historical data, the stocks' closing prices, number of outstanding shares, book values, deferred taxes, interest expense, total assets for companies registered in the stock market. For the behavioral model, a systematic review is firstly employed to build the behavioral theoretical and conceptual models. Secondly, a standardized questionnaire is used to reach the applied behavioral model and point out the most significant behavioral factors affecting investment decision and accordingly stocks' return.

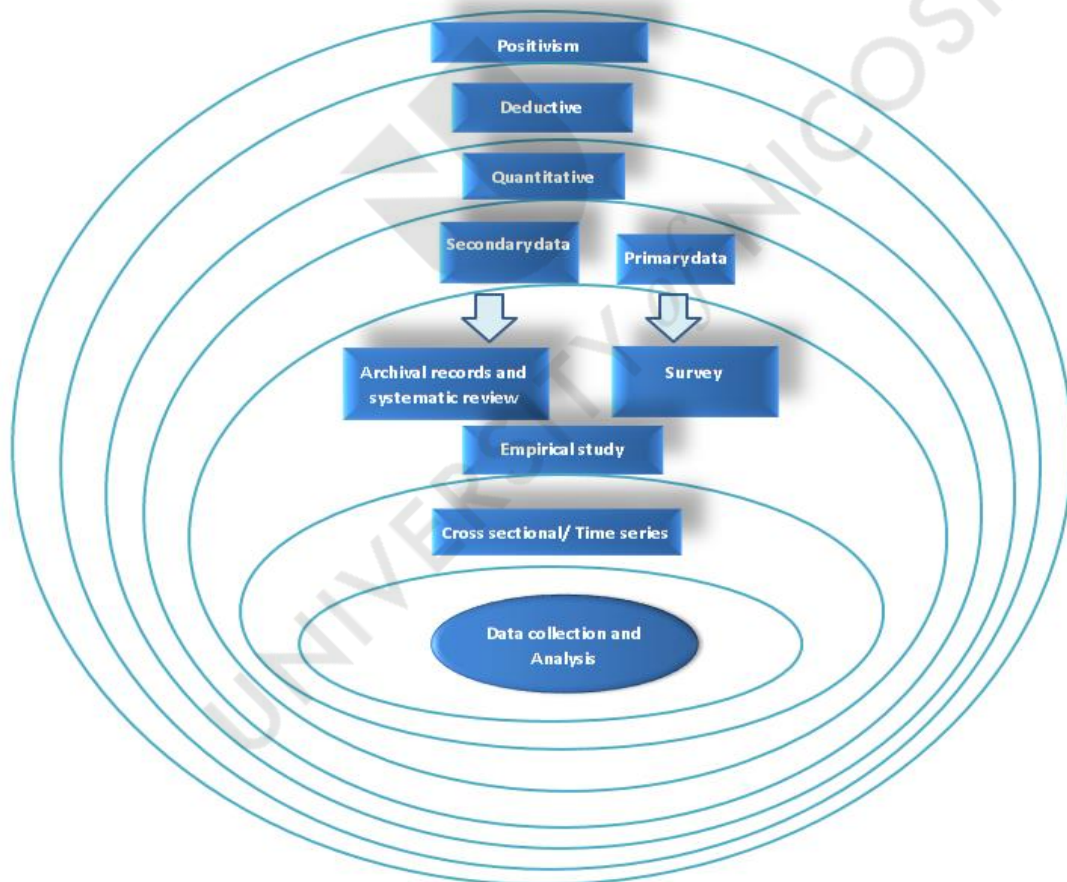
Noting that, the type of data emerged from the systematic review and the archival documents, like the financial and economic numbers, are secondary ones. This type of data is not developed by the researcher himself, but it is acquired from the stock market, governmental and companies' reports, in addition to the web search engines. The secondary data save time, while providing access to a large database. The data type of the standardized survey is a primary one. The survey represents a low-cost method of collecting data, and it is the most preferable method for analytical and practical evaluations when a cause-and-effect relationship is needed to be determined (Elgazzar, 2013), as the one in this study, which aims at measuring the relationship between the inventors' behavioral attitude and stock market's return.

Based on the previous discussion, the target of this study is to develop a new compatible and applicable stock pricing framework that is able to capture the markets' different anomalies. The framework depends on the relationship between the three different theories (micro, macro and behavioral) and the stocks' return, which is discussed in the literature chapter. The aim of this study is retrieved from the desire to fill in the gap missed by the previous researchers who have not provided a comprehensive explanation about what the market return determinants are, taking into consideration the rational and irrational perspectives together.

To develop the augmented conceptual framework, an extensive review for literature about the macroeconomic variables affecting different stock market is conducted, employing the microeconomic variables presented in Fama and French (2015) five-factor model and conducting a systematic review about the investors' behavioral factors affecting the stock market. The study will follow the positivism philosophy to verify the hypothesis, while employing the deductive approach and the quantitative research methodology. Two different quantitative research methodologies will be conducted. After the data collection and analysis are done, the study will point out the most significant variables under each model, which will be integrated to develop the applied augmented framework.

The following figure 3.3 represents a summary of the research philosophy, approach and methodology implemented in this study.

Figure 3.3: The adopted research philosophy, approach and methodology



Source: The researcher

The following section will provide a detailed description of the methodology implemented to test the hypotheses of each theory separately. It will also describe the steps that will be implemented on the selected stock market to test the augmented conceptual framework and develop the applied integrated stock pricing framework.

3.3 Research stages

This section will present thoroughly the research stages that will be followed to test the research hypotheses and conduct the research methodology.

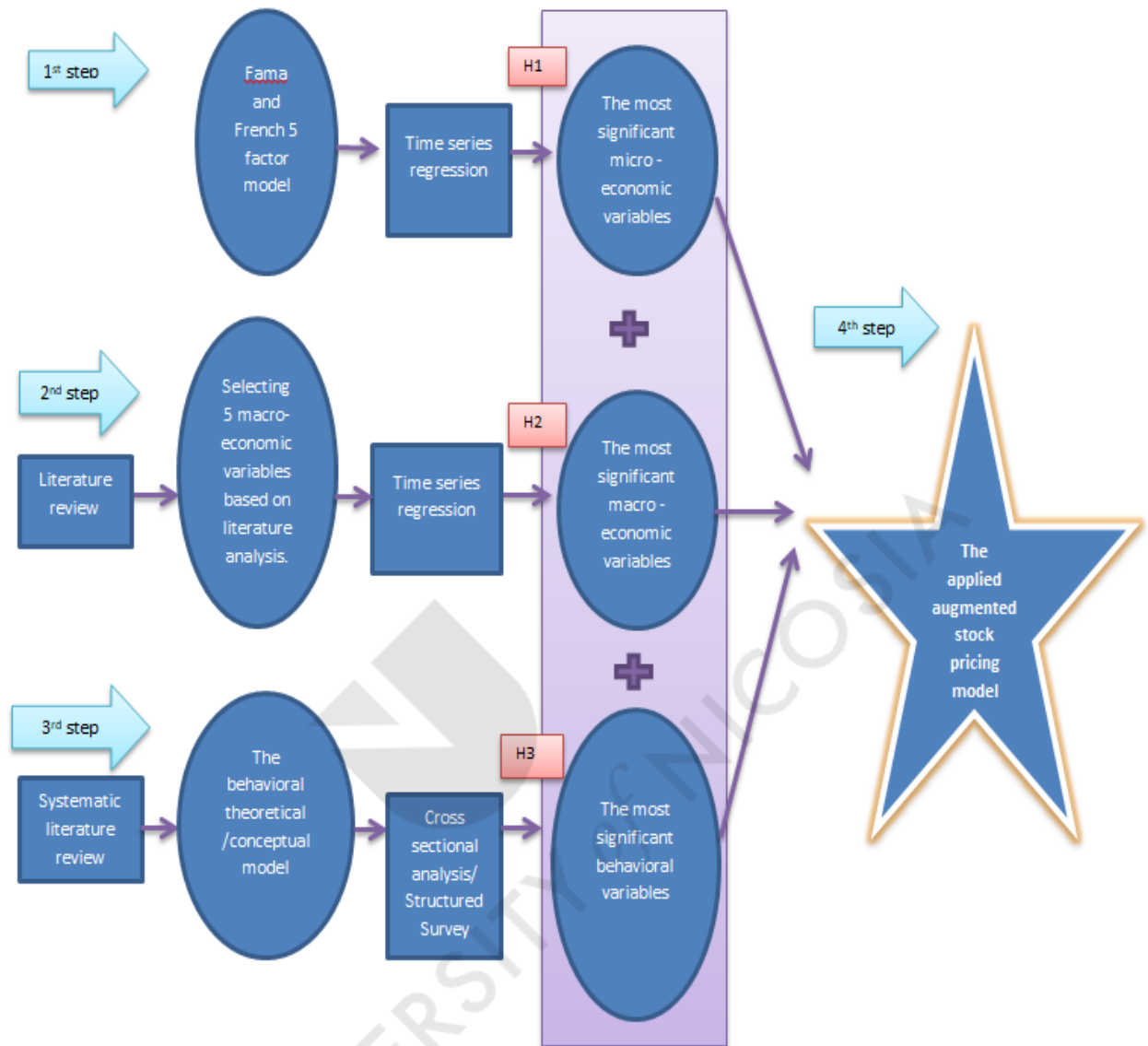
The stages are retrieved from the research objectives to achieve the aim of this study. Table 3.3 and the flow chart shown in figure 3.4 present a summary of the stages and procedures that will be covered to achieve the research aim and objectives, and also the research methods, techniques that will be implemented in each stage are described.

Table 3.3: Research methodology's stages and techniques

Research objectives	Research hypotheses	Research approach	Research methodology
To determine the most significant microeconomic variables and their impact on stock prices of the Egyptian stock market using Fama and French five-factor model.	The microeconomic variables presented in Fama and French five-factor model have significant effect on the portfolios' excess return.	Using Fama and French five-factor model.	Quantitative methodology using Ordinary Least Square method (OLS)
To identify the most significant macroeconomic variables and test their effect on the Egyptian stock market using preselected macroeconomic variables.	The selected five macroeconomic variables have significant effect on portfolios' excess return.	Following Arbitrage Pricing Theory methodology in selecting the variables through applying pre-specified approach.	Extensive review of literature.
			Quantitative methodology using Ordinary Least Square method (OLS)
To present and analyze comprehensively the literature and topics related to the effect of investors' psychology on stock market	The investors' psychological variables have a significant impact on stock's return.	Presenting and analyzing comprehensively the literature and topics related to the effect of investors' psychological	Systematic review

returns as a prelude to this research.		factors on stock market returns.	
To identify the most significant behavioral variables and test their impact on the investment decisions with respect to the Egyptian investors.		Determining the most significant behavioral factor on the Egyptian investors' investment decision.	Quantitative methodology using structured Survey
To develop an augmented framework that captures the most significant variables from the three tested theories based on the conducted empirical study.		Integrating the most significant variables emerged from the analysis of each theory.	
To explain the validity of the applied augmented stock pricing framework developed in this study.		Using different validity tests.	Content validity: (face validity, Pilot test) and Construct validity.

Figure 3.4: A broad flow chart describing research procedures, stages and hypotheses



Source: the researcher

3.3.1 Phase one: identifying the most significant microeconomic variables

The microeconomic variables utilized in this study are based on the most recent model developed by Fama and French (2015), where this model utilizes four variables related to firm's characteristics in addition to market's beta. The Fama and French's theory is based on the claim that some microeconomic variables related to firm characteristics are able to explain variation in stocks' prices more than CAPM's market beta. Accordingly, in 1992, the researchers added two additional variables to the market beta, which are size and value. Later in 2015, the researchers added another two variables: profitability and investment. Although Carhart's (1997) recommendation regarding adding momentum to Fama and French three factor model;

the empirical studies that was conducted in the Egyptian stock market (El Abd, 2016; Taha and Elgiziry, 2016; Shaker and Elgiziry, 2014) revealed its weak explanatory power in explaining the variation in return of the Egyptian stocks as found by earlier studies. Basically, Fama and French (2015) model represents the first notion used in this study regarding the factors that affect stock market prices and are able to predict prices' movement, which needs to be emphasized and proved.

3.3.1.1 The microeconomic model: Fama and French 5-Factor Model

The model that will be used to test the microeconomic variables' impact on the stock market return is represented in the following equation:

$$R_{pt} - R_{ft} = \beta_0 + \beta_1(R_{mt} - R_{ft}) + \beta_2SMB_t + \beta_3HML_t + \beta_4RMW_t + \beta_5CMA_t + Y_{it} \quad (3.1)$$

Where: SMB_t measures size as the historical difference between return on small stocks portfolio and return on large stocks portfolio (SMB), HML_t measures value as the historical difference between return of high book to market value portfolios and return of low book to market value portfolios. RMW_t measures profitability variable as return of diversified portfolios of robust stock minus that of weak stock, while CMA_t measures investment as the return of diversified portfolio of low investment stocks minus that of high investment stocks, where low investment stocks are named as conservative and high investment stocks as aggressive. The variable β_0 is the intercept, whereas the variable γ_{it} is the error term. As for β_1 to β_5 , they represent the sensitivity (slope) of each microeconomic variable to portfolio excess return. The microeconomic variables will run against portfolio excess return to get the most significant variables among the employed ones.

The measurements of the right-hand side variables: (RM-RF, SMB, HML, RMW and CMA) presented in the above equation are described below:

RM-RF: is market portfolio's rate of return minus risk free rate.

SMB and HML will be calculated based on the following steps. **Firstly**, stocks will be arranged ascendingly at the end of June for each year under study (which is the end of the fiscal year for most companies) based on their market capitalization. **Secondly**, the median of market capitalization will be used as a break point to divide the stocks into two size groups: "Big" and "Small". **Thirdly**, stocks will be independently arranged again ascendingly, according to their

BE/ME⁴ ratio (Book Equity to Market Equity ratio). Following Fama and French (1993) approach, stocks whose BE/ME ratio that is less than the 30th percentile are labeled “Low”, stocks whose BE/ME ratio are more than the 70th percentile will be labeled “High”, and stocks that are in-between will be labeled “Neutral”. As a result of the intersection of the two size groups and the three BE/ME groups, six portfolios will be constructed: “SL”, “SN”, “SH”, “BL”, “BN”, and “BH”; (Small Low, Small Neutral, Small High, Big Low, Big Neutral, Big High). **Fourthly**, for each one of these portfolios, monthly value-weighted returns are calculated from July of year t to June of year t+1, whereas the return of every stock within the portfolio is calculated as the percentage change in price using the following equation

$$R_{i,t} = \frac{P_t - P_{t-1}}{P_{t-1}} * 100 \quad (3.2)$$

Where; $R_{i,t}$ is the return on individual stock July(t), P_t is the closing price of the stock at the end of the month (t), and P_{t-1} is the closing price of stock at the end of month (t-1).

Then, the return of every portfolio is calculated as the weighted average return of the stocks forming that portfolio, such that the SMB factor is calculated as difference between average return of small stocks portfolios from (SL, SN, and SH) and the average return of the big stock portfolios from (BL, BN, and BH). The same for the HML factor, the average returns on portfolios with the high B/M (SH and BH) minus portfolios with the low B/M (SL and BL) (Czapkiewicz and Wójtowicz, 2014). The reason for having two size groups and three B/M groups is based on the results provided by Fama and French (1992) which explained that size had minor role in demonstrating average return for stocks relative to the B/M.

To calculate the profitability factor (RMW); **firstly**, stocks will be sorted into three groups based on their operating profit ratio: stocks whose OP ratio that is below the 30th percentile will be labeled as “Weak”, stocks whose OP ratio that is above the 70th percentile will be labeled as “Robust”, and those with OP ratio that is in between the 30th and the 70th percentile will be labeled as “Neutral”. Six portfolios will be constructed at the intersection of the two size groups and the three operating profitability groups: “SW”, “SN”, “SR”, “BW”, “BN”, and “BR” (Small Weak, Small Neutral, Small Robust, Big Weak, Big Neutral, and Big Robust, respectively). **Secondly**, for each one of these portfolios, monthly value-weighted returns are

⁴ Market Equity (ME) will be used to measure size in this study; it is calculated by multiplying the adjusted closing price on the last trading day of the month by the number of outstanding shares. As for Book Equity (BE) is the book value of common equity (El Abd, 2016).

calculated from July of year t to June of year $t+1$. Thus, two additional factors will be calculated: SMB_{OP} and RMW, where the SMB_{OP} factor is the difference between the arithmetic mean of the three small stocks portfolios and the arithmetic mean of the three big stocks portfolios, while the RMW factor is the difference between the arithmetic mean of the two High OP/BE stock portfolios and the arithmetic mean of the two Low OP/BE stock portfolios (El Abd, 2016).

The CMA⁵ factor will be calculated using the following steps: (1) **Firstly**, stocks will be arranged into three groups according to their asset growth. Consequently, stocks with asset growth that is below the 30th percentile will be labeled “Conservative”, stocks with asset growth that is above the 70th percentile will be labeled “Aggressive”, and stocks whose asset growth between the 30th and the 70th percentile will be labeled “Neutral”. At the intersection point of the two size groups with the three asset growth groups, six portfolios will be constructed: “SC”, “SN”, “SA”, “BC”, “BN”, and “BA” (Small Conservative, Small Neutral, Small Aggressive, Big Conservative, Big Neutral and Big Aggressive respectively). **Secondly**, two factors are then calculated: SMB_{INV} and CMA. The SMB_{INV} factor is calculated as the difference between the arithmetic mean of the three small stocks portfolios and the arithmetic mean of the three big stocks portfolios, while the CMA factor is the difference between the arithmetic mean of the two Conservative asset growth stock portfolios and the arithmetic mean of the two Aggressive asset growth stock portfolios.

Finally, the SMB factor is the arithmetic average of the three previously calculated SMB factors: SMB_{BM} , SMB_{OP} , SMB_{INV} .

The Left-Hand Side (LHS) portfolios are more precise versions of the Right-Hand Side (RHS) portfolios, which represent the dependent variables. It will be calculated using 2x3 construct described in Fama and French (2015) in which three different groups of 2X3 portfolios will be used as described below:

The first group involves portfolios that are built based on size-BE/ME, the second group involves portfolios based on size-profitability, and the third group is for portfolios based on size-investment. The value weighted return of each portfolio is then calculated from July of year t to June of year $t+1$, and then the excess returns of each one of the portfolios over the risk-free rate will be calculated and used in the regression. The stocks used in constructing the

⁵ The Investment ratio that will be used for portfolio construction in June of year (t) will be calculated as the percentage change in total assets from December of year end $t-2$ to December of year end $t-1$.

portfolios are stocks that constitute EGX100- one of the Egyptian indices that involves the largest number of companies compared to EGX30 and EGX70. The study selected companies from this index such that the selected stocks are classified as common equity a kind of A-shares stocks (Jiao and Lilti, 2017) after excluding the banking sector as recommended by literature (Foye, 2018; Jiao and Lilti, 2017) because of the different characteristics of their financial statement that differs from the financial statements of other listed firms. Accordingly, the stocks that are listed in foreign markets as well as types of investments other than common equity will be excluded like the exchange traded fund and American depositary receipts (El Abd, 2016). The period under analysis is from June 2010 to June 2020; hence, the stocks included in this study are those that are listed for the period under study, and in order to avoid survivorship bias while ensuring the quality of the companies included in the study and the availability of their data; the study included the stocks that got out of this index and returned again. This resulted in having 47 stocks used in the construction of portfolios. In some years, the number of stocks employed to build the portfolios decreased to 46 or 45 stocks, due to specific filtering criteria, such as excluding stocks with negative BE/ME and stocks with investment rate of change greater than 100% or less than 50%, according to the methodology of Fama and French (1993) and Erdinc (2017).

It worth mentioning that the portfolio construction steps for both the dependent and independent are done on yearly base at the end of June of each year for the period under examination while portfolios' return is calculated on monthly base using equation (3.2).

3.3.1.2 The microeconomic model variables

Several methods were used to measure the variables, specifically for countries other than U.S.A. Other countries have markets with very small numbers of stocks, and there is a great difficulty in finding a proxy for stocks that have high market capitalization similar to the NYSE. Also, there are differences among countries due to the different accounting methods, the fiscal year end dates with respect to each country and the difference in variables definitions (Bhayo, 2015). This section provides a description of the way of measuring the microeconomic variables employed in this study and the sources of data collection.

Based on the literature, the stock market index can be used as an indicator for the stock market performance in a specific country, as it represents a group of selected stocks for companies that can act as representative for the entire market or a particular industry (Ramadan *et al.*, 2016). The market return is calculated using the following equation:

$$R_{m,t} = \frac{MI_t - MI_{t-1}}{MI_{t-1}} * 100 \quad (3.3)$$

Where: $R_{m,t}$ is the return on the Market index at the end of the month (t), MI_t is the price of the Market index at the end of month (t), and MI_{t-1} is the price of the market index at the end of month (t-1).

As the Egyptian stock market has 7 indices (EGX30, EGX50EWI, EGX70, EGX100, Nile index, S&P/ EGX ESG, and EGX30 capped). EGX30 is the market index employed in this study. It involves the most active 30 stocks listed in the Egyptian stock market in terms of liquidity and activity (Sakr, 2015). It is more appropriate to use this stock index rather than EGX70 and EGX100 for this study as the inclusion and exclusion of the Egyptian companies in the bigger indices is more frequent than in EGX30. Moreover, it is the best indicator used in previous studies to capture the performance of the Egyptian stock market as it tracks the performance of the most liquid 30 stocks traded in the Egyptian stock market (Kamal, 2018; Ramadan *et al*, 2016). The risk-free rate is calculated using the rate of change of the monthly weighted average yield on the three-months Egyptian treasury bills.

As for the variables used for portfolio construction, the book to market ratio is calculated using two steps. **Firstly**, the book ratio is measured using book value of common equity plus deferred taxes (El Abd, 2016), companies whose book ratio is less than zero will be excluded from the calculation. **Secondly**, the market ratio which stands for size is measured by multiplying the adjusted closing price on the last working day of the month by the number of outstanding shares. This study will use earnings before interest, taxes, depreciation and amortization divided by Book Equity: (EBITDA)/Book Equity as the measure of profitability. EBITDA is suggested to be used in measuring profitability as it provides fair analysis when comparing between companies of different size, structure, tax and depreciation and it was suggested as a better measure for profitability in emerging markets (Leite *et al.*, 2018; Martins and Eid Jr, 2015)

The total growth in assets will be employed as a proxy for the investment variable as suggested by most empirical studies (Jiao and Lilti, 2017; El Abd, 2016). However it should be taken into consideration that the asset pricing tests are not sensitive to how profitability and investment are measured (Foye and Valentinčič, 2020)

3.3.1.3 The microeconomic model sampling technique and data collection

The sampling technique implemented in this study is the purposive one, since a specific period is selected to be under investigation. The period under analysis is 10 years, starting from June 2010 until June 2020. The reason for starting the analysis from 2010 is justified by the fact the

Egyptian stock market started publishing EGX100 from August 2009 and since the companies employed in this study are picked from the companies that constitute EGX100, thus the study started the analysis from the financial year following the inception of the EGX100 which is June 2010 in order to be able to get the name of the companies that are listed in this index. Also, a change in the number of the Egyptian listed firm is witnessed before 2010 such that, the number of the Egyptian listed firms before 2010 was completely far from the numbers shown after 2010. The number of the listed firms in 2008 was 373 and in 2009 was 306, while in 2010 the number of the listed firms dropped to 212 and remained steady till 2022, which showed 218 listed companies (EGX, 2021). The type of data used for the microeconomic model is secondary data, whether for the microeconomic variables or for the stocks' return.

The time interval used in this study depends on the frequency of change and the availability of data. Since the stocks prices are changing every day, that would have recommended using the daily interval; however, most of the data are presented either in monthly or quarterly intervals. Additionally, Adesanmi (2018) argued that weekly and daily data of the stock market may be distorted because of the non-synchronous or having missing data, such as for national holidays, new-year eve and the religious holidays. Therefore, the study follows the monthly interval, ending up with approximately 120 observations for each variable. Using Green's (1991) formula to calculate the essential number of observations ($N > 50 + 8K$), the appropriate number of observations for this study should not be less than 90 ($50 + (8 \times 5)$), where N refers to the number of observations and K is the number of the independent variables, which is 5 based on this study. Since the number of observations of this study is 120, greater than 90, this allows the implementation of the analysis based on this rule.

Since the data are analyzed over time, the time series analysis is employed. Time series is the most appropriate in Econometrics since the past can be used to predict the effects on the future and the wide spread of the behavioral lag (Asteriou and Hall, 2015).

Table 3.4 summarizes the microeconomic variables used in this study with their proxies and the way of measuring each variable. All the data used in building the microeconomic variables are in Egyptian pound extracted from Reuters DataStream.

Table 3.4: The microeconomic variables, their proxies and calculation method.

The microeconomic models' variable	Its calculation
The Market return	$R_{m,t} = \frac{MI_t - MI_{t-1}}{MI_{t-1}} * 100$
Risk Free rate	Rate of change of the monthly weighted average yield of three months treasury bills.
Size	Multiplying the adjusted closing price on the last working day of the month by the number of outstanding shares
Value (BE/ME)	BE = book value of common equity plus deferred taxes
	ME = multiplying the adjusted closing price on the last working day of the month by the number of outstanding shares
Profitability	EBITDA / Book Equity
Investment	Percentage change in total assets from year end on December (t-2) to year end on December (t-1)

3.3.2 Phase two: identifying the most significant macroeconomic variables

As illustrated in the previous chapter, the Arbitrage Pricing Theory (APT) is one of the most well-known asset pricing theories, which claims that the stocks' return is affected by a group of macroeconomic variables; however, this theory gives no indication about the number or the identity of these variables. This gives researchers the freedom to select as much macroeconomic variables as appropriate, especially after the advancement made in the statistical software nowadays. Accordingly, the pre-specified macroeconomic approach will be followed for selecting the macroeconomic variables.

Throughout the previous years, researchers have reached various results when employing this method, regarding the most influential factors (see section 2.3). However, as there are differences among countries and among their economies, the results reached for a specific economy cannot be generalized to the other, thus increasing the necessity of adopting an adequate amount of country specific studies. This section will enrich the literature of the studies implemented in the developing economies regarding the most significant macroeconomic variables affecting their stock markets.

The employed pre-specified approach depends on nominating macroeconomic variables to measure their significance. Some researchers have stated that five variables are enough (Chen *et al.*, 1986; Chen, 1983; Roll and Ross, 1980). Also, Brown and Weinstein (1983) stated that

the number of the employed factors should not exceed five, and Adesanmi (2018) added that the use of few variables will prevent the contradictory effect. This study will follow the methodology employed by Chen *et al.* (1986) in selecting the macroeconomic variables; thus, five macroeconomic variables will be selected. The variables are selected to reflect the economic and financial environment, based on the belief to have an influence on the stock market of the country subject to research, and their impact on future cash flow of stocks, also taking into consideration the availability of data, in addition to the ability to quantify the variables' effect, since there are some variables that cannot be quantified and measured, like war and terrorism. Any change in the selected factors is expected to cause changes in the stock market; however, the intensity of the change depends on the significance of the factor. The study will examine the impact of the selected variables on portfolios' excess return, using time series regression analysis.

3.3.2.1 The scope of the macroeconomic model

Based on Adesanmi's (2018) work and the analysis of other studies in the literature, it is noticed that there is an insufficiency of studies that examine the effect of global macroeconomic variables on stock markets of emerging economies. On the other side, most of examined macroeconomic variables were domestic, such as inflation (consumer price index), exchange rates, interest rates, GDP and industrial production (as a measure for economic growth) and money supply. Accordingly, the researcher decided to highlight the role of the global factors on the emerging markets by using two of the most prominent global macroeconomic factors with three of the most comprehensive domestic macroeconomic factors to build the macroeconomic model that will be tested in this study.

The first domestic macroeconomic variable utilized in this study is the exchange rate, which has proved its impact on the nations' economic condition and stock market performance (see section 2.3.1). There are various explanations regarding the effect of exchange rate on the stock market, where the increase in the value of the local currency may attract the investors, causing an increase in the stock market performance. On the other side, the exchange rate can be seen as a factor depending on the international trade and balance of trade position of each nation that depends on the amount of exports and imports. Due to its importance, it is selected among the macroeconomic variables to be examined in this study.

The second domestic macroeconomic variable selected for this study is the inflation rate, measured by core CPI. This variable can capture the effect of money supply and interest rate

on the economy, as the inflation rate is affected by the amount of money circulated in the economy, such that the increase in money supply causes an increase in prices of the products and also an increase in interest rate. The relationship between interest rate and expected inflation is represented by Fisher's equation (1930), which shows that nominal interest rate is the summation of real interest rate and expected inflation rate; this indicates a positive relationship between interest rate and inflation level. Accordingly, the inflation rate was selected in this study to capture money supply and interest rate effects on the economy. This will help in reducing the variables' multicollinearity because of the relationship between interest rate, money supply and inflation rate.

The third domestic variable used is intended to measure the level of economic growth within a nation, which is the Industrial Production Index. The IPI is a measure for production output and is used to highlight the structural developments of the economy; a growth in its value is an indicator for an economic boom, while a reduction is noticed in case of economic recession. Accordingly, the stocks' returns are expected to show an increase when the industrial production increases and the opposite is true. The relationship between stock markets and industrial production index can be explained by models, such as free cash flow model, discounted cash flow and dividend discount model which equate the current market prices of the stocks to the present value of their future return or cash flow, and since IPI has an impact on the return of the firms, it would thus impact the stock market. Based on the literature analysis done by Adesanmi (2018) to the most examined macroeconomic variables, the IPI was found as one of the most examined variables; accordingly, it is selected to be investigated in this study. Beside the proved influence of the domestic macroeconomic variables, there is a growing interest by academic researchers, individuals and institutional investors worldwide to study the developing countries' stock performance globally after their prominent achievements in the world stock markets. This has induced the interest toward studying the global macroeconomic variables' impact in addition to the domestic ones on the emerging stock markets. Also, there is a view that the domestic factors are not enough to explain the variation in stock returns of the emerging markets (Graham *et al.*, 2016) and that the response of the country's stock market to the global variables depends on its degree of global exposure. The developing markets could be segmented, integrated or partially integrated, where the integration indicates that the market is affected by global risk more than the domestic ones, while the segmentation indicates that the market is more prone toward the domestic factors than the global. Additionally, it is

important to determine whether the relationship is lagged or immediately beside its positive or negative impact (Graham *et al.*, 2016).

The first global macroeconomic variable selected is the Federal Funds Rate. It is often said that “whenever the federal fund reserve sneezes, the emerging markets catch a cold” and that the announcement made by the federal reserve leads to the domino effect, causing volatility in the financial markets (Marwah, 2015), specifically the emerging markets. Moreover, it is argued that the increase in fed rate causes deviation in the developing markets on the short run; this increase can cause drawbacks in emerging economies, as it will make the investors withdraw their dollar investments and channel them to the U.S market. However, it is claimed that the degree of sensitivity to fed rate depends on the strength of the macroeconomic variables owned by the developing countries. Despite the impact of fed rate on emerging economies, limited studies have tested its effect on the stock markets, which drives the interest to consider its effect in this study.

Since the developing economies are the beneficiaries from the global investment and from the consumers and manufacturers of the international investments, the commodity price index is selected as the second global factor in this study. The developing markets are expected to confront deviation in their economies as the global commodities’ prices change, in addition to the commodities’ price impact on price of the domestic currency. Most of the previous studies have examined the impact of oil prices on stock markets (Singhal *et al.*, 2019; Abouwafia and Chambers, 2015; Alshogeathri, 2011), so this is the chance to look beyond the oil commodities and consider the non-oil commodities, which are not less important.

3.3.2.2 The macroeconomic model variables

In this section, the theoretical assumptions are used to determine the relationship between the selected macroeconomic variables as the independent variables and portfolios’ excess return as the dependent variable, which enables developing the theoretical framework for the macroeconomic model. A comprehensive analysis is implemented on the previous literature to determine the proxies used in measuring each macroeconomic variable, followed by the presentation of techniques and procedures implemented to reach the most significant macroeconomic variables.

3.3.2.2.1 Portfolios’ excess return

Throughout the literature, researchers had used stock’s prices or stock return as a proxy of stock market (Akbar *et al.*, 2018; Saleem and Alifiah, 2017; Majid and Yusof, 2009). This study is

using monthly change in stock's prices to measure stock's return then constructs portfolios, as described in section 3.3.1.1.

3.3.2.2.2 The exchange rate

Indeed, the relationship between exchange rate and stock prices is not a straightforward one. There are two major approaches that provide a description of the relationship between exchange rate and stock prices that were explained in details in section 2.3.1. The first is the approach explained by Dornbusch and Fischer in 1980 (Alshogeathri, 2011). This approach explains the impact of exchange rate with respect to exporting and importing firms, such that the increase in the value of the local currency will make the exported products look expensive and less competitive compared to the foreign one, which will impact the stock prices of these firms negatively, while the importing firms will be affected in a good way, since they will import the inputs of their product at a lower cost, and this will impact their profits and stocks' prices positively (Abouwafia and Chambers, 2015). The second approach is introduced by Frankel in 1983 (Alshogeathri, 2011). This approach describes the impact of stock markets on the exchange rate, such that the appreciation in the local stocks' prices will attract investors to buy the domestic stocks, increasing the demand for the local currency and causing its value to appreciate. However, it should be noted that for the stock market to have this impact on the exchange rate, the stock market has to be large and liquid enough, which is not of most of the emerging market.

Additionally, exchange rate is divided into two main types: the real exchange rate and the nominal one; the real exchange rate is the amount of international goods or services that can be purchased using the local currency while the nominal exchange rate can be described from two perspectives: either it is the unit of foreign currency per unit of local currency or the opposite (Adesanmi, 2018).

There are two scenarios that the governments can adopt regarding the usage of exchange rate. The first is the flexible or floating exchange rate, in which the rate is determined based on the rules of supply and demand for the currency without any governmental intervention. The second is the fixed exchange rate, in which the authorities set the price for their local currency. Friedman (1953) explained that the first type is the best for the economy as it is able to deal with the unexpected events; on the contrary, investors and traders prefer the second type as it is predictable and can protect the prices of the local commodities; for example, the increase in the price of the local currency will lead to decreasing the amount of exports while the decrease

in the price of the local currency will cause an increase in the prices of imported goods and commodities. Johnson (2015) explained that fixed exchange rate helps in setting plans for business and economy and also provides protection against shocks. On the other hand, the flexible rate based on the market forces will enable the optimal distribution and usage of resources. The choice of which regime to adopt is based on the degree of financial development of the country. The decision of either regime to follow varies till a crisis is reached; then the resolution made would not be the wisest one and could result in worsening the current situation (Adesanami, 2018). The exchange rate applied in this study is the monthly rate of change in EGP/U.S dollar.

3.3.2.2.3 The inflation rate

Inflation rate is another macroeconomic variable that affects the economic environment. It has a direct relationship with money supply, as the increase in money supply will decrease the value of the currency, causing the prices of the local commodities to increase and decreases the consumers' purchasing ability for these commodities. Accordingly, sometimes the money supplied by the governments is used to adjust the inflation rate in the economy; for example, in order to reduce inflation, the central bank may decide to decrease the lending rate while raising the borrowing rate. There were different explanations regarding the impact of increase in inflation rate on the stocks' prices, whereas Fisher assumed the increase in inflation rate would affect the stocks' prices positively (Suhaibu *et al.*, 2017), while other researchers explained that the increase in inflation rate will cause an increase in living cost, and accordingly investors will diverge from buying stocks in favor of spending more on consumable products, which will impact stocks' return negatively (Simakova *et al.*, 2019; Mohamed and Ahmed, 2018,). Barakat *et al.* (2016) explained that the direction of the inflation effect depends on whether the measurement use is the expected or the unexpected one. This study will measure inflation rate using rate of change in core CPI.

3.3.2.2.4 The industrial production index

The Industrial Production Index (IPI) is a cyclical indicator measuring the real output and shows the changes occurring in the production level of different industries, like manufacturing, mining and utilities (Jareno *et al.*, 2019). Accordingly, various studies used it as a proxy for the economic development and examined how the stock markets respond to the changes in its value. It is expected that the stocks return is affected positively by the increase in industrial production index, such that the increase in productivity of the nation's firms will cause an increase in the

index that will be reflected directly on the prices of the stocks traded. Ross (1976) and Chen *et al.* (1986) highlighted the role of industrial production index as a measure of risk factor that is able to determine stocks' return in their studies in the New York Stock Exchange market.

3.3.2.2.5 The federal fund rate

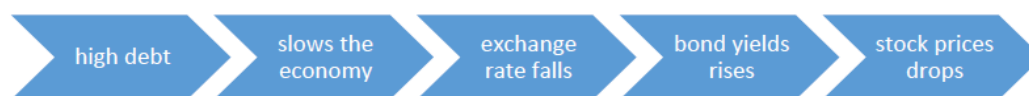
Before the global financial crisis, the American investors were the largest international investors and owned approximately 30% of the asset's portfolios of the international investment. Thus, it is expected that any change occurring in the U.S economy would impact the world's stock market. That made the governments of the emerging economies anticipate the Federal Reserve actions. The Federal Open Market Committee declared on 16th of December 2008 to keep the interest rate at low level near zero to boost the U.S economy (Marwah, 2015). The low Federal Fund rate⁶ was of great benefit to U.S economy and to the emerging economies, which was noticed in NIFTY 50 index (the Indian Benchmark index) and the SSE composite index of China (Marwah, 2015). The low interest rate had encouraged the portfolio manager to borrow more from the U.S economy because of the low capital cost and move it to the emerging markets; the U.S banks offered deposits rate of 1.75 to 0.25 percent for the period from 2008 to 2009 while the Egyptian market was offering rates from 11.5 to 8 percent during the same period based on Central bank of Egypt reports.

On 22nd of May, 2013, the chairman Ben Bernanke announced the possibility of tapering the event that was predicted to lead the emerging economies toward an economic crisis similar to what happened in 1998 in Asia, but the reaction of every country to that crisis varied across countries (Adesanmi, 2018).

The following figure 3.5 describes what the emerging markets face in case an increase in the fed fund rate.

Figure 3.5: The effect of the increase in Fed Fund rate on the emerging economies.

⁶ The federal fund rate is the overnight interest rate charged by banks to another banks in excess of the reserve (Adesanmi, 2018)



Source: Adesanmi (2018)

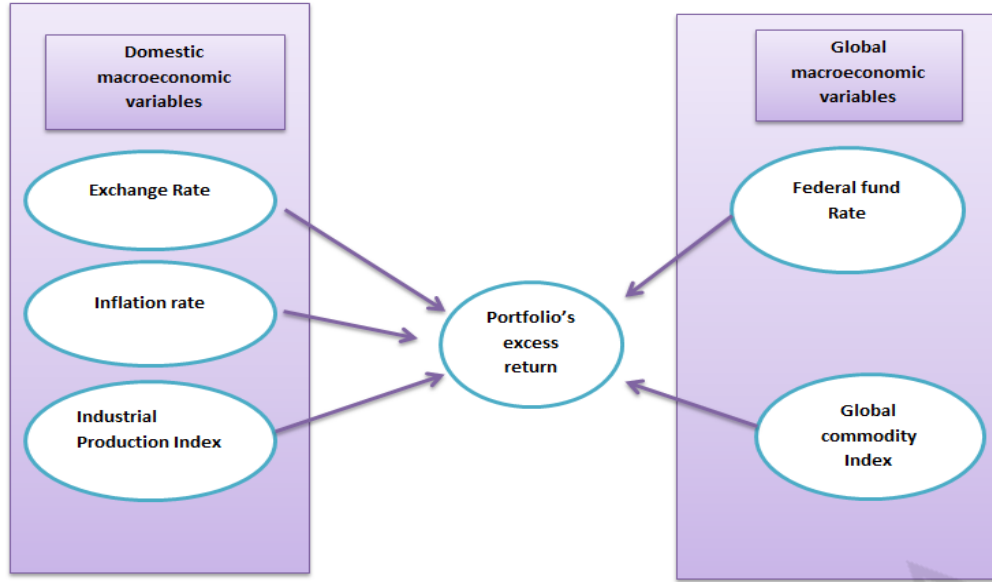
Studying the impact of the federal fund rate as a global factor would enhance the investigation and answer the question of whether the factors that affect the emerging markets are global or not. Since most of the emerging markets are open market economies, this opened the space to study the impact of U.S. monetary policy tools presented in federal fund rate as a global macroeconomic indicator, as changes occurring in the U.S monetary policy should be taken into consideration when studying the international diversification opportunities (Abou-Zaid, 2013).

3.3.2.2.6 Global commodity index

As the foreign investors are concerned about the global factors that affect the emerging economies, in order to decide how to allocate their capital across the globe given the presence of other sources of risk (Mensi *et al.*, 2014), and as the developing economies receive a great advantage from the international investment and from the consumers and manufacturers of the worldwide investments, the commodity price index is examined in this study. The developing markets are expected to confront deviation in their economies as the global commodities' prices change. Moreover, the commodities' prices are of great impact on price of the domestic currency; there is a direct relationship between the commodity price index and the value of the local currency, such that the decrease in the value of the global commodities causes an outward flow of the domestic currency and relieves the stress from the balance of payment (Hegerty, 2015).

Figure 3.6 shows the macroeconomic variables presented in this study.

Figure 3.6: The macroeconomic model variables.



Source: The researcher.

After selecting the macroeconomic variables to be examined in this study, the following section introduces the regression model that will be used in the testing process.

3.3.2.3 The macroeconomic model

The methodology that will be employed in this section is to reach the most significant macroeconomic factors and identify the direction of relation. Time series regression analysis will be run between the dependent and the five independent variables shown in figure 3.6 that is presented in the following equation:

$$R_{pt} - R_{ft} = \beta_0 + \beta_1 EXR_t + \beta_2 INFR_2 + \beta_3 IPI_3 + \beta_4 FFR_4 + \beta_5 GCI_5 + \varepsilon_t \quad (3.4)$$

Where $R_{pt} - R_{ft}$ represents portfolios' excess return, β_0 is the intercept that should be constant and equal to the mean expected value of the dependent variable in case the independent variables are equal to zero. Variables β_1 to β_5 represent the sensitivity of each independent macroeconomic variable used against the dependent variable, while ε_t measures the error term that represents the existence of other indicators other than the used independent variables. EXR is the rate of change in exchange rate of the national currency against U.S dollar, INFR is the inflation rate measured as the rate of change in Core CPI, IPI is the industrial production index measured as the rate of change in IPI, FFR is the Federal Fund Rate, which is the overnight borrowing rates in percentages, and the GCI is the global commodity price index measured as rate of change.

The steps for constructing the portfolios are described in details in section 3.3.1.1 using the forty-seven (47) stocks selected based on specific selection criteria. Then, the excess return for each portfolio is calculated in excess of the risk-free rate.

3.3.2.4 The macroeconomic model sampling technique and data collection

The sampling technique and period under study used in the macroeconomic model are the same as what is employed for the microeconomic model (see section 3.3.1.3). Table 3.5 shows a description of each macroeconomic variable employed in this study in addition to the data sources.

Table 3.5: The macroeconomic variables with their sources and description

Macroeconomic Variables	Description/ interval	Source
Exchange rate	EGP/U.S. Dollar/ monthly data	World bank
Inflation rate	Core CPI, not-seasonally adjusted/ monthly data	World bank
Industrial Production index	industrial production index, constant 2010, not seasonally adjusted / monthly data	World bank
Federal fund rate	Effective Federal Funds Rate, Percent, not seasonally adjusted/ monthly data	Federal Reserve Bank of St. Louis
Commodity price index	Global Price Index of All Commodities, not seasonally adjusted/ monthly data	Federal Reserve Bank of St. Louis

3.3.3 Phase three: presenting and analyzing the topics related to the effect of investors' psychology on stock market returns

Starting from the beginning of the 1980s, several studies have argued the traditional views' justifications for the mispricing occurring in the stock market and criticized their way in explaining investors' actions and behavior, as the investor usually does not act based on the logical norms (Barber and Odean, 2001; DeBondt and Thaler, 1987; 1985). Previous work in behavioral studies proved the existence of several psychological factors that are exerted by investors while trading in the stock market.

The consideration of psychological or behavioral factors will widen the approach of this topic and will help in explaining the irrational part behind investment decision-making process, which in turn affects stock prices. This section of the study aims at getting the most significant

psychological factors that affect investors' decision-making process that will be implemented through the following steps:

1. Presenting and analyzing comprehensively the literature and topics related to the effect of investors' psychological factors on stock market returns through systematic review. This systematic review will gather all the relevant articles that investigated the effect of the investors' behavioral aspects on stock markets' return, whereas the selection of the relevant articles will be done following Tranfield *et al.*'s (2003) steps. This systematic review will result in developing a theoretical and then the conceptual model about the behavioral factors affecting the investment decision.
2. Developing the behavioral applied model that captures the most significant behavioral factors affecting the investment decision, by testing the hypothetical model through conducting a survey.

3.3.3.1 Systematic literature review

The systematic review is adopted for the behavioral finance part presented in this study due to its multiple advantages over the narrative review; systematic review provides a synthesis for all previous relevant articles about a specific topic, which will result in reliable results and analysis. Also, it draws attention to the gaps in the methodology of these primary studies and provides more information about the areas that need further research (Cook *et al.*, 1997). The aim of this section is to gather all the relevant articles that investigated the effect of the behavioral aspects of investors, and how this could affect stock markets' return.

3.3.3.2 Systematic literature review methodology

The selection of the relevant articles is done using the following steps based on Tranfield *et al.*'s (2003) approach.

Firstly: providing identification of research needs ended by defining the research questions with a number of keys words.

Secondly: a broad scanning for the titles and abstracts of the derived citations is done while excluding the studies irrelevant with the present research aim.

Thirdly: a strict screen of the remaining studies that passed the previous stage is done, while selecting the most appropriate and relevant ones with the present research topic, followed by data extraction, whereas the selection criteria are described in details in section 3.3.3.2.2.

Fourthly: Providing a summary of synthesizing and reviewing the relevant articles ending by developing the theoretical behavioral model.

3.3.3.2.1 Search strategy

The strategy followed in this systematic review is using an automated search; the following English search terms and keywords were employed: “behavioral factors affecting stock return” and “psychological factors affecting stock return” and ‘Investors' sentiment and stock market’. The keywords are derived from the aim of this systematic review, which is extracting all the behavioral factors that have an effect on stock market prices. The electronic databases used in the search process are EBSCO Host, Science direct, SAGE journal, Emerald Insight and University of Nicosia.

Each of the above mentioned databases has its own search strategy; accordingly, different search term sequences and methods are used for each electronic database. This variety has its benefit in enhancing the possibility of including as many relevant articles as possible. Moreover, the choice of the above mentioned search terms emanates from their sensitivity with the present research topic and since they represent the most well-known and used search engines by academic researchers. Hereupon, this will minimize the possibility of missing any research papers that could be relevant with the aim of this systematic review.

3.3.3.2.2 The selection criteria

The selection of the accepted articles is according to the following criteria:

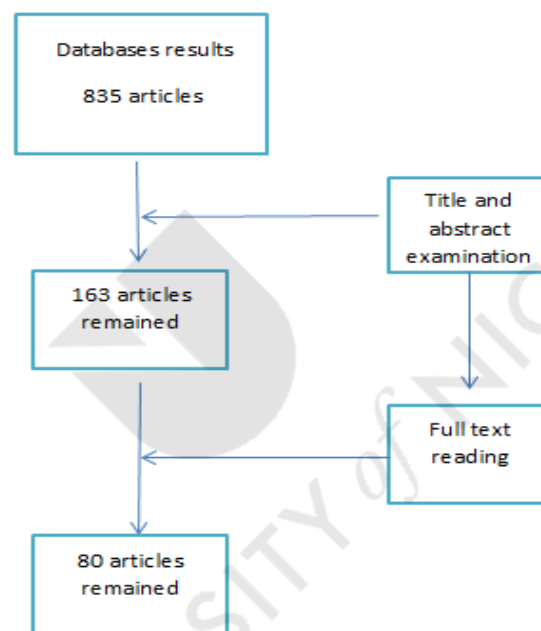
- **Language:** The paper must be written in English.
- **Study topic:** it is essential for the selected research papers to meet the aim of this study. Thus, studies that are irrelevant with the research question are excluded.
- **Time frame:** Since the objective of this systematic literature is to collect the articles that investigated the effect of the behavioral variables exerted by investors and how this could affect stock markets' return, the time period of investigation of the existing literature was set from the inception of behavioral finance concept in 1970 until 2018 in order to extract and define the behavioral factors affecting investors' decision making and accordingly affecting stocks' return.
- **Methodology adopted:** the articles that adopted both qualitative and quantitative methodology approach were included for two reasons: to reduce the probability of excluding any article that could be significant and highly relevant to research aim, and to maximize the possibility of finding and documenting all the researched behavioral and psychological factors affecting stock markets.

- **Quality assessment:** to ensure the quality of the retrieved articles, the previous mentioned databases were employed as they include the most well-known and top ranked journals; also, only the peer reviewed articles were chosen as relevant articles.

3.3.3.2.3 The synoptic results of the search strategy:

The sum of the results retrieved from the literature search is shown as a flow diagram in figure 3.7 below.

Figure 3.7: The relevant articles' selection process



The running of the mentioned search engines resulted in 835 articles (179 articles from UNIC library search, 508 articles from Emerald, 24 articles from Science direct, 43 articles from SAGE Journal, and 81 articles from EBSCO host search). After a broad scanning for the titles and the abstract of the derived citations, this resulted in 163 articles. Then, a strict screening for the aim, methodology and findings for the articles that passed the previous stage is done resulting in 80 articles.

3.3.3.2.4 Data extraction

In this systematic review, a data extraction form has been developed and used in order to extract the data from the 80 selected studies and to document the data extraction process. The elements that have been extracted from the studies' concern:

- General details: title of the paper, author's name and publication details.
- Features of the study: methodological approach, population characteristics, sample size.
- Key results.

3.3.3.3 Data synthesis

The analysis of the literature revealed that the behavior of the individual investor has a great effect on the stock prices' movements, and to date there is no evidence of a complete psychological model describing and covering behavioral anomalies and the psychological variables affecting stock market. Thus, there is a growing interest to consider these variables and add them to the existing pricing models in order to develop a new comprehensive stock pricing model.

The reviewing and the synthesizing of the reached 80 articles have yielded several phenomena, heuristics, cognitive and biases measured against stock market returns or against investors' decision-making process. These variables are presented in table 3.6 below:

Table 3.6: The variables extracted from the related articles

Variables	Number of articles that measured each variable
Social media sentiment (twitter, Facebook, Google trends)	6 articles
Investor sentiment	20 articles
Negative social mood	2 articles
Investors' attention	2 articles
Herding behavior	11 articulated
Newspaper reports / news sentiment	2 articles
Gambler's fallacy	1 article
Optimism/ excessive optimism	5 articles
Overconfidence/ self confidence	13 articles
Investors' local bias and home bias/ familiarity	3 articles
Risk tolerance	3 articles
Risk avoidance	2 articles
Sociability	1 article
Perceived investments of significant others (PISO).	1 article
Perception of regulator ⁷	1 article
Subjective financial literacy ⁸	1 article
Big five personality traits	4 articles
Disposition effect	5 articles

⁷ Sivaramakrishnan *et al.* (2017) described it as the trust in governmental control over the capital markets.

⁸ Sivaramakrishnan *et al.* (2017) explained that this variable describes the financial knowledge and the confidence level to use it.

Fear	1 article
Representativeness	3 articles
Availability	4 articles
Internal locus of control	1 article
Linguistically fluent tickers	2 articles
Anchoring	2 articles
Environmental variables/ weather	6 articles
Investment Ability	1 article
Risk Appetite	1 article
Pessimism	2 articles
Investor mood	2 articles
Sports sentiments / sports fans loyalty	4 articles
Weekend-weekdays Sentiment	1 article
Loss aversion	1 article
Regret aversion	1 article
Mental accountancy	2 articles
Emotions	1 article
Investor Competence ⁹	1 article
Neurotransmitters	1 article
Emotional intelligence	1 article
Framing	1 article
Breakeven ¹⁰	1 article
Prospect theory	1 article

Howard (2012) had explained that decision making process involves several behavioral characteristics that enable their categorizing into different schemas, which means that a variable can be categorized as either a bias for one researcher or as a heuristics for another, so it depends on researcher's point of view. This means that there is no widely accepted or a standard way of classifying the behavioural variables found in the previous articles. This lack of standardization led to confusion and reduced the potential for developing a behavioral model.

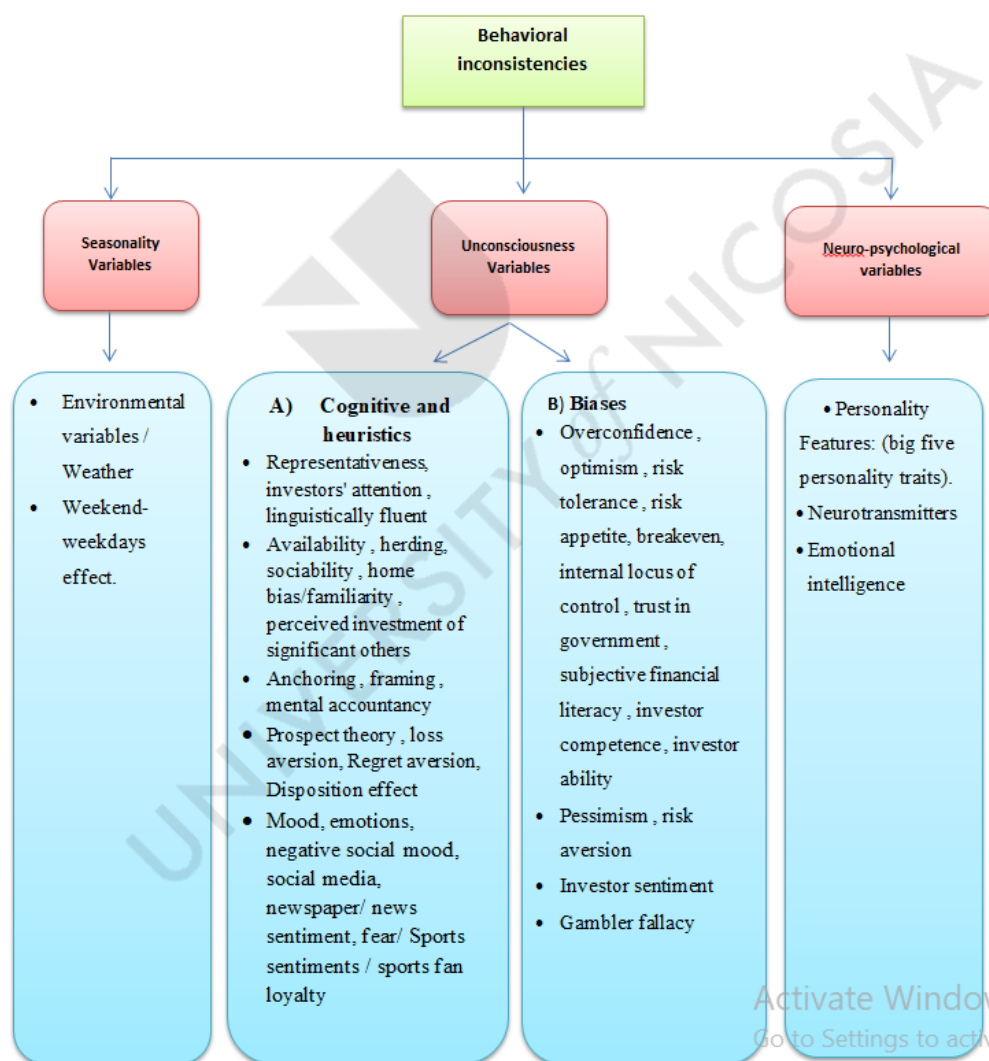
Thus, this study intends to bridge the knowledge gap missed by previous researchers and reaches a widely common acceptable comprehensive model about the behavioral variable that affects stock market. Consequently, the above variables are categorized into four different subcategories based on different perspectives, and then within each subcategory similar variables merged or aggregated into one variable.

⁹ Posits that people's willingness to act on their own judgments is affected by their subjective competence (Graham *et al.*, 2009)

¹⁰ The breakeven effect has to do with the behavior of taking bigger bets to try to make up for losses so as to return at least to a breakeven position. The urge to erase loss can lead to excessively risky investment behavior (Wong and Nwude, 2018)

The categorization and consolidation will be done based on the following steps: first, integrating the repeated variables (like confidence and overconfidence); second, assembling the variables that reflect similar meanings or used to measure the similar psychological effect but are presented in different terms (like sociability and herding). Third, combining the variables that are interwoven or interrelated (like overconfidence and risk tolerance); then naming these variables, where the name of the variable is chosen either according to the most tested one in the accepted articles or based on the main variable that is triggering other variables. Figure 3.8 presents the categorization and the consolidation of the extracted behavioral variables.

Figure 3.8: Behavioural categories and variables affecting stocks' prices



The following section provides the illustration upon which the categorizing and merging of the behavioral variables is done beside the explanation provided in the literature chapter; these

variables are divided into four subcategories: seasonality, cognitive and heuristics, biases, and neuro- psychological variables.

3.3.3.3.1 Seasonality variables:

The seasonal variables considered in this section imply the effect of weather reflected in temperature degree, wind and cloud cover, etc. in addition to calendar anomalies presented by the weekend-weekdays effect.

3.3.3.3.1.1 Environmental variables / weather:

Like sunshine, cloud cover, daylight, temperature, these variables proved to have an impact on investors' behavior and accordingly can affect their investment decision making (Li and Peng, 2016; Shim *et al.*, 2015).

3.3.3.3.1.2 Weekend vs weekdays' effect:

It is examined over a longitudinal time series due to its relationship with the investors' general feeling (Kaplanski *et al.*, 2015). It is claimed that during weekdays, stock market return is low and is high during weekends.

3.3.3.3.2 Unconsciousness variables:

Mercier and Sperber (2011) stated that unconsciousness is something inherent in humans' mind affecting their behavior and argued that both heuristics and biases can be categorized under investors' unconsciousness; accordingly, it is divided into two subcategories: heuristics/cognitive and biases variables, which are presented in details next.

3.3.3.3.2.1 Heuristics and cognitive variables

Behavioral finance emerged as a result of the integration of the cognitive¹¹ psychology's findings with the financial entity; the contribution of cognitive psychology started by its criticisms toward the traditional theories (Howard, 2012), that investors do not act rationally. Behavioral finance based its criticism on the concept of bounded rationality introduced by Simon in 1956; bounded rationality describes the fact that humans face restrictions because their cognitive power is limited and they possess finite computational, conceptual abilities and flawed memories (Nigam *et al.*, 2018). These restrictions are due to the limited availability of high-quality information and the long time required to reach the optimal decision. Therefore,

¹¹ Cognitive psychology is a branch which deals with the humans cognitive abilities or the mental processes that can affect individual behavior. Cognitive psychology researchers examined different topics such as perception, attention, creativity, memory, reasoning, knowledge representation, and problem solving. Cognitive psychology illustrates individual thoughts as an information system in terms of input, representation, processing, and output (Park and Sohn, 2013)

this means that humans' cognitive abilities are the biggest restriction to reach the best decision rather than most pleasant one (Howard, 2012).

Heuristic, according to Gigerenzer and Wolfgang (2011), is a rule of thumb; it is an action plan that uses only part of the information available to make decisions easily and more quickly rather than using complicated methods. It is not aiming at reaching the optimal choice but to reach the best decision under the available restrictions. The use of heuristics feature is good when the cost of information required and uncertainty increase, while the quality of information available and the time needed to make decision decrease. This trade-off was discussed by bounded rationality. From these explanations, we can conclude that heuristics and cognitive variables can be aggregated together rather than treating them separately. The following sections describe the variables under heuristics and cognitive

3.3.3.3.2.1.1 Representativeness, attention, linguistically fluent ticker

Representativeness is a cognitive deviation (Komba, 2016) describing a situation when decision makers evaluate choices and make decision using cursory characteristics instead of using detailed information (Park and Sohn, 2013); it happens when a human is bonded to a base value and responds tardily in case a change occurred, also when an investor focuses personal attention on specific information, neglecting all other information without any bias (Chandra and Thenmozhi, 2017), like the mistake made by investors when using P/E ratio or increase in sales as an indicator for good investment opportunities instead of focusing on expected increase in prices of the examined stocks (Komba, 2016). In this case, representativeness gives the same meaning like investor attention, which is described by Behrmann *et al.* (2004) as the process of selecting and filtering specific inputs to enter into a preferential process, which means that representativeness is triggered by investor attention, while linguistically fluent measures the investor focus and attention to stocks of resonant names and early alphabet stocks rather than to the latter ones. According to Itzkowitz and Rothbort (2016), two behavioral heuristics variables cause the linguistic fluency: status quo bias and satisfying, which means that linguistically fluent is directed by investor attention, which is maximum for stocks with the first alphabetical letters and then decreases for the later ones.

3.3.3.3.2.1.2 Availability, herding, sociability, home bias/familiarity, perceived investment of significant others

Availability is defined as a situation when investor make decisions based on information that is easily recalled to one's mind (Chandra and Thenmozhi, 2017) and when investors depend on

information that is already available and intuitive, the easily accessible ones and depends on the recently occurred events for making future decisions (Park and Sohn, 2013; Howard, 2012; Redhead, 2011).

As for herding, it is the investor tendency to depend on others' decision instead of depending on one's personal judgment and analysis (Wong and Nwude, 2018). Accordingly, herding can be considered as a specific type of availability since investors in this situation tend to rely on easily accessible information and since the investor is affected by the events that have recently occurred or recalled to mind, whereas sociability and perceived investment of significant others are the same as herding since they represent the effect of society on investors' decision and the dependence of investor's mind on the already available information and dominant decisions. Home bias and familiarity also represent a specific type of availability since investor depends on the available information about domestic and local stocks rather than searching for new information about international stocks.

Based on the explanation provided above, it can be concluded that availability, herding, sociability, home bias or familiarity, perceived investment of significant others, all describing the same behavioral phenomenon.

3.3.3.3.2.1.3 Anchoring, framing, mental accountancy

Anchoring is a heuristic variable that occurs when a human adheres to specific information, uses it as a reference, for example the stock initial price and historical prices, and forms preferences based on them (Chandra and Thenmozhi, 2017). The use of anchoring will affect human judgment for future value. It is claimed that humans' estimates regarding future value will be lower when starting by a lower-value anchor point than when starting by a higher-value anchoring point (Tversky and Kahneman, 1974), while Wu and Cheng (2011) had explained that in most cases higher price is translated into higher quality than the lower price. Accordingly, it is expected that investors will have favorable attitude and a purchase desire toward stocks with higher value anchor points than lower ones.

Howard (2012) defined framing as a situation when different specifications and descriptions for one situation led to different outcomes. It is believed that when information is presented in positive manner, this will result in having favorable encoding in ones' mind while the opposite happens when presenting information in a negative manner (Levin, 1987). Levin (1987) illustrated that when a product's feature is explained in a favorable manner, the product will be recalled in memory in a positive way than when the information is explained negatively, which

may lead to unfavorable cognitive reactions. Kooreman and Prast (2010) and Howard (2012) involved mental accounting as an example of the framing effects. Howard (2012) represented mental accounting as a situation when individual's mind agrees to use the money won in a gamble in another gamble while excluding all other sources of money, so mental accounting can be considered as internal framing or personal framing happening in person's mind in which fund is categorized or framed in different ways while ignoring its fungibility.

Looking at these three variables from a wider perspective, they involve adherence to specific information, building future value estimates and making judgment depending on how the information is presented or prescribed either in internally i.e., in ones' personal mind or externally. The same as what was explained by Soman (2004); the way in which the information related to certain situation is presented affects the decision maker' interpretation and accordingly his opinion.

From the above illustration, it can be concluded that anchoring, framing and mental accounting are interrelated.

3.3.3.3.2.1.4 Prospect theory, loss aversion, regret aversion, disposition effect

Understanding prospect theory is a necessity for understanding behavioral theory; it was first introduced by Kahneman and Tversky in 1979; it defines situations when humans overestimate losses than gains of the same amounts (Chandra and Thenmozhi, 2017). It is developed as a result of individual stimulation to prevent losses instead of achieving gains (Schilirò, 2012).

Loss aversion gives the same meaning as it reflects investors' tendency to value loss more than gains, since a huge amount of pain is resulted from these losses (Redhead, 2011). Loss aversion, according to Howard (2012), is when an investor is facing a situation of a sure loss from the beginning of the endowment, so the investor has an option to hold investment until break-even, regardless of whether this will lead to good or bad results in the future. While disposition effect measures investor willingness to realize gains but not losses, this phenomenon can be explained by prospect theory since the pain felt by investors from losses outweighs the joy of gains; accordingly, investors decide to hold on losing stocks while selling winning stocks.

As for regret aversion, it is a heuristic phenomenon (Chandra and Kumar, 2012) representing human's action in a way that reduces pain feeling in case an adverse event occurs (Park and Sohn, 2013). Disposition effect can be considered as a decision aimed to avoid regret feelings in case an opposite event occurs, since the investor decides to sell the winning stock to avoid

the remorse feeling in case the prices decrease, while holding the losing stock aiming that its price will increase.

Based on the above explanation, it can be deduced that prospect theory, loss aversion, regret aversion and disposition effect are interwoven.

3.3.3.3.2.1.5 Mood, emotions, negative social mood, social media, newspaper sentiment, fear, sports sentiments / sports fan loyalty

Kaplanski *et al.* (2015) explained that mood is a feeling that lasts for a limited time and that it is of a great impact on investment decision making process, while Nigam *et al.* (2018) considered mood, emotions and fear as various types of sentiments studied under behavioral finance umbrella. Mood tends to last for a longer time than emotions (George, 2000) as emotions subside once the individual deals with the cause, leaving the positive or negative mood overbearing the individual's status. Several studies found that social media and news sentiments can be used for assessing the impact of mood and emotions. They are a kind of expressing individual feelings and emotions, and now the social media can analyze investors' feelings to anger, disgust, fear, joy and sadness (Xu *et al.*, 2017). Additionally, various studies proved that investor's mood is affected by the results achieved by one's favorite sports team, which in turn will affect expected market return and the expected risk. Berument *et al.* (2013) found that the results of sports matches have a big effect on fans' mood and accordingly on their investment decisions.

3.3.3.3.2.2 Biases

Biases are tendencies to engage in specific kinds of mistakes (Howard, 2012). Based on the analysis of the literature, the following behavioral variables can be considered as types of biases exerted by investors.

3.3.3.3.2.2.1 Overconfidence, optimism, risk tolerance, risk appetite, breakeven, internal locus of control, perception of regulator, subjective financial literacy, investor competence, investor ability

Overconfidence is the overestimation of individuals' capabilities, skills, knowledge and the accuracy of their estimates (Redhead, 2011). This definition is close to Chandra and Thenmozhi's (2017) description of excessive optimism, presented as overstatement of one's own qualification induced by illusion of control. The same for internal locus of control, which occurs when one is sure that a specific outcome will take place because of personal owned skills and capabilities (Rasheed *et al.*, 2018). Subjective financial literacy reflects the degree of

confidence in one's financial knowledge and trust to use it in investment decision, while perception of regulators explains the confidence investors' gain as a result of trust in governmental regulations and supervision over the capital market (Sivaramakrishna *et al.*, 2017). As for investor competence, it describes subjective competence owned by investor, which will affect personal confidence level in decisions made (Graham *et al.*, 2009). Investor ability also measures the extent to which the investor feels confident about the owned ability in making the right investment decision (Lathif and Aktharsha, 2016). As long as the investor feels confident, the exerted abilities will increase.

Concerning risk tolerance and risk appetite, they are outcomes for the overconfidence and optimism felt by investors. Hardies *et al.* (2013) explained that as the level of overconfidence increases, the level of risk accepted increases and that the two variables are interwoven. The same for breakeven effect, which was described by Wong and Nwude (2018) as a situation when investor is insisting on overcoming losses by taking as much bets to return back to the breakeven position. The urge to erase loss can lead to making more risky decisions and becoming more risk seeker (Wong and Nwude, 2018).

3.3.3.3.2.2.2 Pessimism and risk aversion.

Pessimism is felt when human expects bad circumstances, when investor expects the return to be below the actual one (Dhaoui, 2013). Pessimism is the opposite case of optimism, which is always associated with risk aversion and excessive caution (Redhead, 2011). Huang *et al.* (2014) illustrated that pessimism is associated with a decrease in stock market return and an increase in risk aversion level.

3.3.3.3.2.2.3 Investor sentiment

Huang *et al.* (2014) stated that investor sentiment is composed of two elements: optimism and pessimism. One of the ways of measuring investor sentiments is by using consumer confidence index. Neves *et al.* (2016) used Consumer Confidence Index (CCI) developed and published by University of Michigan to measure investor level of optimism and pessimism for the current and future economic situation.

Therefore, this means that investor sentiment is an aggregation for the previously mentioned two variables. However, this study is going to consider the impact of optimism and pessimism separately. The reason for not merging these two variables under investor sentiment is the interest in examining each variable independently and determining the significance level of each variable separately.

3.3.3.3.2.4 Gambler fallacy

It involves the mistaken belief that if something happened frequently in the past, then the probability of its occurrence again in the future will decrease. Thus, if a stock has been increasing in price for a long series of trading, investors may sell it, thinking that it is time for price to go down. This way of analysis is incorrect as past events are not the only indicators for the future probabilities (Amin *et al.*, 2010)

3.3.3.3 Neuro-Psychological variables

This sub-dimension represents integration between two psychological variables: (personality traits and emotional intelligence) and a neuro variable: neurotransmitters. Personality traits and EI are claimed to have neurological explanation while neurotransmitters are claimed to have a psychological impact. The justification behind this sub-dimension is described in section (2.4.2.9) in the literature chapter.

A description for each variable is provided below.

3.3.3.3.1 Neurotransmitter

Neurotransmitters are chemical signals that move from one neuron to another in human's brain (Lodish, 2000). They are composed of four hormones: dopamine, serotonin, epinephrine and norepinephrine that are considered to be related to investors' behavior. They evolve as a result of transition from normal investing to pure concentration on gain and loss due to changes occurring in the financial system (Ahmad, 2018).

3.3.3.3.2 Emotional intelligence

It was explained as sentiment of someone's mindset (Mayer *et al.*, 1999). It measures individual's stimulation to invest, as it was proved to have an important relation with individual behavior, like loss aversion, status quo bias and the endowment effect (Rubaltelli *et al.*, 2015; Salovey, 2006), while Maccann *et al.* (2014) described emotional intelligence as the talent of determining and gathering the feelings needed to administer the thinking process and the feelings required to boost everyone's power.

3.3.3.3.3 Personality traits

Personality features are considered as major determinants of individuals' behavior as it affects the level of confidence and risk tolerance that everyone possesses, which in turn affects the investment decisions.

There are five personality features: openness, consciousness, extraverted, agreeableness and neuroticism. These features were tested by Tauni *et al.* (2017) on the trading behavior and reached the following results. Openness investor has more tendencies to trade on a regular basis while using special sources and getting the information needed personally. Conscious investors are more confident and self-reliant; their trading frequency depends on the extent they are able to get the information by themselves rather than depending on others. Extraverted investors increase their trading as soon as they get information from advisors, family or friends. Agreeableness feature positively facilitates the relationship between communication, using word of mouth, and financial advice for trading activity, which in turn will increase the trading frequency. Neuroticism trait increases their trading frequency if they got a financial advice and decreases it when they get information using word of mouth.

3.3.4 Phase four: identifying the most significant behavioral variables

Based on the reviewing and the synthesizing of the accepted 80 articles, 41 variables were extracted; these variables represented several phenomena, heuristics/cognitive and biases. These variables were categorized into 4 subcategories based on different notions, while for each subcategory, identical variables were merged or aggregated into one common variable.

The merging was done using the following steps:

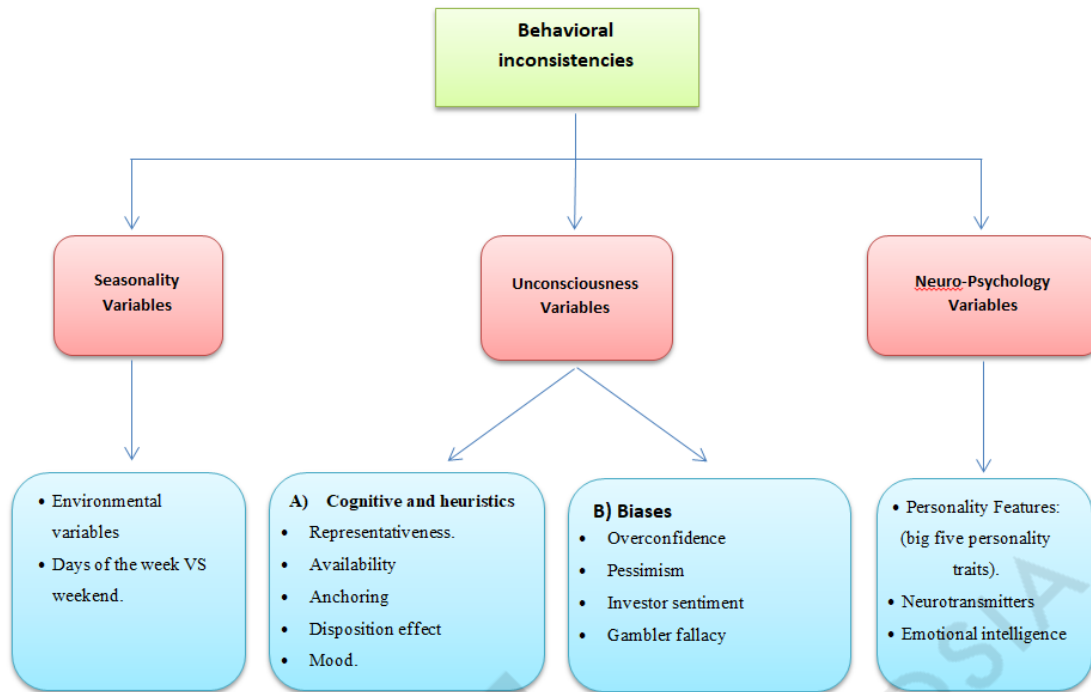
Merging the duplicated variables (like optimism and excessive optimism)

Aggregating the variables that have the same meaning or used to measure the same behavioral effect but are presented in different terms (like herding and sociability)

Assembling the variables that are interwoven or interrelated (like overconfidence and risk tolerance).

The discussion shown in section 3.3.3.3 illustrated how the previous steps are implemented and justified the reasons of merging, aggregating and assembling the variables. Then, a common name is chosen either according to the most tested variable in the accepted articles or based on the main variable that is triggering other variables. This resulted in developing the conceptual behavioral model shown in figure 3.9.

Figure 3.9: The conceptual behavioural model.



The value of this conceptual behavioral model extracted from the truth that it involves all the behavioral variables that have been tested before against the stocks' return or the investment decision making process, starting from the inception of the behavioral thought till 2018 in a single picture.

3.3.4.1 Developing the behavioral applied model

Figure 3.9 represents the proposed behavioral conceptual model developed after merging, aggregating and assembling the behavioral variables extracted from the systematic review. This model will be tested for validity and used to develop the applied behavioral model that represents the most significant psychological variables.

The main target of this section of study is determining the most prominent behavioral factors and their effect on the investment decision making and on stocks' prices. Accordingly, the most appropriate methodological approach is the cross-sectional analysis. The reason for choosing this methodology is justified by various reasons. Firstly, this part of study implies conclusive research in which the data are collected one time from a sample of investors dealing with the stock market. Secondly, this study is considering the individual investors as a unit of analysis, and then the survey is regarded as the most appropriate tool to get the required personal

behavior. The survey allows reaching large sample gathering in a kind of low cost and fast way (Saunders *et al.*, 2009).

The sections below describe the steps followed to reach the applied behavioral model.

3.3.4.1.1 The sampling procedures

The sampling approach involves the usage of a small portion of the population in making judgement for the whole population. The aim of the invented sampling techniques is to reduce the data needed to be gathered by selecting data from a subgroup (Saunders *et al.*, 2009).

The study has employed a mix of two non-probability sampling techniques. The first technique is the convenient sampling, which represents a non-probability sampling technique that includes selecting the unit of analysis based on the easiness of their accessibility. Since the study is implemented in the Egyptian stock market thus, the respondents required to answer the survey are the Egyptian individual investors. However, because of the inability of reaching an appropriate sampling frame for the Egyptian investors participating in the Egyptian stock market (Elhariry, 2018), the convenient sampling is found to be the most appropriate sampling technique.

The second sampling technique is the snowball sampling, in which the first respondents who voluntarily undertake the survey are asked to refer to others about the study (like friends and colleagues who own shares and are active investors).

As for the sample size, which represents the number of survey participants, the literature had agreed that the size affects the accuracy of the results when there is a desire to refer to the whole population and also affects the ability to generalize the results (Komba, 2016; Saunders *et al.*, 2009). Hair *et al.* (2006) explained that if the sample size is very small, it cannot be used to generalize the results for the population, while if the sample size is very large, then this will result in having too many significant variables because of the sensitivity of the statistical test. Also, Malhotra *et al.* (2003) illustrated that there are several factors that affect the sample size that should be taken into consideration, like the number of the variables, the restriction on resources and the tools of analysis used in the study.

The study used Green's (1991) formula to calculate the essential number of observations ($N > 50 + 8K$). This formula is employed in several behavioral studies (Komba 2016), where N refers to the number of observation and K is the number of the independent variables. As the number of the behavioral variables examined in this study are 13 variables (as shown in figure 3.9), then the sample size to be used is $50 + (8 * 13) = 154$. Hair *et al.* (2014) explained that the ratio

of the observation to the independent variables should not decrease below 5:1 and to enable the generalization of the results, the ratio should be between 15 to 20 observations per independent variable; accordingly, the required sample size should be at least $15 \times 13 = 195$ observation.

Other researchers explained that in order to construct a structural equation modeling, the approximate sample size required should be greater than 200 ($n > 200$) (Sivaramakrishnan *et al.*, 2017; Fan *et al.*, 1999), while Osborne and Costello (2004) argued that there is no rule of thumb under behavioral implications for the sample size.

3.3.4.1.2 Data collection strategy

Data collection stage is the step employed after determining the sampling techniques and the required sample size. There are factors that affect data collection methodology to be employed, like the objective of the study and the experienced response rate (Malhotra *et al.*, 2003). Adopting the survey approach is the most appropriate tool for collecting the responses required. For distributing the survey, previous studies depended on the hard copies, such as the drop and pick strategy, to manage the data collection personally by the researcher, as this can increase the response rate (Saunders *et al.*, 2009); however, these methods lack ignoramus of the responses, which is very important if the researcher wants to have honest answers (Graham and Harvet, 2001, cited in Komba, 2016).

In this study, the online survey is adopted, where the survey is prepared using Google form, distributed and collected using online tools. Preparing the survey using Google forms enables setting validity questions to ensure that the participants meet the required criteria. By passing these validity questions, the participant will be directed to the survey. Also, it enables making all survey's questions mandatory since the participant cannot submit the survey if there are any missing questions. This process will enhance the completion rate.

Distributing the survey using online tools facilitates reaching participants located in different geographical areas, and since the collection of the survey is also electronic, this will facilitate exporting the data to statistical package without hand coding or data entering errors. As a result, the whole process will be completed correctly, precisely, efficiently and in a limited time.

The following section provides description of the steps followed to develop the survey.

3.3.4.1.3 Survey development

Most of the studies that have tested the psychological variables have used several proxies. For example, the investors' sentiment was measured by market ratios, like trading volume, dividend premium or by index like that developed by Baker and Wurgler (2006), while using the suicide

rate and aviation disasters to measure the negative social mood (Choi, 2016; Kaplanski and Levy, 2010). The turnover rates and exceptional return were used to measure investor's attention (Yang *et al.*, 2017). The reviewing of the proxies employed in previous studies revealed that the same proxy was used to measure different behavioral variables such that Litimi (2017) used trading volume for measuring the herding phenomenon, Tas and Akdag (2012) used trading volume to measure overconfidence while, Jitmaneeroj (2017) used it to measure investors' sentiment, which may result in misleading justification regarding the behavioral variable behind the deviation in stocks' return. Over and above, based on the variation and the number of the behavioral variables examined in this study; it is found that the survey is the most suitable tool that can be used to measure the impact of these variables at once. Accordingly, this study intends to measure the effect of the psychological variables using a structural built questionnaire. The maximum of behavioral variables measured in a survey according to the researcher's knowledge was made by Chandra and Kumar (2012). Chandra and Kumar (2012) measured the significance of eight variables through their study on the Indian stock market. However, the value of this study emerges from the fact that it combined and merged 41 variables into 13 main variables that will be tested in this study which are: environmental variables, weekend versus weekday's effect, representativeness, availability, anchoring, disposition effect, mood, overconfidence, pessimism, gambler fallacy, personality traits, neurotransmitters and emotional intelligence. The steps used to build the survey involved two main steps: first, the selection and creation of each variable's item. Second, conducting a content validity test. The steps are presented in details next.

First: The selection and creation of each variable's item:

To build the items that will be used in measuring each variable, the researcher leaned on the surveys and experiments used in the literature. The following table summarizes the number of items and the sources used in measuring each behavioral variable as presented in the initial version of the survey.

Table 3.7: Questionnaire's initial items

The Psychological variables	Number of items	Sources from literature
Environmental variables	2	Kaplanski <i>et al.</i> (2015)
Representativeness	8	Komba (2016), Abdin <i>et al.</i> (2017), Peterburgsky (2017), Rasheed <i>et al.</i> (2018).

Availability	10	Komba (2016), Abdin <i>et al.</i> (2017), Rasheed <i>et al.</i> (2018).
Anchoring	7	Komba (2016), Abdin <i>et al.</i> (2017)
Disposition effect	17	Komba (2016)
Mood	1	The researcher
Overconfidence	10	Komba (2016), Abdin <i>et al.</i> (2017).
Pessimism	4	Ahmad <i>et al.</i> (2017)
Gambler Fallacy	4	Amin <i>et al.</i> , (2009)
Neurotransmitters	16	Ahmad (2018)
Emotional intelligence	4	Ahmad (2018)
Personality traits	15	Lathif (2019) (Pan and Statman, 2013)
Investment decision	7	Ahmad (2018)
Total	105	

Second: Content validation for the initial questionnaire

One of the construct validity components is the content or face validation. The aim of this step is to ensure that the items or the questions used to measure every variable provide a sufficient coverage (Komba, 2016; Hair *et al.*, 2014; Saunder *et al.*, 2009). The adoption of this procedure in investors' psychology survey is not common despite its value in assuring the objectivity of the data gathered (Komba, 2016), as it depends on subjective judgments made by experts, pre-test with subpopulation or other ways (Hair *et al.*, 2014). The implementation of content validity is divided into two steps: **the first step** involves a face validity done with two field experts (an investment advisor and an experienced trader) and eight academic experts. The following table summarizes the specialized field for the academic experts who examined the survey.

Table 3.8: The content validity participants

The specialized fields of the academic experts
4 academic experts with a PhD in finance
1 with Master's degree in marketing and professional expert

1 academic expert with a PhD in behavioral finance
1 academic expert with a PhD in accounting
1 academic expert with a PhD in economics

The face validity is done with academic experts and the field experts through asking them about the appropriateness and clarity of the questions relative to the Egyptian investors, the time spent on solving the survey and the areas that need improvement. The answers of the experts involved several comments and suggestions:

The demographic questions of the survey need some modifications, like decreasing the monthly income range to include “less than \$1,000” to fit the Egyptians’ economic level and increasing the options of the marital status to include the widowed and the divorced, in addition to adding a question about the presence of children. These points of amendments may affect participants’ trading behavior.

There are some questions that are solid and cannot be understood according to Egyptians’ level of education, while others are inappropriate with respect to the Egyptian culture. The experts justified that although any Egyptian investor would be either a bachelor degree holder or has at least completed the secondary school, this cannot guarantee that they have received a high education level as investors located worldwide, which means that what fits an international investor does not have to fit the local Egyptian investor.

There are some questions that showed repetition or have the same meaning.

The questionnaire was relatively long, which can discourage the investors from completing it due to time constraints, as such participants are accustomed to quick analysis while doing their trading, and for the current study, they are voluntarily selected without any incentive.

Finally, the survey has to be translated into Arabic, which is the native language of the Egyptian citizens, to make sure that the questions are correctly understood to avoid any confusion.

The second step used to ensure the validity of the survey to be implemented is the pilot test. This step is important to ensure that the questions fit the desired outcomes, would answer the issue under investigation and that the item selected would have practical and theoretical implications (Hair *et al.*, 2014) and also to ensure that there will be no problem when recording them and to determine the area that needs improvements before publishing the final version (Saunders *et al.*, 2009).

Since there is no specific number for the respondents required to conduct the pilot test nor specific criteria, except that they have to be similar to the final population that will undertake the final version of the survey, and that the number of pilot participants is able to cover as much variation in responses as possible (Saunders *et al.*, 2009), the researcher has sent the survey via email to 20 individual investors. The researcher was able to reach the pilot participants by asking friends, relatives and some personal relations at work, while assuring that their answers will be anonymous and without revealing their identity. The analysis of the demographic characteristics of the pilot test participants revealed variation in their income and education levels, their trading frequency and their trading experience which means that the pilot size used covers enough variation and is well representative of the population as recommended by Saunders *et al.* (2009)

Factor analysis using principal component analysis technique without rotation is employed to analyze the initial version of the survey using the pilot sample (Hair *et al.*, 2014). The results of the pilot are analyzed for convergent validity and internal consistent reliability tests. The convergent validity is examined using two factors: firstly, the Average Variance Extracted (AVE), which represents the average communality of each latent factor. The (AVE) result should be greater than 0.5 to imply adequate validity (Hair *et al.*, 2014). Secondly, the factor loading of each item (statement), which should be greater than or equal to 0.4 to represent an adequate correlation between the item and the variable (Hair *et al.* 2014). As for the reliability test, since each variable is measured using a group of questions, Cronbach's Alpha is used to indicate how stably and consistently the instrument taps the variable i.e., the suitability of the items (questions) used to measure the construct (variable) as a group. The range of Alpha coefficient is between 0 and 1, the higher the score, the higher the reliability. If Alpha coefficients are greater than or equal to 0.6, it implies adequate reliability.

The pilot analysis revealed that the values of AVE are within the acceptable range, the factor loading of each item of each variable has some values less than 0.4, which means that these items either should be deleted or rephrased to enhance the values of average variance extracted (Hair *et al.*, 2014). For Cronbach's alpha, the results are greater than 0.6, ranging between 0.898 and 0.687 which indicates adequate reliability.

Based on the results of the face validity and the pilot test, the researcher made the following changes with the initial survey. **Firstly**, the researcher deleted some items, whose factor loading are less than 0.5 but rephrased the other to make them clearer, as the researcher considered the

latter items important to be investigated, with respect to the current situation in the Egyptian market; also, this will work on improving the AVE values. **Secondly**, as the initial version of the survey used for pilot test was in English, it was highly recommended to translate the questionnaire to the Arabic language. The researcher made this translation taking into consideration to make the sentences as simple as possible to be easily understood by the Egyptian citizen, which means that the translation does not have to be typical but to provide the same meaning of the English sentence (Peng *et al.*, 1991), and to avoid using many technical words so that solving the survey will not take much time and effort. The more the items are clear in meaning to the respondents, the more this will work on reducing any bias, reducing the errors and reducing the decline in responses when drawing the conclusion (Saunders *et al.*, 2009). Moreover, the researcher has asked an academic expert to read the Arabic version and compare it with the English one used in the pilot as a final check before publishing, who asked only for few wording changes.

Table 3.9 represents the changes in the items used in measuring each construct after the validity and reliability test of the pilot.

Table 3.9: The content and pilot tests results

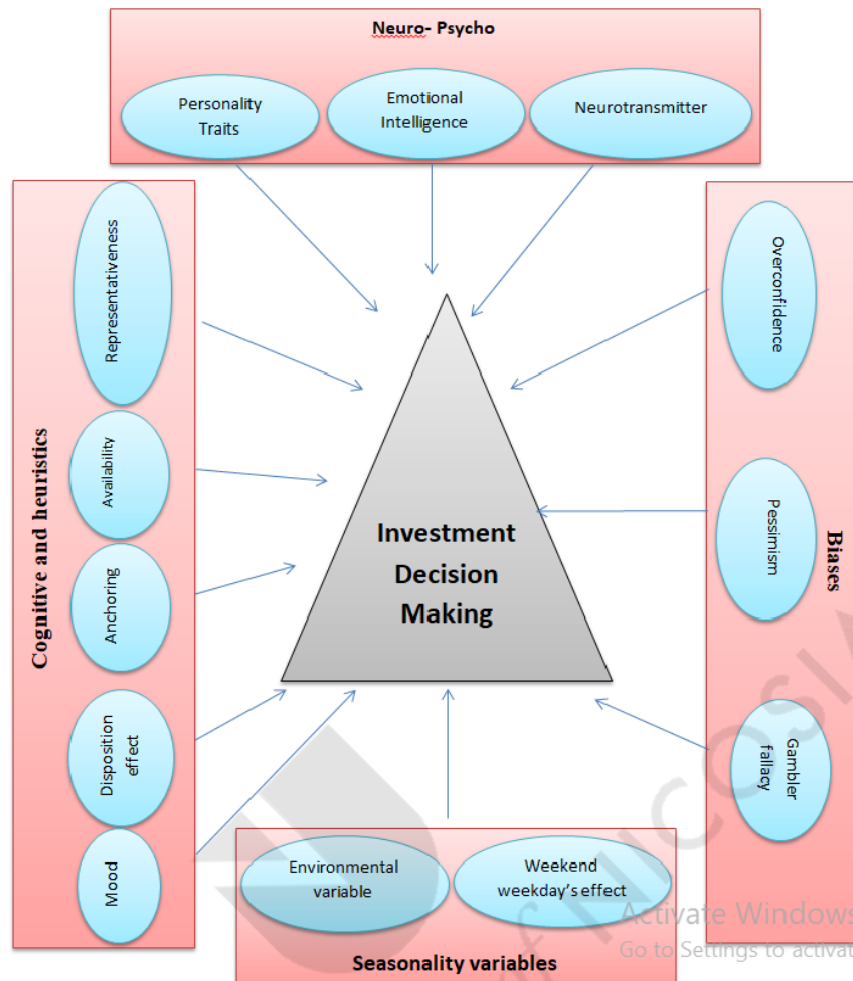
The Psychological Construct	Initial number of items	Retained items
Environmental variables	2	2
Representativeness	8	5
Availability	10	9
Anchoring	7	5
Disposition effect	17	9
Mood	1 ¹²	1
Overconfidence	10	6
Pessimism	4	4
Gambler Fallacy	4	4

¹² Bowling (2005) supported the use of single item.

Neurotransmitters	16	13
Emotional intelligence	4	4
Personality traits	15	13
Investment decision	7	7
Total	105	82

The following figure 3.10 represents the hypothetical research model for the behavioral factors that will be measured using the survey.

Figure 3.10: The hypothetical behavioural model.



The survey is employed to examine the relation between the behavioral variables and the investment decision as presented in the hypothetical model. The collected data will be analyzed using Structural Equation Modeling (SEM). SEM is a strong analytical tool that is used to measure the relationship between a set of unobserved variables (Schumacker and Lomax, 2010). It depends first on conducting confirmatory factor analysis (CFA) which involves confirming or denying that a certain construct is composed of a set of measured variables. The confirmatory factor analysis is conducted in this study to confirm or deny each of the four developed constructs as shown in figure 3.10 using a set of fit indices. This means that the CFA is used to approve or reject the proposed behavioral model. The results of the CFA will generate a behavioral model that statistically fits well using the collected data (Schumacker and Lomax, 2010). After retrieving the confirmed constructs, they will be examined for their impact on investment decision using structural equation modeling (SEM) to extract the most significant ones affecting the Egyptian investors investment decision.

3.3.5 Phase five: developing the augmented framework

The analysis of the literature in the previous chapter and the results reached by previous researchers for the three theories revealed the insufficiency of any of the examined models independently to define the determinants of stocks' return. Additionally, some studies proved the insufficiency of the behavioral factors as Dhaoui (2013), while other studies confirmed the necessity of considering the rational and irrational sources of risk to provide a complete explanation about the markets' return determinants (Soydemir *et al.*, 2017; Tan *et al.*, 2016)

Accordingly, this study will build an augmented framework once the previous four objectives are achieved (see table 3.3). The running of the regression analysis for the micro and macroeconomic models independently will yield the most significant micro and macroeconomic variables affecting portfolios' excess return with respect to the Egyptian stock market. Then, the conduction of the survey will yield the most significant psychological factors affecting the Egyptian investors' investment decision. The augmented framework will be built based on the significant variables captured from each theory. This framework is developed through conducting an empirical study on a representable emerging market.

3.3.6 Phase six: explaining the validity of the applied augmented framework within the empirical study context

Phases one, two and four described above will be done with respect to the Egyptian stock market- a representable emerging stock market that represents the stock market under examination in this research.

As mentioned before, the study is following quantitative methodology to implement the research phases in order to test the proposed conceptual framework within the real-life context and to reach the applied one.

As the current study represents an empirical test of social science, the developed applied augmented framework is subject to validity and reliability test in order to ensure its quality. Reliability test is to ensure that the same results will be reached again when the same methodology and procedures are repeated. However, reaching similar findings is very difficult as the data and people may change from one incident to another while the validity test will ensure how the instrument is good in measuring a particular situation (Elgazzar, 2013). The development of the applied augmented framework will pass through several validity tests that will be explained in the conclusion chapter.

The next chapters will provide a detailed description of the implementation of research phases.

3.4 Conclusion

This chapter started by reviewing the different research philosophies, approaches and methodologies while illustrating the most appropriate ones to be followed in this study. The chapter further illustrated the methodology and procedures to be followed to achieve each of the six objectives. The study adopted a deductive research approach using quantitative methodology to test each of the three theories and to develop the applied augmented framework. An illustration of the retrieved results after testing each theory separately is provided in the next chapters.



CHAPTER 4 Empirical Study- Microeconomic and Macroeconomic models results

4.0 Introduction

The methodology of developing an augmented framework capturing different theories was covered in chapter three. The application of the research methods using an empirical study begins in this chapter to examine the proposed augmented conceptual framework (figure 2.1). The implementation of the empirical study will provide an explanation for the events from a variety of lenses (micro, macro and behavioral). It is based on the use of multiple data sources (primary and secondary) to enable revealing different facets of the phenomenon under investigation (stock pricing determinants). The application of the empirical analysis in this study involves examining the conceptual augmented framework on the selected stock market to reach the applied augmented framework. This is based on two main stages. First: testing the proposed augmented framework which is further divided into three stages a) presenting the results of the regression analysis of the microeconomic model against portfolios excess return to reveal the significant ones according to the Egyptian stock market, b) presenting the results of the regression analysis of the macroeconomic variables to show the significant macroeconomic variables, c) displaying the results of the survey used to examine the conceptual behavioral model to determine the significant behavioral variables affecting the Egyptian investors investment decision. Secondly: the augmented applied framework is built by aggregating the significant variables realized from the examination of the three theories while describing the validity test passed by the development of this applied framework.

4.1 The results of regression analysis of the microeconomic model

This section presents the results of testing the impact of microeconomic variables presented in Fama and French Five-Factor model: market excess return (RM-RF), size (SMB), value (HML), profitability (RMW) and investment (CMA) on portfolio excess return presented by 18 portfolios. The portfolios used as dependent variables are constructed based on 2x3 sorts: size-BE/ME, size-profitability and size investment. The stocks used in constructing the portfolios are stocks that constitute EGX100 following specific criteria that are described in details in section 3.3.1.1, this has resulted in having 47 stock, however in some years the number of stocks decreased to 46 or 45. It is worth mentioning that the portfolios that are built based on the intersection explained are better than the portfolios of the single sortation so that the constructed variables are not affected by the sorting order effect (Fama and French, 1993). These stocks are used to construct 18 portfolios based on 2x3 sorts: size-BM, size-profitability and size

investment. The number of stocks that form each portfolio are shown in detail in appendix I for the 10 years under examination from June 2010 to June 2020. EGX30 is used as a proxy for market return, where monthly changes in this index are taken as measure for the market rate of return, while the risk-free rate is calculated using the rate of change of the monthly weighted average yield on the three-months Egyptian treasury bills.

The analysis is conducted on time series data collected on monthly basis using Ordinary Least Square (OLS) regression. In order to get reliable statistical results, the time series must be covariance stationary, i.e., mean and variance are stationary over time. The most common test for the nonstationarity is the Augmented Dickey-Fuller (ADF) test, which is used to test whether there is a unit root in the variables. Finally, diagnostics tests of autocorrelation, heteroscedasticity and residual normality tests are applied to examine the specification of the models. The following sections introduce the analysis conducted according to the mentioned techniques using EVIEWS software version 10.

The results of the microeconomic model regression are organized as follows. The next section shows the descriptive analysis using mean, minimum, maximum and standard deviation of the research variables. The second section shows the stationarity status of the data collected according to the Augmented Dickey Fuller (ADF) test. The third section displays the results obtained for OLS regression, while the fourth section displays the results of the diagnostics test.

4.1.1 Descriptive analysis of the microeconomic variables

This section shows the descriptive statistics of the microeconomic variables and portfolios excess return. The descriptive statistics is used to give a summary of the data in a numeric form through explaining the existing patterns and trends. Table 4.1 panel A, illustrates the computed values of the descriptive statistics of the independent variables used in Fama and French five-factor model, where the average RM-RF is $2.11\text{E-}05$, with a standard deviation of 8.8566% per month, noticing that the standard deviation is caused by the 8.888% standard deviation of the market return compared to a mean return of 0.01184. This is due to the high volatility faced by the Egyptian stock market as a result of the political and economic instability after the 2011 revolution and Arab spring revolutions. The average SMB, which measures the mean of return as a result of firm's size, is 0.0016, with a standard deviation of 0.1448; the SMB factor is constructed as the weighted average of the SMB_{BE} , SMB_{OP} , and SMB_{INV} . The average HML, which measures the mean return as a result of a firm's BE/ME, is 0.00798 and a standard deviation of 0.0577. Moreover, the average RMW, which measures the mean of return as a

result of a firm's profitability, is -0.00018, with a standard deviation of 0.068. Furthermore, the average CMA, which measures the mean of return as a result of a firm's investment, is 0.01, with a standard deviation of 0.0598. Comparing the mean return of the five independent variables shows that CMA has the highest average monthly return, while the least average monthly return is for RMW portfolios, while the highest standard deviation is SMB and lowest standard deviation is for HML.

The descriptive statistics of the 18 portfolios constructed based on 2x3 sorts: size-BM, size-profitability and size investment are shown in table 4.1 Panels B, C and D respectively. The results show that the average monthly excess returns are low due to the small numbers of stocks used in constructing the portfolios, in addition to the high values of the standard deviation. It is observed that big size companies with conservative investment strategies (BC) and big size companies with weak profitability (BW) achieve the highest average monthly excess return. This means that in the Egyptian stock market, companies with (1) high market capitalization and conservative investment strategies and those (2) with high market capitalization and weak profitability achieve the highest return, while (1) the small size companies with weak profitability (SW) and (2) the big market capitalization companies with robust investment (BR) achieve the lowest average monthly excess return. Panel B, which represents the portfolios constructed based on size-BE, shows that big sized companies with high BE/ME (BH) have the highest average monthly excess return. It also shows that when holding size constant, the mean monthly excess return increases with the increase in value (BE/ME) from low to high i.e., from small capitalization with low value (SL) to small market capitalization companies with high value (SH) and from big capitalization companies with low value (BL) to big capitalization companies with high value (BH). When holding value constant, the mean monthly excess return showed a decrease with the increase in market capitalization, except for high value companies, which show approximately the same monthly mean excess return. Panel C, the size-profitability construction, shows that the big size companies with weak profitability (BW) have the highest average excess return. It is also noticed that when holding size constant, the mean monthly excess return increases with the increase in profitability for the small sized companies and decreases for the big sized companies. In panel D, it is noticed that the big sized companies with conservative investment (BC) have the highest average excess return. The pattern observed in panel D is similar to panel C, such that when holding size constant, the mean monthly excess

return decreases by the increase in investment for the big sized companies; however, there is not a clear pattern for the small sized ones.

As for the normality analysis using Jarque Berra test, it is shown that P-values are less than 0.05 for the independent variables and most the dependent portfolios constructed, which indicates the rejection of the null hypothesis concerning the normality of the variables however, the size of the sample used in the analysis is quite large (120 observation), this will not impede the completion of the analysis based on the central limit theorem even when the normality assumption is violated but this requires choosing higher confidence level when selecting the significant variables (Habib and Islam, 2017).

Table 4.1: Descriptive Statistics of the microeconomic model variables.

The table shows the descriptive statistics of Fama and French five factor model (2015) and the 18 constructed portfolio based on 2x3 sorting method size-BE/ME, size-profitability and size investment. The independent variables are: Rm-Rf is market excess return, SMB is size, HML is value, RMW is profitability while CMA is investment. The stocks used in constructing the portfolios are stocks that constitute EGX100 which are reduced to 47 stocks based on specific criteria that are described in details in section 3.3.1.1. The variables are measured on monthly interval for the period from June 2010 to June 2020.

	Mean	Median	Max.	Mini.	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Prob.	Sum	Sum Sq. Dev.
Panel A: The independent variables											
RM	0.01184	0.04409	0.36575	-0.209	0.0888	0.6076	4.98	24.52	0.000	1.29	0.85
RF	0.01115	0.010	0.018	0.008	0.0026	0.8317	2.52	13.6	0.000	1.29	0.00072
RM_RF	2.11E-05	-0.0014	0.3501	-0.22	0.088566	0.595666	4.87528	22.41743	0.000	0.0023	0.84714
SMB	0.001162	0.003333	0.16	-0.14	0.144788	-0.35192	4.921108	19.01166	0.000	0.126667	2.2641
HML	0.00798	-0.01	0.17	-0.15	0.057748	-0.51181	4.44916	14.29694	0.001	-0.87	0.3602
RMW	-0.00018	0	0.13	-0.24	0.068014	1.159882	5.441773	51.51865	0	0.02	0.4996
CMA	0.01	0	0.23	-0.12	0.059815	1.358511	6.120939	777.7645	0	1.09	0.3864
Panel B: Size - BM portfolios											
SL	0.002815	-0.00286	0.266614	-0.34	0.106076	-0.13230	3.6513	2.244533	0.3255	0.306847	1.215
SN	0.002524	-0.00741	0.5097	-0.27	0.114233	1.03477	6.78938	84.66754	0	0.275077	1.4093
SH	0.00799	-0.00397	0.313047	-0.23	0.093265	0.346325	3.528902	3.449404	0.1782	0.87096	0.939
BL	-0.00289	-0.00627	0.30714	-0.26	0.100425	0.299976	4.014706	6.310975	0.0426	-0.3152	1.08921

BN	-0.00286	-0.00998	0.40941 7	-0.22	0.094871	0.939292	5.64323 2	47.75906	0	- 0.31189	0.9721
BH	0.00801	-0.0016	0.38098 4	-0.24	0.118643	0.897492	4.32126 8	22.56172	0.000 0	0.87325 6	1.520
Panel C: Size-profitability portfolios											
SW	-0.0062	-0.01186	0.30917 4	-0.32	0.109182	0.055455	3.87041 2	3.49671	0.174	- 0.67537	1.2874
SN	-0.00164	-0.0093	0.31419 5	-0.35	0.11186	0.084528	3.76357 4	2.777797	0.249	- 0.17833	1.351
SR	0.00984	0.015323	0.42406 3	-0.20	0.0914	0.720737	5.98134 6	49.80514	0	1.07297 5	0.9022
BW	0.01043	-0.01498	0.45750 2	-0.27	0.134518	1.0479	4.63565 7	32.09937	0	1.13661 6	1.954
BN	-0.0047	-0.01554	0.38888 4	-0.226	0.0987	0.924206	5.46868 4	43.19592	0	- 0.51247	1.052
BR	-0.00624	-0.01346	0.33000 8	-0.23	0.086381	0.409111	4.47576 3	12.93178	0.002	- 0.68057	0.80587
Panel D: Size-investment portfolios											
SC	0.000935	-0.00936	0.32649 9	-0.27	0.110559	0.28203	3.72635 8	3.841154	0.147	0.10194 3	1.320
SN	0.00108	-0.00756	0.35134 7	-0.31	0.104209	0.131436	4.20454 8	6.9035	0.031 7	0.11775	1.17282
SA	-0.00179	-0.01359	0.27599 4	-0.29	0.099847	0.126115	3.39716 3	1.005334	0.604 9	- 0.19495	1.0767
BC	0.01262	-0.00077	0.44799	-0.24	0.123122	1.106159	5.61659 1	53.32326	0	1.37557 7	1.6372
BN	-0.00399	-0.01803	0.38442 3	-0.222	0.102484	1.02609	5.09845 3	39.12623	0	- 0.43449	1.134
BA	-0.00419	-0.00446	0.33956	-0.25	0.099479	0.337738	4.10823 2	7.650189	0.022	- 0.45639	1.0688

4.1.2 Unit Root Test – Stationarity test

This section shows the results of the stationary tests using Augmented Dicky-Fuller test (ADF) for the five independent variables and the 18 constructed portfolios to represent the dependent variables of the microeconomic model. ADF is used to determine whether there is a unit root in the variables and to examine the suitability of the data for model estimation. The null hypothesis of the test indicates the existence of unit root while the alternate hypothesis indicates that there is no unit root, (i.e., stationarity in variables).

Table 4.2 shows the results of ADF test; it could be observed that all the variables are stationary at level and has no unit root at level (P-value < 0.05), which indicates the rejection of the null hypothesis; hence, the results are satisfactory to apply OLS regression.

Table 4.2: Augmented Dickey-Fuller test of the microeconomic model variables.

The table shows the results of Augmented Dickey-Fuller test of the microeconomic model variables presented in Fama and French five factor model (2015) and portfolios' excess return using 2x3 sorting method. Rm-Rf is market factor, SMB is size, HML is value, RMW is profitability while CMA is investment. The portfolios used are constructed based on 2x3 sorts: size-BE/ME, size-profitability and size-investment. The stocks used in constructing the portfolios are stocks that constitute EGX100 which are reduced to 47 stocks based on specific criteria that are described in details in section 3.3.1.1. The analysis is run using monthly interval for the period from June 2010 to June 2020 which indicates the usage of 120 observations for each variable.

Augmented Dickey-Fuller test		t-statistics	Prob.
RM-RF		-10.95299	0.0000
SMB		-2.002218	0.0438
HML		-4.620346	0.0002
RMW		-4.048693	0.0017
CMA		-9.209734	0.0000
Size- BM portfolios	SL	-11.96669	0.0000
	SN	-9.704171	0.0000
	SH	-9.733338	0.0000
	BL	-10.59910	0.0000
	BN	-10.52865	0.0000
	BH	-8.013301	0.0000
Size- profitability portfolios	SW	-11.82489	0.0000
	SN	-11.18300	0.0000
	SR	-11.10792	0.0000
	BW	-7.723675	0.0000
	BN	-10.99127	0.0000
	BR	-9.100709	0.0000
Size- investment portfolios	SC	-10.95298	0.0000
	SN	-11.74709	0.0000
	SA	-11.87829	0.0000

	BC	-6.611628	0.0000
	BN	-10.70045	0.0000
	BA	-10.87153	0.0000

4.1.3 Time series regression results

This section introduces the results of time series regression using least square method to estimate the parameters of the regression model. Table 4.3 presents the results of the regression when size-BM, size-profitability and size-investment portfolios are used in the construction of the dependent variable in Panels A, B and C, respectively. Each panel shows the coefficient, the t-statistics and p-values of every factor, in addition to the intercept, R^2 and adjusted R^2 to measure the percentage of variation in the dependent variable as a result of the independent variables. Also, the results of F-test are presented to test the significance of each model, in addition to the standard error.

As observed in the three panels, the market excess return is insignificant with negative coefficient when constructing all of the portfolios. This could be due to the fact that EGX30 used as a proxy for market index is heavily weighted by stocks of financial institutions (such as Commercial International bank and others), while the negative coefficient might be due to the increase in the treasury-bills rates more than the market return for the period under study (EGX, 2021). Also, the intercept of the 18 constructed portfolios is insignificant and almost zero, which means that there is not pricing error for the 18 regression models (Acaravci and Karaomer, 2017).

Panel A shows the time series regression results when portfolios are constructed based on size-BM portfolios, the most significant variable is profitability (RMW) for the six portfolios “SL”, “SN”, “SH”, “BL”, “BN”, and “BH”; (Small Low, Small Neutral, Small High, Big Low, Big Neutral, Big High) with negative coefficient indicating the negative impact of profitability and its importance, regardless of the market capitalization (size) of the company. It is noticed that given the same value (BE/ME) level, the coefficient of RMW decreases with the increase in firms’ size, from small capitalization companies with low value (SL) to big capitalization companies with low value (BL) and from small capitalization companies with high value (SH) to big capitalization companies with high value (BH). Then, it is the size factor (SMB) that shows significant impact for all portfolios except for the big size companies with low BE/ME (BL). Also, it is noticed that the significance of SMB is high for small sized companies

compared to the big sized ones. The coefficient of SMB is positive for the small sized companies (SL, SN, SH) and negative coefficient for the big sized companies (BL, BN, BH). This indicates a decrease in the coefficient with the increase in size while holding BE/ME constant. Also, it indicates the positive relationship between small sized portfolios' return and size factor and the negative relationship between big sized portfolios' return and size factor. Jiao and Lilti (2017) reached the same results for size factor when implementing a study on the Chinese stock market. Additionally, the coefficient of SMB shows a decrease with the increase in BE/ME for the big sized companies; however, there is not a clear pattern for the small sized companies. HML is only significant for the small capitalization with low value (SL) and big capitalization with low value (BL) i.e., low BE/ME companies regardless of the company size; additionally, the coefficient is showing an increase with the increase in the value of the company. CMA is significant for only two portfolios: small capitalization companies with low value (SL) and big capitalization companies with high value (BH). The highest explanatory power (R^2) is for the big companies with high BE/ME (BH) with three significant variables size (SMB), profitability (RMW) and investment (CMA). Belimam *et al.* (2018) reached the same results for RMW factor and for CMA, whereas the latest variable showed significance for only one out of the six portfolios when conducting a study in Shanghai stock market. Dhaoui and Bensalah (2017) found a positive significant impact for SMB for the six portfolios and a negative statistical impact for RMW for the small portfolios when implementing a study using US stock market (NYSE). Alrabadi and Alrabadi (2018) reached the same result regarding the negative impact of RMW while a positive and significant impact got for the other four variables when implementing a study in Amman Stock Exchange (ASE).

There are limited differences noticed when size-profitability portfolios are used to construct the dependent variable. As presented in panel B, profitability (RMW) is showing to be the most significant variable except for portfolio constructed of big capitalization companies with robust profit (BR) while having negative coefficient for the six portfolios. Also, the coefficient of RMW is increasing with the increase in the profitability of the companies across the same size group similar to the results of Jiao and Lilti (2017) in both the Chinese and the US markets. Size (SMB) is showing the same impact as when using the Size-BM construction; it is having a positive coefficient for small sized companies (SL, SN, SR) and negative for the big sizes (BL, BN, BR); however, there is a difference in the significance level; this shows that when holding profitability constant, the coefficient decreases with the increase in the market

capitalization of the company. HML is having a negative coefficient for the six portfolios with significant impact for only four portfolios, while CMA is showing a significant impact for only the big capitalization companies with weak profitability (BW) portfolio, which indicates the weak impact for investment on portfolios formed on profitability, the same results reached by Belimam *et al.* (2018). The highest explanatory power is for the big sized companies with weak profitability (BW) as R^2 is 60% with four significant variables: size (SMB), value (HML), profitability (RMW) and investment (CMA).

Table 4.3: The results of Fama and French five factors model regression.

The table shows the results of running the regression analysis between the variables presented in Fama and French five factor model (2015) and portfolios' excess return using 2x3 sorting method. $R_m - R_f$ is market factor, SMB is size, HML is value, RMW is profitability while CMA is investment. The portfolios used are constructed based on 2x3 sorts: size-BE/ME, size-profitability and size-investment. The stocks used in constructing the portfolios are stocks that constitute EGX100 which are reduced to 47 stocks based on specific criteria that are described in details in section 3.3.1.1. The time series regression analysis is run using monthly interval for the period from June 2010 to June 2020 which indicates the usage of 120 observations for each variable. Panels A, B, C represents the regression results based on size-BE, size-profitability, size-investment respectively. The table reports the intercept, the coefficient, the probability and t-statistics of each macroeconomic variable, the adjusted R^2 and R^2 and the F-statistics for each of the 18 portfolios constructed.

		RM-RF		SMB		HML		RMW		CMA		Adj R^2/R^2	F- stat
	Inter	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat		Prob
SL	0.006	- 0.0463	- 0.4672 (0.641 4)	0.2055	3.0510 77 (0.0029)***	-0.9415	-4.807 (0.000) ***	-0.607	-3.8949 (0.00)***	0.3335	1.8961 (0.0608)*	0.29/0. 32	0.00
SN	0.003	- 0.0567	- 0.5127 (0.609 2)	0.288	3.8456 26 (0.000) ***	-0.1865	-0.854 (0.395 1)	-0.857	-4.9353 (0.000)** *	-0.0478	-0.2435 (0.8081)	0.24/0. 27	0.00
SH	0.001	- 0.0431	- 0.4575 (0.648 2)	0.2618	4.0922 99(0.00 0)***	-0.1685	0.9055 (0.367 3)	-0.462	-3.1245 (0.0023)* **	-0.0025	-0.0150 (0.9880)	0.17/0. 21	0.00
BL	0.004	- 0.0413	- 0.4126 (0.680 7)	- 0.0862	- 1.2676 78 (0.2078)	-0.9091	-4.598 (0.000) ***	-0.703	-4.4726 (0.000)** *	0.0136	0.0764 (0.9392)	0.19/0. 23	0.00
B N	0.002	- 0.0072	- 0.0716	- 0.1207	-1.772	-0.3239	-1.635	-0.555	-3.5214	-0.2137	-1.2013	0.09/0. 13	0.00

			(0.943 1)		(0.0793)*		(0.105 1)		(0.000)** *		(0.2324)		
B H	0.005 0.0496	- 0.4926 (0.623 3)	- 0.1462	- 2.1391 94 (0.0348)**	-0.0320	-0.161 (0.872 5)	-0.866	-5.477 (0.000)** *	0.3370	1.888 (0.0618)*	0.41/0. 44	0.00	
S W	- 0.002	- 0.0235	- 0.2361 (0.813 8)	0.1679	2.4825 01 (0.0147)**	-0.4735	-2.407 (0.017 9)**	-1.095	-6.998 (0.000)** *	-0.1063	-0.6018 (0.5486)	0.32/0. 35	0.00
SN	- 7.53 E-05	0.0285	0.2667 (0.790 2)	0.2408	3.3206 22 (0.0012)***	-0.3155	-1.496 (0.137 7)	-0.916	-5.4637 (0.0000)* **	-0.0051	-0.0269 (0.9785)	0.26/0. 29	0.00
SR	0.011	- 0.1115	- 1.1323 (0.260 1)	0.1125	1.6825 14 (0.0955)*	-0.4141	-2.130 (0.035 5)**	-0.288	-1.8594 (0.0658)*	0.1283	0.7345 (0.4641)	0.05/0. 10	0.04 5
B W	0.010	- 0.0766	0.7874 (0.432 9)	- 0.1757	- 2.6603 09 (0.0091)***	-0.323	-1.683 (0.095 4)*	-1.384	-9.064 (0.000)** *	0.2968	1.7209 (0.0883)*	0.58/0. 60	0.00
B N	- 2.66 E-05	- 0.0415	- 0.4035 (0.687 4)	- 0.0739	- 1.0594 42 (0.2919)	-0.3261	-1.607 (0.111 2)	-0.686	-4.2483 (0.000)** *	-0.194	-1.0639 (0.2898)	0.12/0. 16	0.00
B R	1.89 E-05	0.0102	0.1069 (0.915 1)	- 0.1134	- 1.7543 44 (0.0823)*	-0.3791	-2.017 (0.046 3)**	-0.188	-1.260 (0.2105)	0.0812	0.4808 (0.6317)	0.015/0. .06	0.25
SC	- 0.002	-0.005	-0.47 (0.963)	0.238	3.284 (0.001) ***	-0.494	-2.340 (0.021) **	-0.607	-3.616 (0.000)** *	0.597	3.150 (0.002) ***	0.24/0. 27	0.00
SN	0.004	- 0.0292 89	- 0.2843 (0.776 7)	0.1497	2.1412 (0.0346)**	-0.456	-2.243 (0.027 1)**	-0.837	-5.1755 (0.000)** *	-0.0216	-0.1181 (0.9062)	0.21/0. 24	0.00
SA	0.003	- 0.0371	- 0.3976 (0.691 7)	0.2206	3.4779 (0.0007)***	-0.1842	-0.999 (0.320 2)	-0.874	-5.959 (0.0000)* **	0.3758	-2.2691 (0.023) ***	0.29/0. 32	0.00
B C	0.008	- 0.0451 57	- 0.4981	- 0.1801	-2.9255 (0.0042)***	-0.1602	-0.895 (0.372 9)	-0.935	-6.5699 (0.000)** *	0.6169	3.8376 (0.002) ***	0.56/0. 58	0.00

			(0.619 5)										
B N	- 0.000	- 0.0608	-0.553 (0.581 5)	- 0.0683	-0.9153 (0.3622)	-0.3880	-1.788 (0.076 7)*	-0.573	-3.3186 (0.0013)* **	-0.0455	- 0.2332 18 (0.8161)	0.067/0 .11	0.03
B A	0.004	- 0.0144	- 0.1415 (0.887 8)	- 0.1637	-2.3697 (0.0197)**	-0.4706	-2.343 (0.021 0)**	-0.659	-4.122 (0.0001)* **	-0.4162	-2.307 (0.0230)**	0.15/0. 19	0.00

*** significance at 1%, ** significance at 5%, and * significance at 10%.

The same results are closely reached for the size-investment construction shown in Panel C, whereas profitability (RMW) is still the most significant variable for the six portfolios at 0.01 significance level with negative coefficient. Size (SMB) is having the same impact as when using the Size-BE/ME and Size-profitability constructions. Also, value (HML) is having results equivalent to when using the size-profitability portfolio construction with closely the same significance power. The coefficient of HML is increasing with the increase in the investment strategy of the firm for the small sized companies and decreasing for the big sized ones. Investment (CMA) is showing more significant power for four out of six portfolios; this could be due to the way used in constructing the portfolio. A portfolio of big sized companies with conservative investment (BC) is having the highest R^2 58%, which means this portfolio has the highest explanatory power.

The probability of the F-Statistics is also investigated to check the predictive power of the 18 portfolios and the overall fitness of the model through comparing the fitness of the model with and without the independent variables. The null hypothesis of the F- test indicates the fitness of the model with the intercept only while the alternate hypothesis indicates that the fitness of the model with the used independent variables is greater than the fitness of the model with just the intercept. The results indicated the significance and the fitness of the established models with variables as p-values are less than 0.05, except for one model of big market capitalization companies with robust profit (BR) in panel (B).

4.1.4 Diagnostics test

Diagnostic tests are applied to check for the adequacy of the model. This involves autocorrelation test, heteroscedasticity test, and residual normality test. Table 4.4 presents the results of these tests. A serial correlation test is done among the estimated variables, using

Breusch-Godfrey Serial Correlation LM test to examine the existence of correlation between the residuals, where the null hypothesis indicates no serial correlation. The p-value column of the serial correlation test shows that the values are all greater than 5% ($p > 0.05$). This indicates that the residuals are not correlated and the null hypothesis cannot be rejected.

A heteroscedasticity test is employed to check whether the variance of the residual is constant or not using Breusch-Pagan-Godfrey test. The null hypothesis indicates that residuals have constant variance and are homoscedastic. The p-values are greater than 0.05, except for 8 models out of the 18 presented based on the 18 constructed portfolios; hence, the null hypothesis cannot be rejected and reflects the constant variance of the residual.

Additionally, a normality test for the residual is examined using Jarque-Berra test, where it is observed that all the p-values are less than 0.05, which indicates that the residual distribution is not normal. The results of regression are reliable despite the non-normality of the residual as long as the sample used in the analysis is quite large (120 observations) (Habib and Islam, 2017; Talla, 2013).

Table 4.4 Serial Correlation, Heteroscedasticity test and residual normality tests of the microeconomic model.

The table shows the results of serial correlation, heteroscedasticity test and residual normality tests of the 18 microeconomic models based on the 18 constructed using 2x3 sorting method. The portfolios used are constructed based on 2x3 sorts: size-BE/ME, size-profitability and size-investment. The stocks used in constructing the portfolios are stocks that constitute EGX100 which are reduced to 47 stocks based on specific criteria that are described in details in section 3.3.1.1. The data analyzed using monthly interval for the period from June 2010 to June 2020 which indicates the usage of 120 observations.

		Correlation test (Breusch-Godfrey)	Heteroscedasticity test (Breusch-Pagan-Godfrey)	Residual normality (Jarque-Bera)
		Prob. F	Prob. F	Prob.
Size- BM portfolios	SL	0.9566	0.0199	0.0000
	SN	0.0701	0.1065	0.0000
	SH	0.1275	0.0682	0.0000
	BL	0.2008	0.1806	0.0000
	BN	0.2925	0.1196	0.0000
	BH	0.9433	0.0411	0.0000
Size-profitability portfolios	SW	0.1675	0.0536	0.0000
	SN	0.3203	0.0103	0.0000
	SR	0.5218	0.1259	0.0000
	BW	0.4557	0.0662	0.0000
	BN	0.5403	0.1930	0.0000
	BR	0.1514	0.0288	0.0000
Size-investment portfolios	SC	0.6475	0.0359	0.0000
	SN	0.5986	0.1164	0.0000
	SA	0.6128	0.0279	0.0000

	BC	0.4202	0.0172	0.0000
	BN	0.6284	0.4490	0.0000
	BA	0.4589	0.0308	0.0000

The test of the microeconomic variables presented in Fama and French five-factor model has revealed that profitability has the most important role in explaining the variation in portfolios' return and rejected the role of market excess return beside the weak explanatory power of investment. The limited role of investment could be due to the reasons explained by Lin (2017) who explained that the companies in emerging markets possess powerful ownership concentration, such that investment can be employed as a tool that benefit controlling shareholders accordingly, investors do not view the past investment as a guidance to forecast future return. The negative and positive role of investment found in this study was justified by Titman *et al.* (2004). Titman *et al.* (2004) explained that the increase in investment can be illustrated in favorable or unfavorable ways. The favorable way happens when the increase in investment can be viewed as an increase in investment opportunities while the unfavorable way is explained when the increase in investment could mean that the companies are managed by individuals who act in an over-investing manner and there is not a logical justification behind this increase in investment expenditure. As for size measured by market capitalization, it is found across the three sorting methods that the coefficient of SMB is positive for the small sized companies and negative coefficient for the big sized companies. This implies the same to what was found by Banz (198) who found that high market capitalization got lower return relative to low market capitalization companies. the negative role of value means that the constructed portfolios act more like growth stock portfolio (Jareno *et al.*, 2018), while the negative role of profitability is not justified yet by any study (Guo *et al.*, 2017) however, similar results were found by Janero *et al.* (2018) in the Spanish stock market also by Erdin (2017) in the Turkish stock market and it is recommended to try different measures for profitability till an illustration could be provided.

4.2 The results of the regression analysis of the macroeconomic model

This section discusses the results of testing the impact of the macroeconomic variables on portfolio excess return for the period from June 2010 to June 2020. The selected macroeconomic variables are three domestic variables: exchange rate (EXR), inflation rate (INFR), industrial production index (IPI), and two global variables: federal fund rate (FFR) and global commodity index (GCI). The portfolios of the dependent variables are constructed using

the same method employed in the microeconomic model, while the independent variables are measured using monthly rate of change. The analysis is conducted for the time series data collected on monthly basis, using the same way as used with the microeconomic model; the descriptive analysis, stationarity test, and Ordinary Least Square (OLS) regression estimation are discussed below in the same order as previously followed.

4.2.1 Descriptive analysis for the macroeconomic variables

Table 4.5 illustrates the descriptive statistics of the macroeconomic variables; it is observed that the mean values of EXR, INFR, IPI and FFR are greater than the median values, which indicates that the data falls in the right side of the probability density curve while the mean of GCI is less than the median, which means that the data fall in the left side of the curve. The minimum value of EXR is -0.08932, and the maximum value is 0.766146, which indicates a little dispersion in the data, and similarly are INFR, IPI and GCI, which means that there is less variability in the data as reflected in the standard deviation values. FFR is more dispersed with the highest value for standard deviation of 15.8%. Also, it is observed that the standard deviation of the macroeconomic variables is greater than the mean return of the constructed portfolios presented in table 4.1, which means that associated risk level is greater than the return.

Jarque-Bera normality test shows that EXR, INFR and FFR are not normally distributed. Accordingly, the null hypothesis is rejected as the p-values are less than 0.05, while the null hypothesis cannot be rejected for IPI and GCI; this is also reflected in the values of skewness and kurtosis, where the skewness values are close to zero and kurtosis are almost three. However, based on the central limit theorem, the size of the sample used in the analysis is quite large (120 observation), which would not limit proceeding with the analysis and allows relying on the results of the t-statistics even when the normality assumption is violated however this requires choosing higher confidence level when selecting the significant variables (Habib and Islam, 2017).

Table 4.5: Descriptive Statistics for the macroeconomic variables

The table shows the descriptive statistics of the five macroeconomic variables employed in the current study. EXR is the exchange rate, INFR is the inflation rate, IPI is the industrial production index, FFR is the federal fund rate, GCI is the global commodity index. All the variables are measured in rate of change using monthly interval for the period from June 2010 to June 2020 (120 observation).

	EXR	INFR	IPI	FFR	GCI
Mean	0.012736	0.008755	0.002437	0.03078	0.002208

Median	0.001228	0.006833	0.006055	0.002618	0.004294
Maximum	0.766146	0.053326	0.149254	0.948914	0.080911
Minimum	-0.08932	-0.00523	-0.17015	-0.30773	-0.09571
Std. Dev.	0.076088	0.009896	0.055603	0.158113	0.036004
Skewness	9.141121	2.208404	0.002249	2.203054	-0.37454
Kurtosis	90.78843	9.331746	3.27518	13.3769	2.834763
Jarque-Bera	36184.72	268.1964	0.340849	571.9224	2.647955
Probability	0	0	0.843307	0	0.266075
Sum	1.375529	0.945578	0.263198	3.324257	0.238439
Sum Sq. Dev.	0.619459	0.010479	0.330806	2.674974	0.138704

4.2.2 Unit Root Test – Stationarity test

It is essential to check the stationary of the data when dealing with time series. If the data used are not stationary, this may result in having high R^2 without having realistic relationships between variables (Talla, 2013). The results of the stationarity tests using Augmented Dickey-Fuller test (ADF) for the five macroeconomic variables used as independent variables are presented in table 4.6, while the stationarity tests for the dependent variables presented by the 18 constructed portfolios are already presented in table 4.2. It could be observed that all the variables are stationary at level and have no unit root at level (P-value < 0.05); this proves the appropriateness of the time series data to apply the regression test.

Table 4.6: Augmented Dickey-Fuller test for the macroeconomic variables

The table shows the results of Augmented Dickey-Fuller test of the macroeconomic model variables. EXR is the exchange rate, INFR is the inflation rate, IPI is the industrial production index, FFR is the federal fund rate, GCI is the global commodity index. All the variables are measured in rate of change using monthly interval for the period from June 2010 to June 2020 which indicates the usage of 120 observation per variable.

Augmented Dickey-Fuller test	t-statistics	Prob.
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EXR	-8.360611	0.0000
INFR	-5.348494	0.0000
IPI	-4.193113	0.0011
FFR	-8.005651	0.0000
GCI	-7.550637	0.0000

4.2.3 Time series regression results

The regression tests using least square method are employed after testing the data for their stationarity to estimate the parameters of the regression model. Table 4.7 presents the results of the regression when using three groups of the dependent variables (size-BM, size-profitability and size-investment portfolios) as shown in panels A, B and C, respectively. For each portfolio constructed, the intercept, the coefficient, the t-statistics and p values for every factor are presented, in addition to the adjusted R^2 , R^2 , F-stat and standard error.

The intercept for most of the constructed portfolios is insignificant and almost zero, which means that there is not pricing error for most of the regression models. Panel (A) shows the regression results of the macroeconomic variables against portfolios constructed based on Size-BM. It is observed that the only significant variable is the Industrial Production Index (IPI), which showed a positive coefficient at different significance level. This indicates the powerful role of IPI in affecting the return of the portfolio constructed based on size-BM. The IPI coefficient of SH portfolio is 0.50778, which indicates that 1% increase in IPI will result in an increase in the return of SH portfolio by about 50%. The coefficient of IPI shows an increase with the increase in the value of the firms for the small sized companies from (SL) to (SH) and a decrease in value for the big sized ones, while when holding value constant, it is observed a decrease in the coefficient with the increase in market capitalization of the firms. Inflation rate (INFR) and Federal Fund Rate (FFR) have not shown any significant role, which indicates their weak impact on portfolios constructed based on value. As for Exchange rate (EXR) and Global Commodity Index (GCI), each variable showed a significant impact with only one portfolio, which is the big sized companies with neutral value (BN), which is also reflected in R^2 value of that portfolio (15%), which showed to be the highest one compared to the other portfolios. The coefficient of EXR is positive while GCI is negative for the six portfolios. The F-statistics is also examined to check for the overall fitness of the model; it is observed that three out of the six models are significant: SL, SH and BN. This means that the macroeconomic variables

in these models have a significant impact jointly on the return of the constructed portfolios (Habib and Islam, 2017).

Panel B shows similar results to those reached in Panel A as IPI is still the only most significant variable for five out of the six portfolios with positive impact. The coefficient is showing an increase with the increase in profitability level of the firms for both the small and big sized companies. INFR and FFR have not showed any significant impact while having the same coefficient sign as in the previous construction; this indicates their weak impact on portfolios constructed based on firms' profitability. EXR and GCI are also showing similar patterns to those shown in Panel A, whereas EXR is only significant for only one portfolio (BR) with positive coefficient. GCI is showing the same negative impact with 0.05 significance level for two portfolios that are (SW) and (BR). The highest explanatory power (R^2) is 15% for the big sized companies with high profitability (BR), which has three significant variables EXR, IPI and GCI and a significant probability for F-statistics.

Table 4.7: The results of the macroeconomic model regression

The table shows the results of running the regression analysis between the five macroeconomic variables employed in the current study and portfolios' excess return using 2x3 sorting method. EXR is the exchange rate, INFR is the inflation rate, IPI is the industrial production index, FFR is the federal fund rate, GCI is the global commodity index. All the variables are measured in rate of change using monthly interval for the period from June 2010 to June 2020 which indicates the usage of 120 observation per variable. Panels A, B, C represents the regression results based on size-BE, size-profitability, size-investment respectively. The table reports the intercept, the coefficient, the probability and t-statistics of each macroeconomic variable, the adjusted R^2 and R^2 and the F-statistics for each of the 18 portfolios constructed.

		EXR		INFR		IPI		FFR		GCI		Adj R ² / R ²	F- stat
	Int.	Coef	t-stat	Coe f	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat		Prob
Panel A: size-BE portfolios													
S L	-0.0046	0.180 0	1.1957 (0.235)	0.23 8	0.20 (0.84)	0.44	2.45 (0.0156) *	0.0428	0.6544 (0.514)	-0.44	-1.535 (0.1279)	0.06/0. 10	0.047
S N	-0.0020	0.016	0.096 (0.9236)	0.12 799	0.0977 (0.9224)	0.382	1.917 (0.058)*	0.0627 75	0.8656 (0.887)	- 0.362 5	-1.1323 (0.2599)	0.014/0 .06	0.26
S H	0.0065	0.081 2	0.61895 (0.5373)	- 0.41 05	- 0.3991 9 (0.6906)	0.5077 8	3.2457 (0.0016) ***	0.0779	1.36899 (0.1740)	- 0.287 228	--1.1435 (0.2555)	0.087/0 .13	0.01

B L	-0.0026 99	0.138 (0.3263)	0.986 (0.3263)	- 0.58 49	-0.5295 (0.5976)	0.3579	2.12998 (0.0356) **	0.0108 9	0.178 (0.8589)	- 0.385 9	-1.430 (0.1557)	0.029/0 .07	0.15
B N	-0.0009	0.332	2.511 (0.014)* *	- 0.86	-0.830 (0.408)	0.411	2.607 (0.011)* *	0.021	0.373 (0.710)	-0.499	-1.969 (0.052)*	0.109/0 .15	0.00
B H	0.015	0.241	1.405 (0.163)	- 1.30 0	-0.965 (0.337)	0.457	2.231 (0.028)* *	0.022	0.290 (0.772)	-0.473	-1.437 (0.154)	0.044/0 .09	0.086

Panel B: Size-profitability portfolios

S W	-0.009	0.093	0.601 (0.549)	0.01 5	0.012 (0.990)	0.409	2.203 (0.030)* *	0.022	0.325 (0.746)	-0.623	-2.087 (0.039)* *	0.052/0 .096	0.06
S N	-0.010	0.008	0.051 (0.960)	0.38 5	0.306 (0.761)	0.450	2.351 (0.021)* *	0.093	1.340 (0.183)	-0.302	-0.981 (0.329)	0.039/0 .08	0.1
S R	0.011	0.206	1.566 (0.121)	- 0.67 99	-0.659 (0.511)	0.363	2.310 (0.023)* *	0.018	0.313 (0.755)	-0.316	-1.256 (0.212)	0.043/0 .088	0.09
B W	0.011	0.204	1.029 (0.306)	- 0.67 6	-0.433 (0.666)	0.377	1.590 (0.115)	0.069	0.802 (0.425)	-0.309	-0.812 (0.419)	0.003/0 .05	0.38
B N	0.002	0.21	1.486 (0.140)	- 1.23 4	-1.115 (0.267)	0.423	2.513 (0.014)* *	0.0201	328 (0.743)	-0.425	-1.575 (0.118)	0.064/0 .10	0.03
B R	-0.006	0.222	1.840 (0.069)*	- 0.43 7	-0.462 (0.645)	0.414	2.879 (0.005)* **	0.024	0.463 (0.644)	-0.514	-2.227 (0.028)* *	0.110/0 .15	0.004

Panel C: Size-Investment portfolios

S C	-0.002	0.095	0.603 (0.548)	- 0.03	-0.025 (0.980)	0.377	2.014 (0.047)* *	0.036	0.535 (0.594)	-0.738	-2.453 (0.016)* *	0.065/0 .11	0.036
S N	0.002	0.091	0.600 (0.550)	- 0.37 8	-0.317 (0.752)	0.374	2.059 (0.042)* *	0.014	0.223 (0.824)	-0.37	-1.284 (0.202)	0.017/0 .06	0.24
S A	-0.012	0.065	0.458 (0.648)	0.50	0.454 (0.651)	0.488	2.899 (0.005) ***	0.0696	1.136 (0.259)	- 0.199 6	-0.738 (0.462)	0.059/0 .10	0.048
B C	0.019	0.205	1.145 (0.255)	- 1.29 6	-0.921 (0.359)	0.451	2.108 (0.038)* *	0.044	0.567 (0.572)	-0.429	-1.250 (0.214)	0.033/0 .078	0.13
B N	0.000	0.223	1.524 (0.131)	- 1.05 7	-0.921 (0.359)	0.456	2.611 (0.010)* **	0.039	0.608 (0.545)	-0.416	--1.485 (0.141)	0.067/0 .11	0.033
B A	-0.005	0.26	1.864 (0.065)	- 0.40 8	-0.367 (0.714)	0.429	2.534 (0.013)* *	0.000	-0.002 (0.998)	-0.462	-2.307 (0.0230) **	0.071/0 .11	0.02

*** significance at 1%, ** significance at 5%, and * denotes the significance at 10%.

Panel C of table 4.7 shows the results of regression for the six portfolios sorted based on size-investment. The results are similar to those reached in the other two sorting methods. IPI is the most significant variable with positive impact on portfolios sorted based on size and investment. The coefficient of IPI is showing an increase with the increase in the investment from conservative to aggressive strategy, whether the size of the firm is small or big. EXR, INFR and FFR show insignificant impact, which indicates that they are not able to explain the variation in return related to size and investment. GCI is specifically significant for two portfolios out of the six with negative coefficient; this indicates its limited role in capturing variation in return with its negative impact.

Conclusively, this section shows the limited role of the selected macroeconomic variable in explaining the variation in the return of portfolios sorted based on size-BE, size-profitability and size-investment. This is also verified by R^2 , which showed a low level, ranging from 5% to 15% i.e., the employed macroeconomic variables capture a limited level from the variation affecting the constructed portfolios return, adding that the only significant variable is IPI. However, it should be noticed that although the limited significant impact of the macroeconomic variables, this does not mean that there is not a relationship between the macroeconomic variable and the dependent variable- especially after noticing that the coefficients values are statistically different from zero- but it means that the results cannot be generalized outside the sample used in this study.

The positive role of IPI observed in this study is supported by economic theory as the increase in the industrial production index means a boost in several industries and an increase in the economic growth of the country. The increase in firms' production level will result in an increase in their stock prices.

The negative impact of inflation rate is also supported by literature. It is explained that the increase in inflation rate is accompanied by an increase in cost of living causing a deviation away from the purchase of stocks, a decrease in their demand and accordingly a decrease in firms' stock prices. It also implies that the Egyptian stock market cannot be used to hedge against inflation and that the investors should search for other investment opportunities. The increase in inflation is associated with an increase in interest rate and cost of borrowing, which will affect the profit of the companies traded in Egyptian stock market and their desire to expand negatively. However, the observation of INFR coefficient in the three panels revealed its

positive impact on SL, SN portfolios in Panel A and SW and SN in Panel B and SA in Panel C. The common denominator about these portfolios is that they are all constructed of firms with small market capitalization. This means that with the increase in inflation rate, there is a shift toward small sized companies with different characteristics regarding their value, profitability and investment.

Regarding exchange rate, the positive coefficient found in this study means that the depreciation in the value of the Egyptian currency will have a positive impact on the firms' return and the opposite in case of currency appreciation. This could be explained by the fact that the depreciation of the national currency makes the products of country's firm cheaper, resulting in higher profits that foster the economy and have a positive impact on the stock market.

Empirical results reached in this study regarding the FFR are different from what is illustrated by the economic theory. It is expected that the increase in FFR would affect the emerging economies negatively by drawing the capital away from these markets. However, this is not the case for the Egyptian stock market as a positive insignificant impact of FFR is noticed. This indicates the limited role of FFR in explaining the variation in the return of the constructed portfolios. The positive relationship could be justified, as the period under study witnessed depreciation in the value of the Egyptian pound, making investing in the Egyptian stock market more profitable regardless of the increase in FFR; this is supported by the positive relationship found between the depreciation of the Egyptian pound and the portfolios' return. Also, the depreciation of the Egyptian pound made it costly to withdraw the capital to outside markets. A point that could justify the weak role of FFR in the Egyptian stock market is the limited interest of the Egyptian individual investors in trading in the international stock market (based on the analysis of their responds in the survey employed to test the behavioral model presented in chapter five); the majority of the survey participants declared their limited interest in the international stock markets. This provides an explanation to the weak insignificant signals sent by exchange rate risk and changes in federal fund rate to the Egyptian stock market.

As for GCI, which is composed of both fuel and non-fuel prices together in this study, the results in table 4.7 reveal its negative insignificant impact on the return of the constructed portfolios. This moves in line with what is explained by the economic theory as the increase in the commodities' prices, which include oil, agricultural products and metals, will cause an increase in the cost of living and a shift away from the stock market and causing a decrease in stocks prices. The negative response also explains that most of the Egyptian companies are

importers for these commodities; that is why an increase in commodities' prices affects them negatively, while the insignificant impact could be due to the limited dependence of the Egyptian economy on importing natural resources, along with the depreciation of the Egyptian pound, which makes the imported products more expensive. Most of the Egyptian economy imports are minerals and chemical products, followed by agricultural products, livestock and foodstuff like (maize, wheat and meat).

The weak response of the Egyptian stock market to the global macroeconomic variables (FFR and GCI) indicates its segmentation and supports the idea that the emerging markets provide a better diversification opportunity than the developed markets because of their weak correlation with the global changes.

4.2.4 Diagnostics test

Table 4.8 presents the results of the diagnostics tests. The p-value column of the serial correlation test illustrates that the values are all greater than 5% ($p > 0.05$). This indicates the absence of correlation in the residual, and the null hypothesis is not rejected except for three models: BH, BW and BC. As for the heteroscedasticity test, Breusch-Pagan-Godfrey test has been used and shows that the p-values are greater than 0.05 for all portfolios; hence, the null hypothesis cannot be rejected and indicates that the residual are homoscedastic. Finally, normality test for the residual is examined using Jarque-Berra. The p-values are insignificant for six portfolios out of the 18 portfolios at 0.05, which indicates that the residual distribution is not normal for the other portfolios and the null hypothesis cannot be accepted. However, the t-statistics can be reliable as the sample size is large enough (120 observation) (Islam and Habib, 2017). Accordingly, the diagnostics test results can conclude that the residual are pure white noise.

Table 4.8 Serial Correlation, Heteroscedasticity test and residual normality tests of the macroeconomic model.

The table shows the results of serial correlation, heteroscedasticity test and residual normality tests of the 18 macroeconomic models based on the 18 constructed using 2x3 sorting method. The portfolios used are constructed based on 2x3 sorts: size-BE/ME, size-profitability and size-investment. The stocks used in constructing the portfolios are stocks that constitute EGX100 which are reduced to 47 stocks based on specific criteria that are described in details in section 3.3.1.1. The data analyzed using monthly interval for the period from June 2010 to June 2020 which indicates the usage of 120 observations.

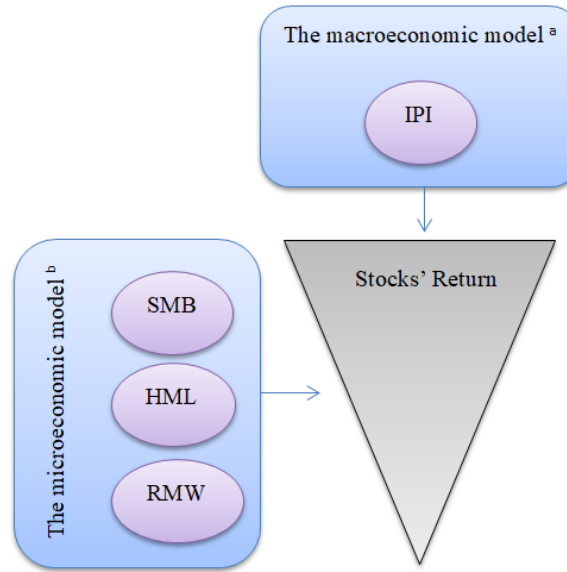
		Correlation test (Breusch-GodFrey)	Heteroscedasticity test	Residual normality (Jarque-Bera)
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			(Breusch-Pagan- Godfrey)	
		Prob. F	Prob. F	Prob.
Size- BM portfolios	SL	.0733	0.6	0.033
	SN	.057	.08488	0.0000
	SH	.0525	0.711	.058
	BL	.03373	0.95	.0106
	BN	.08792	.08706	0.0000
	BH	.00134	.09798	0.0000
Size-OP portfolios	SW	.06954	.06335	0.0815
	SN	.05009	.07984	.01968
	SR	.09787	.08063	0.0000
	BW	.00028	.09836	0.0000
	BN	.09522	.05787	0.0000
	BR	.03412	.07492	0.017
Size-investment portfolios	SC	.09442	.09421	0.0698
	SN	.04093	0.5089	.00266
	SA	.07226	.08260	.05633
	BC	.0000	.09975	0.0000
	BN	.07794	.07559	0.0000
	BA	.07826	.07936	0.0299

Based on the results reached above for the micro and macro model, the conceptual augmented framework developed in chapter two figure 2.1 can be modified to the following figure 4.1. The figure shows the applied micro and macroeconomic models after getting the regression results of these two models. The macroeconomic model is reduced to include the industrial production index (IPI) as the only variables among the selected five macroeconomic variables to show a significant impact on portfolios' excess return using different construction methods. The microeconomic model is modified to include size, value and profitability variables out of the five variables presented in Fama and French five-factor model.

Figure 4.1 represents a part of the final applied augmented framework, which aimed to be reached after examining the conceptual behavioral model.

Figure 4.1: The micro and macroeconomic significant variables.



a: IPI = Industrial Production Index.

b: SMB = small minus big, HML= High minus low, RMW= robustness minus weak.

Also based on these results, an augmented equation of the significant micro and macroeconomic variables with respect to the Egyptian stock market is provided next:

$$R_{pt} - Rf_t = \beta_0 + \beta_1 SMB_t + \beta_2 HML_t + \beta_3 RMW_t + \beta_4 IPI_t + Y_{it}$$

The reached applied micro and macro model is customized for the Egyptian stock market as it represents the most significant micro and macroeconomic variables in the Egyptian market. This means that different significant variables can be reached in different stock markets. Accordingly, the financial analyst and policy maker within each market can build a customized model when running the same regression analysis using the conceptual model employed in this study.

4.3 Conclusion

This chapter shows achievement of the first two objectives set to reach the applied augmented stock pricing framework. The the microeconomic and macroeconomic model (as two of the three theories investigated in this study to reach the augmented applied framework) are examined using time series regression analysis to determine the most significant variables according to the Egyptian stock market.

The next chapter continues the realization of the objectives imposed to reach the augmented applied framework, where the conceptual behavioral model is examined.

CHAPTER 5 EMPIRICAL STUDY- BEHAVIORAL MODEL RESULTS.

5.0 Introduction

This chapter continues the conduction of the third step of testing the proposed conceptual framework (figure 2.1) that started in the previous chapter. In this chapter, the conceptual behavioral model is tested as the third model of the integrated conceptual framework. The chapter starts by introducing the steps followed to develop and conduct the survey used for testing the behavioral model. Then, the chapter provides the main findings and results after running the data analysis to discover the factors influencing investment decision making. A descriptive analysis of the behavioral variables and respondents' profiles is provided; also, validity and reliability tests are conducted using Statistical Package of Social Science (SPSS). Furthermore, the structural equation modeling (SEM) is used to test the proposed behavioral model while multiple regression analysis is employed to explore the impact of each behavioral variable on investment decision. Finally, the conclusion section represents a summary of the current chapter.

5.1 The behavioral model

Most of the studies that have tested the behavioural variables have used proxies. For example, the investors' sentiment was measured by market ratios, like trading volume, dividend premium, the index developed by Baker and Wurgler (2006). Also, suicide rate and aviation disasters were used to measure the negative social mood (Choi, 2016; Kaplanski and Levy, 2010); the turnover rates and exceptional return were used to measure investor's attention (Yang *et al.*, 2017). Based on the variation and the number of the behavioral variables examined in this study; it is found that the survey is the most suitable tool that can be used to measure the impact of these variables at once. Accordingly, this study measures the effect of the behavioral variables using a structured survey.

5.1.1 Conducting the survey

Beside the studies that used market ratio proxies to measure the behavioral variables, other studies used surveys, but neither of these studies did capture all the behavioral variables presented in the current study. The maximum of behavioral variables measured in a survey according to the researcher's knowledge was made by Chandra and Kumar (2012). Chandra and Kumar (2012) measured the significance of eight variables through their study on the Indian stock market. However, the value of this study emerges from the fact that it combined and

merged 41 variables into 13 main variables that will be tested in this study which are: environmental variables, weekend versus weekday's effect, representativeness, availability, anchoring, disposition effect, mood, overconfidence, pessimism, gambler fallacy, personality traits, neurotransmitters and emotional intelligence.

The questionnaire is divided into three parts. The first part is developed to get knowledge about the investor's demographic characteristics; the second part consists of questions that examine the respondent's investment decision, while the third part contains questions for each variable under every behavioral discipline. The variables were measured using five-point Likert-scale, ranging from 1 (strongly disagree) to 5 (strongly agree) except for the gambler's fallacy and environmental variable's questions because of the nature of the questions employed for measuring these variables that were found in the literature (see table 5.1). Also, the weekend-weekdays effect will be measured as a dummy variable to control for any effect that occurs during the week. The day in which the respondent answered the questionnaire can be used to examine the weekend-weekdays effect on the investment decision process (Kaplanski *et al.*, 2015)

Figure 3.10 presented in chapter three represents the hypothetical behavioural model for the behavioural factors that will be measured using the survey.

5.1.2 Data collection of the behavioral survey

As any capital market, the trading activity in the Egyptian stock market is executed by individual and institutional investors. The individual investors constitute 95% of the Egyptian market participants in 2020; however, the trading activity of the individual investors is 24%, relative to 43% made by institutions, while the rest represents the trading activity made by non-Egyptian investors (EGX, 2021). The current study is focusing on the individual investors' investment decision as they are more prone to behavioral deviations than the institutional investors, who are able to manage their skills and relate the appropriate information with the decision (Itzkowiz and Rothbort, 2016). Thus, the individual investors dealing with the Egyptian stock market who have knowledge and experience to answer the prepared questions are the required respondents. The sampling techniques employed are convenient sampling because of the lack of reaching the sampling frame of the Egyptian individual investors trading in the Egyptian stock market (Elhariry, 2018). In addition to snowball sampling, in which the first respondents were asked to nominate other respondents who have the same characteristics to undertake the survey.

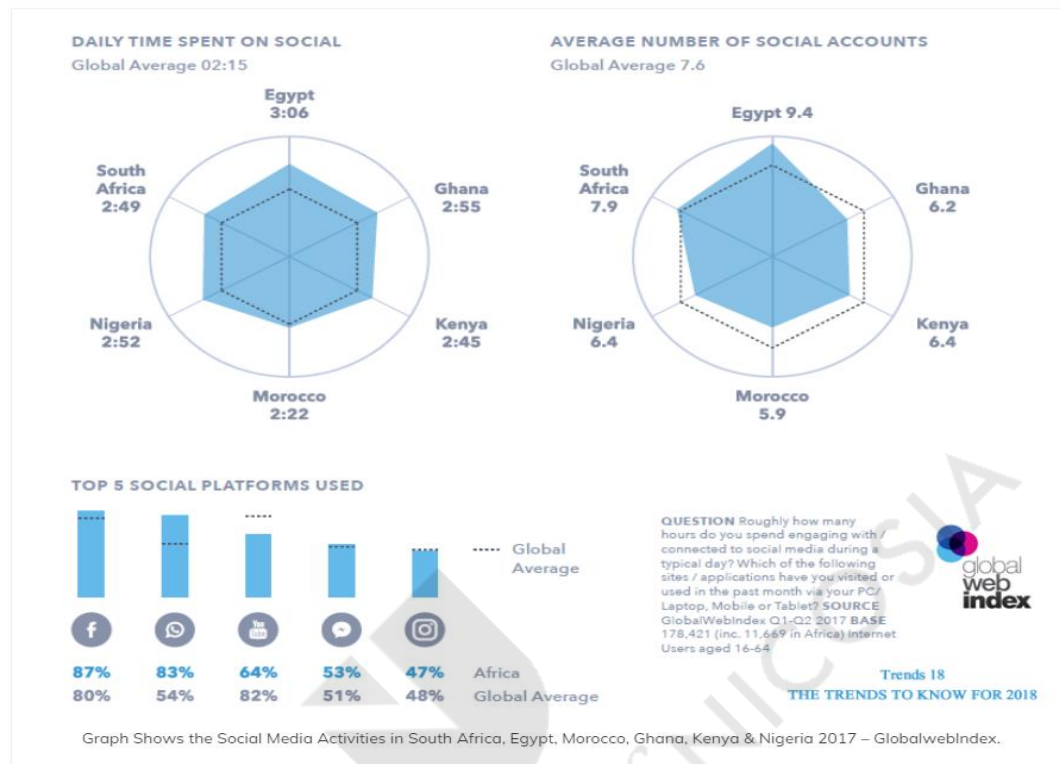
To reach the required respondents, the online survey is employed since the percentage of the Egyptians participating in the Egyptian equity market is less than 1 percent based on Egyptian stock market record in 2019 while, this percentage is widely dispersed in the large geographical area of the country, which increases the difficulty of distributing and collecting the surveys manually. Preparing the survey using the online Google form enabled setting validity questions to ensure that the respondents are Egyptian investors with an experience in stock's trading and their age is above 18 years old.

Since the target participants are widely dispersed and it is impossible to get their contact information (phone numbers or emails), and because of the advancement in web services and the increased use of social media tools (Facebook and WhatsApp), especially in digital marketing, the study used Facebook as a social media tool in distributing the survey. The following figure 5.1 represents the average time spent by six African countries using social media, among which Egypt comes in the first place with average of 3 hours and 6 seconds per day (according to Global Web index questions with internet users aged from 16-64 in 2017). Also, the figure shows that the most dominant social media platforms used are the Facebook and WhatsApp. Additionally, the crowd analyzer¹³ has revealed that there are 35 million active Facebook accounts in Egypt in 2018 (Digital marketing community, 2017) while Nashwa Ali – the Facebook regional director of public policies in the MENA region- had declared that there is 38 million Egyptians using Facebook on a daily basis (Al-Masry Al-Youm, 2019).

Accordingly, the researcher has searched for the Facebook groups that provide news and information about the Egyptian stock market and pages that provide some market analysis to help investors in making their decisions. The researcher has asked the admins of these groups to allow posting the survey in their groups.

¹³ Crowd analyzer is the first Arabic Internationally known tool that monitor social media platforms using its algorithms (Digital marketing community, 2017).

Figure 5.1: The use of social media platforms



Source: (Digital marketing community, 2017).

There are several reasons that justify the adoption of this way: firstly, difficulty in getting an updated database for the Egyptian investors, whereas based on an interview with someone of authority in the M.C.D.R (Misr for central Clearing, Depository and Registry)¹⁴, he informed the researcher that when an Egyptian citizen decides to participate in the stock market, he/she issues the personal code for trading from the headquarters of the Egyptian stock market, and then there is no communication with him/her. Secondly, most of the brokerage firms' policies do not accept to provide any contact details about their clients, even some showed no attention to participate in the survey. Thirdly, the increased use of mobile phones and social media tools and the limited face to face communication have promoted the trading activities to function electronically. All these challenges and opportunities have forced the researcher to employ the mentioned methods to reach the target respondents.

¹⁴ Upon the interviewee request, the researcher cannot reveal his identity or position.

The dissemination of the survey for the data collection started from the beginning of November 2019 until the end of January 2020. Using these techniques, the study succeeded in reaching 212 participants, which is appropriate to apply the Structural Equation Modeling (SEM) technique (Sivaramakrishnan *et al.*, 2017; Fan *et al.*, 1999). It is worth mentioning that the pilot study participants are not counted in the final sample size because of the changes made in the initial version of the survey based on the pilot test results and face validity results as presented in section 3.3.4.1.3.

5.2 The results for the behavioral model

This section shows the results and the analysis for the behavioral model. The study uses the Structural Equation Modeling (SEM) to examine the relationship between the proposed behavioral conceptual model and investment decision, as displayed in figure 3.10. The SEM is done using maximum likelihood estimation to display the relationship between the dependent and independent variables, using LISREL 8.8 statistical package.

This section is divided into three subsections, where firstly the validity and reliability test of each behavioral variable are presented to validate the instrument used for measuring each variable. Secondly, the descriptive statistics will be listed for the behavioral variables and respondents' profiles. Thirdly, the significant behavioral constructs are determined after conducting confirmatory factor analysis to either confirm or disconfirm the developed behavioral conceptual model (see figure 3.9), and then the results of the structural equation modeling are presented, in addition to multiple regression analysis to show the direction of the relationship between each behavioral variable and investment decision.

5.2.1 The validity and reliability results of the behavioral model variables

Construct validity is examined using exploratory and confirmatory factor analysis, whereas exploratory factor analysis is done using Principal component analysis through employing varimax rotation as extraction method. Varimax rotation is the most common orthogonal rotation method used in simplifying the columns of the factor matrix (Hair *et al.*, 2014). Table 5.1 shows the results construct validity and internal consistent reliability of each variable. Construct validity is measured using convergent and discriminant validity whereas convergent validity is measured by: the Average Variance Extracted (AVE) and factor loading while discriminant validity is measured by showing the relation between AVE and correlation matrix. The AVE represents the average communality for each latent factor. It should be greater than

0.5 to imply adequate validity. The factor loading measured for each item (statement) should be greater than or equal to 0.4 to represent a sufficient correlation between the item and the variable (Hair *et al.*, 2014), while the discriminant validity is used to ensure that each variable is distinct from other variable, where the AVE of two variables should be greater than the squared correlation between the two variables (Hair *et al.*, 2014). To examine reliability, Cronbach's Alpha is used to assess the appropriateness of the items used to measure each variable as a group. If Alpha coefficients are greater than or equal to 0.6, it implies adequate reliability (Hair *et al.* 2014).

Table 5.1: Validity and reliability tests for the behavioral model variables

Variables	\sqrt{AVE}	AVE	Cronbach's Alpha	Item	Factor Loading
The use of Emotional Intelligence	.795	63.139 %	.796	EI1	0.795
				EI2	0.744
				EI3	0.837
				EI4	0.799
Openness	.786	61.717 %	.692	Op1	0.753
				Op2	0.770
				Op3	0.831
Conscientiousness	.886	78.551 %	.727	Co1	0.886
				Co2	0.886
Extroversion	.762	58.126 %	.64	Ex1	0.722
				Ex2	0.814
				Ex3	0.748
Agreeableness	.778	60.535 %	.616	Ag1	0.547
				Ag2	0.876
				Ag3	0.866
Neuroticism	.846	71.626 %	.602	Ne1	0.846
				Ne2	0.846
Dopamine	.794	63.049 %	.707	Do1	0.691
				Do2	0.815
				Do3	0.867
Serotonin	.817	66.772 %	.818	Se1	0.847
				Se2	0.694
				Se3	0.904
				Se4	0.819
Epinephrine	.816	66.593 %	.743	Ep1	0.862
				Ep2	0.870
				Ep3	0.705
Norepinephrine	.782	61.22%	.675	No1	0.798
				No2	0.756
				No3	0.792
Representativeness	.78	60.838 %	.674	REP1	Deleted
				REP2	Deleted

Variables	\sqrt{AVE}	AVE	Cronbach's Alpha	Item	Factor Loading
				REP3	0.751
				REP4	0.847
				REP5	0.737
Availability	.701	55.340 %	.729	HER1	Deleted
				HER2	Deleted
				HER3	Deleted
				HER4	Deleted
				HER5	Deleted
				HER6	0.667
				HER7	0.701
				HER8	0.818
				HER9	0.766
Anchoring	.761	57.9%	.631	ANC1	0.800
				ANC2	Deleted
				ANC3	0.805
				ANC4	Deleted
				ANC5	0.670
Disposition Effect	.782	61.185 %	.666	DIS1	Deleted
				DIS2	Deleted
				DIS3	0.839
				DIS4	0.815
				DIS5	0.684
				DIS6	Deleted
				DIS7	Deleted
				DIS8	Deleted
				DIS9	Deleted
Overconfidence	.794	52.602 %	.813	OVER1	0.594
				OVER2	0.697
				OVER3	0.825
				OVER4	0.831
				OVER5	0.779
				OVER6	0.582
Pessimism	.704	49.532 %	.654	Pe1	0.610
				Pe2	0.723
				Pe3	0.722
				Pe4	0.752
Gambler Fallacy	.847	71.82%	.504	GF1	Deleted
				GF2	Deleted
				GF3	0.847
				GF4	0.847
Environmental Variables	0.86	73.454 %	.635	SEA1	0.857
				SEA2	0.857
Stock Investment Decisions	.764	58.421 %	.821	SID1	Deleted
				SID2	0.602
				SID3	Deleted

Variables	\sqrt{AVE}	AVE	Cronbach's Alpha	Item	Factor Loading
				SID4	0.813
				SID5	0.843
				SID6	0.787
				SID7	0.753

As shown in the previous table, the Cronbach's alpha used to measure the reliability is accepted for all the variables as α is greater than 0.6 except for gamblers' fallacy (0.504); however, as it is the only case, this could be accepted for behavioral variables (Kline, 2000), while the overall Cronbach's alpha for the whole survey is 0.827, which also indicates the appropriateness of the whole survey employed. As for the validity, the items whose factor loading is more than 0.4 are accepted, while the items with factor loading lower than 0.4 were deleted, such that the five items used to measure representativeness were found to be loaded over two components; accordingly, a rotation was made through varimax rotation by using factor analysis. After rotation, the items number 3, 4, 5 were loaded on one factor with AVE 0.60838, but the other 2 elements 1, 2 loaded over another factor with AVE 0.4235. Thus, the first component is selected to reflect to the representativeness variable.

The same for availability: the nine items used to measure the availability behavior are found to load over three components. After rotation, the items number 6,7,8,9 are loaded on one factor and the AVE, for this factor is 0.54834, but the other 2 factors got less than 0.50 for AVE. Thus, the first component is selected to reflect the availability variable. Also, anchoring behavior is found to be better represented by items 1, 3, 5. The items 3, 4, 5 are used for disposition effect, items 3, 4 for gambler fallacy and items 2, 4, 5, 6, 7 for the stock investment decision variable. The final version of the survey after removing the items with low factor loading is available in the appendix (appendix 4).

Table 5.2 shows the discriminant validity of the variables, where it could be observed that all square roots of AVE values are greater than the correlations between the corresponding variable and other variables. This means that the variables employed in the behavioral model have adequate discriminant validity.

Table 5.2: Correlation matrix discriminant validity of the behavioral model variables.

	EI	OP N	CN	EX T	AG R	NE U	DO P	SE R	EPI	NO R	RE P	HE R	AN C	DI S	MO D	OV C	PE S	GA M	SE A	WD E
EI	0.795																			
OP N	.429**	0.786																		
CN	.523**	.155**	0.886																	
EX T	.287**	.301**	.206**	0.762																
AG R	.130	.177**	-.085	.190**	0.778															
NE U	.046	.223**	-.047	.120	.096	0.846														
DO P	.007	.139*	-.100	.163*	.075	.260**	0.794													
SE R	.083	.130	-.194**	.055	-.028	.196**	.440**	0.817												
EPI	-.010	.086	.160*	.034	.004	.360**	.542**	.449**	0.816											
NO R	-.085	.079	.167*	-.001	.029	.207**	.403**	.355**	.364**	0.782										
RE P	-.050	.118	-.048	.167*	.004	-.002	.145*	.029	.006	.063	0.78									
AV A	.097	.148*	-.042	.345**	.159*	.026	.225**	.075	.090	.152*	.330**	0.74								
AN C	.103	.094	.099	.161*	-.066	-.052	.063	.061	-.102	.047	.215**	.191**	0.761							
DIS	.094	.162*	.241**	-.098	.024	.178**	.035	-.089	.101	.053	-.069	-.089	.160*	0.782						
MO D	.012	.136*	-.119	.181**	.134	.203**	.178**	.173*	.276**	.192*	.069	.094	.097	.058	1					
OV C	.418**	.224**	.293**	.193**	.003	-.079	-.141	-.048	.187**	.189*	-.080	-.034	.104	.032	-.088	0.725				
PE S	.058	-.117	.164*	.033	-.096	.078	.145*	.050	.139*	.080	-.013	.182**	.174*	.402**	.163*	-.004	0.704			
GA M	.084	.066	.055	.097	-.018	.070	.069	-.034	.015	-.075	.023	-.002	.012	.022	.035	.004	.042	0.847		
SE A	.009	.188**	.003	.031	-.058	.113	.190**	.136*	.196**	.079	-.018	-.078	-.074	.040	.266*	-.068	.084	.027	0.86	
WD E	-.016	.116	-.006	-.058	.022	.047	-.002	.039	-.021	-.004	-.029	-.151*	-.043	.082	.037	-.023	-.098	-.059	-.069	1

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

5.2.2 Descriptive analysis

The descriptive statistics is a tool that explains and gives a distinct understanding of the features of certain data set, by giving short summaries about samples and how to measure the data. The major types of descriptive analysis are the measure of central tendency, such as the mean, measure of variability such as standard deviation and frequency. The measure of central tendency suggests a unique value that generally represents the entire scores set. Measures of variability describes the level of how different the scores are from the mean. Frequency statistics sums how many times each variable is repeated. This study used the Statistical Package for Social Science (SPSS) for the descriptive statistics.

Table 5.3 shows the respondents' profile while table 5.4 shows the mean and standard deviation of each variable. Form table 5.3, it could be observed that the number of male respondents is higher than female respondents as it got 84.2%, while the age group from 26 to 40 years old is higher than other age groups with a percentage of 43.3%. Moreover, Bachelor degree has the highest number of respondents as it got 70.2% of the sample, and Monthly Income less than \$1,000 is higher than other income levels with a percentage of 56.3%. As for the marital status, the married investors dominate the respondents with 75%. Among the respondents 59% are employees, 43.9% are moderately knowledgeable about stock market, while 28.3% of the respondents, trade on a daily base.

Table 5.3: Respondents' profile

		Frequency	Percent %
Gender	Male	179	84.4
	Female	33	15.6
Age	18 to 25 years old	13	6.1
	26 to 40 years old	90	42.5
	41 to 60 years old	94	44.3
	More than 60 years old	15	7.1
	University student	7	3.3
Level of Education	Bachelor degree holder	149	70.3
	Master degree holder	36	17.0
	PhD degree holder	20	9.4
	less than \$1,000	121	56.3
Monthly Income	From \$1,000 to \$2,000	52	25.1
	More than \$2,000 to \$3,000	21	10.2
	More than \$3,000 to \$4,000	6	2.8
	More than \$4,000	12	5.6
	Single	47	22.2
Marital Status	Married	159	75
	Widowed	1	.5
	Divorced	5	2.4
	No children	56	26.4
No. of children	one child	32	15.1
	two children	67	31.6
	more than two	57	26.9
Job nature	own business	87	41.0

	Employee	125	59.0
Trading experience	less than one year	17	8.0
	over a year to 5 years	53	25.0
	over 5 years to 10 years	48	22.6
	over 10 years to 15 years	54	25.5
	Over 15 years	40	18.9
Investment knowledge	not knowledgeable at all	4	1.9
	fairly knowledgeable	41	19.3
	moderately knowledgeable	93	43.9
	very knowledgeable	74	34.9
Trading frequency	on a daily basis	60	28.3
	on a weekly basis	52	24.5
	on a monthly basis	45	21.2
	on a quarterly basis	32	15.1
	on a yearly basis	23	10.8

Table 5.4: The mean and standard deviation of the behavioral variables

	Mean	Std. Deviation
SID	2.5736	.92918
EI	3.9717	.74808
OPN	3.5425	.86155
CN	3.7406	.96314
EXT	2.8836	.91566
AGR	3.7138	.73495
NEU	3.2807	.99775
DOP	1.9308	.90487
SER	1.9658	.88581
EPI	2.3318	.97385
NOR	2.0676	.65482
REP	2.3758	.69511
AVA	2.1014	.82775
ANC	2.5362	.63532
DIS	3.6572	.80081
MOD	3.3821	1.17649
OVC	3.6423	.65153
PES	2.9729	.80881
GAM	2.6509	.60866
SEA	2.0873	.55986
WEWD	1.4623	.49975

5.2.3 Determining the significant behavioral variables

As explained in the literature review, most of the studies that examined the behavioral variables had used simplified versions including single variables to study their impact on stock markets. However, real life involves a complex of conflicting factors affecting particular situation simultaneously and working together toward the emergence of a specific action. Previous empirical work and theories were used in developing the conceptual model presented in this study and afterwards the development of the hypothetical behavioral model presented in figure 3.10.

In this section, the hypothesis under study, regarding the influence of the behavioral variables on investment decision, is tested using the Structural Equation modeling (SEM). Hair *et al.* (2014) explained that the conduction of the structural equation modeling is done on six stages: “1- Defining individual constructs, 2- Developing the overall measurement model, 3- Designing a study to produce empirical results, 4- Assessing the measurement model validity, 5- Specifying the structural model, and 6- Assessing structural model validity” (Hair *et al.* 2014, p. 565). The Confirmatory factor analysis (CFA) is used to cover the first four stages (Hair *et al.*, 2014).

This section is divided into three subsections hereafter: firstly, the confirmatory factor analysis is employed to either confirm or disconfirm the developed conceptual behavioral model, depending on the results of model fit indicators. Secondly, structural equation modeling is employed to reach a behavioral statistical significant applied model. Thirdly, multiple regression analysis is conducted to determine the direction of the relationship between each behavioral variable and investment decision.

5.2.3.1 The confirmatory factor analysis results

The main goal of the confirmatory factor analysis (CFA) is to generate a model that statistically fits well, using the data gathered (Schumacker and Lomax, 2010). CFA is used to prove or deny that a specific construct is defined by a particular subset of observed variables, whereas measurement model is used to describe how a set of variables represents a construct. For the conceptual behavioral model proposed in this study, it is hypothesized that there are four main constructs (latent variables) measured by a specific group of observed variables (see figure 3.10), such that the seasonality construct is measured by environmental variables and weekend-weekday's effect. Cognitive and heuristics construct is measured by representativeness, availability, anchoring, disposition effect and mood. Biases construct is composed of overconfidence, pessimism and gambler fallacy. Neuro-psychology construct is associated with

personality traits, emotional intelligence¹⁵ and neurotransmitters. In this section, the CFA is used to confirm or disconfirm these building blocks. For examining the construct validity of the proposed behavioral conceptual model, various fit indices are used, if the model is properly fit, then the proposed model is supported using the actual data.

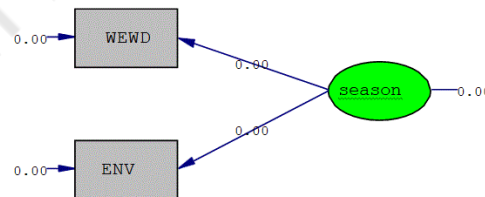
As shown in the following CFA figures, the observed variables are always drawn in rectangles, while the construct (latent variables) are drawn in circles. Lines between them represent the relationship known as factor loading. The values written on the lines directed to the observed variables are the measurement errors and represent that there is a portion of each observed variable used in measuring something other than the hypothesized factor.

For the seasonality construct, figure 5.2 is shown below; there are two measurement equations: one for each observed variable with two factor loadings and two measurement errors. The following figure shows a rejection of this construct because the model is under-identified, as the number of the free parameters should be less than or equal the number of the distinctive values in the matrix S (Schumacker and Lomax, 2010). The count of the free parameter for this construct is four (two factor loading + two measurement errors), while the number of the distinct values in the matrix S is calculated using the following equation:

$$P(P+1)/2 = 2(2+1)/2 = 3,$$

where p represents the number of the observed variables. As calculated, the number of the free parameters is more than the number of the distinct values in the matrix S, making the degree of freedom equals, $df = 3-4 = -1$. Accordingly, this model is under-identified, preventing the calculation of the factor loading and measurement error.

Figure 5.2: Confirmatory factor analysis of the seasonality construct



Chi-Square=0.00, df=0, P-value=0.00000, RMSEA=0.000

¹⁵ The study used one branch of this factor based on Mayer and Salovey's Ability EI model.

For the cognitive and heuristic construct, the following figure is produced. There are five measurement equations, one for each observed variable with five factor loadings and five measurement errors. The count of the free parameter of this construct is ten (five factor loading + five measurement errors), while the number of the distinct values in the matrix S is $5(5+1)/2=15$; accordingly, the degree of freedom equals, $df = 15-10= 5$.

The review of the absolute fit indicators revealed the statistical significant of the chi-square (χ^2) (10.85) from the five degree of freedom. It is interpreted that if the value of the chi-square is not close to the degree of freedom, then the model fitness is weak, while Kline (2004) explained that reasonable fit is achieved when the value of chi square adjusted by degree of freedom be less than 3 ($\chi^2/df \leq 3$). Following this rule, the construct formed here is reliable as $\chi^2/df = 2.17 \leq 3$. A second indicator of fitness is the root mean square error of approximation, which should be less than 0.08 or 0.05 (RMSEA < 0.08 or 0.05) (Schumacker and Lomax, 2010), as shown it is 0.074, which is poorly acceptable. There is also the non-centrality parameter (NCP) calculated as chi-square - degree of freedom (χ^2-df) and should have a zero value. According to this construct, it is $10.85-5= 5.85$. There is also the goodness of fit index (GFI), which is 0.98, and it is within the acceptable range as it is interpreted to have values more than 0.95 or 0.90 (Schumacker and Lomax, 2010).

The review of the above indicators reveals the reasonable fitness of this model; however, the incremental fit indices proved that the model needs modification as the Normed Fit Index (NFI) is 0.8, less than cut off level of 0.95; this index measures fitness of the model relative to the baseline model. The same for Comparative Fit Index (CFI), which is the mostly used fit index as it is the least affected measure by the sample size (Lakshmi *et al.*, 2013); values greater than 0.9 indicate good fit (Hu and Bentler, 1995), but for cognitive and heuristics construct, the CFI is 0.87. Also, the Parsimony Normed Fit Index (PNFI), which should have value greater than 0.5, is 0.4 for this construct. All of the above indicators indicated the need for modification for this construct; this could be achieved through removing the variables whose *t*-values are less than 1.96 determined from the measurement equation of each observed variable (Schumacker and Lomax, 2010). Figure 5.3 shows that disposition effect and mood have insignificant values for the *t*-values at 0.05 significance level (-0.58 and 1.63, respectively) that requires their removal from the model.

Figure 5.3: Confirmatory factor analysis of cognitive and heuristics construct.

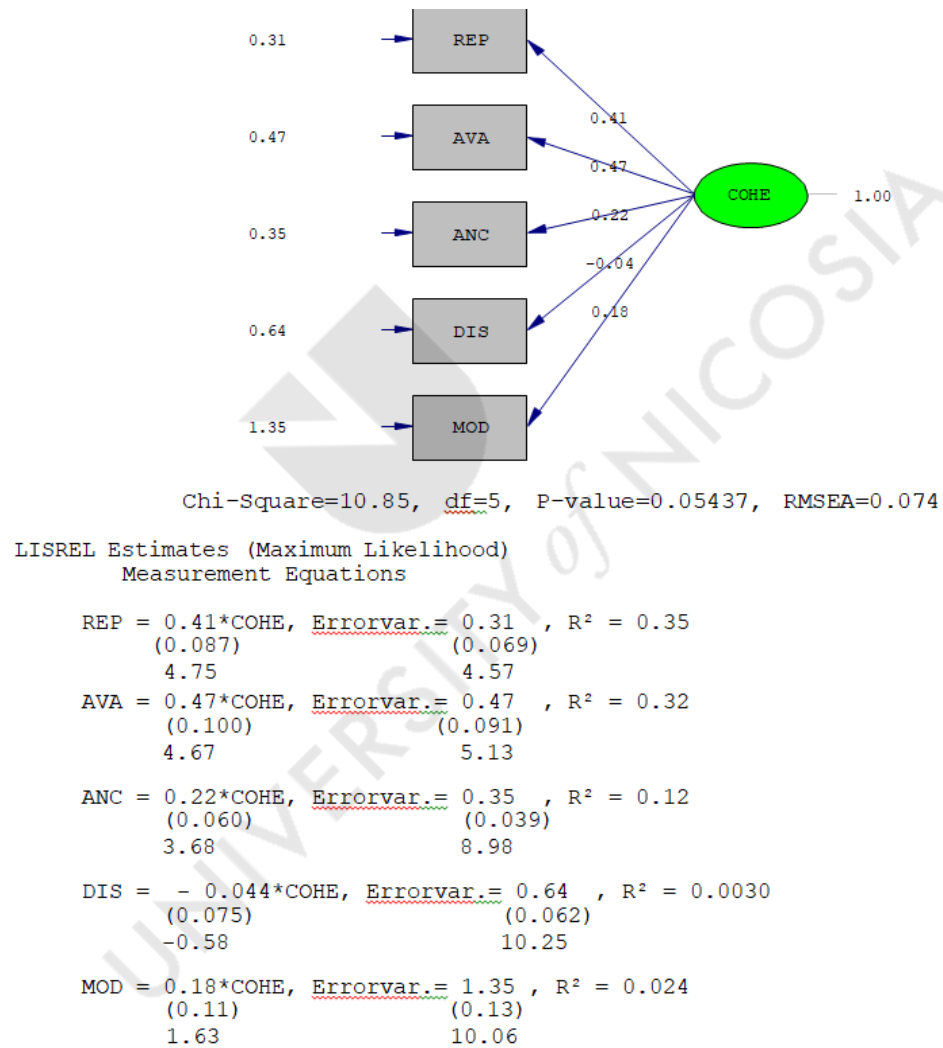
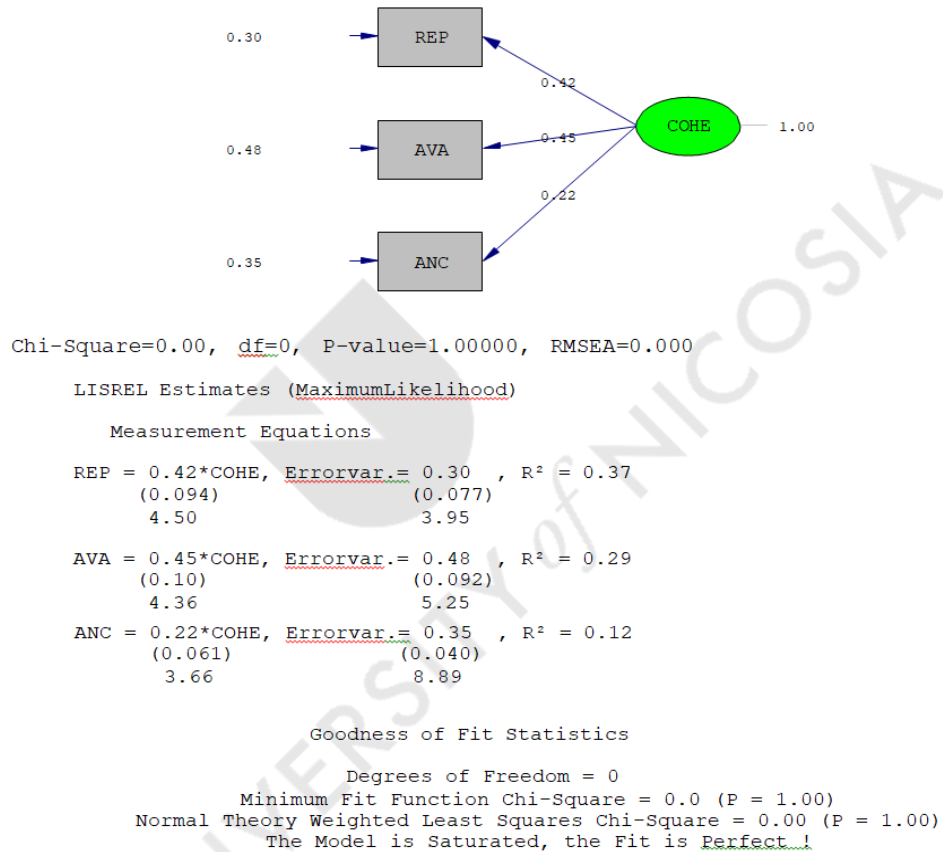


Figure 5.4: Confirmatory factor analysis of heuristics and cognitive construct after modification.

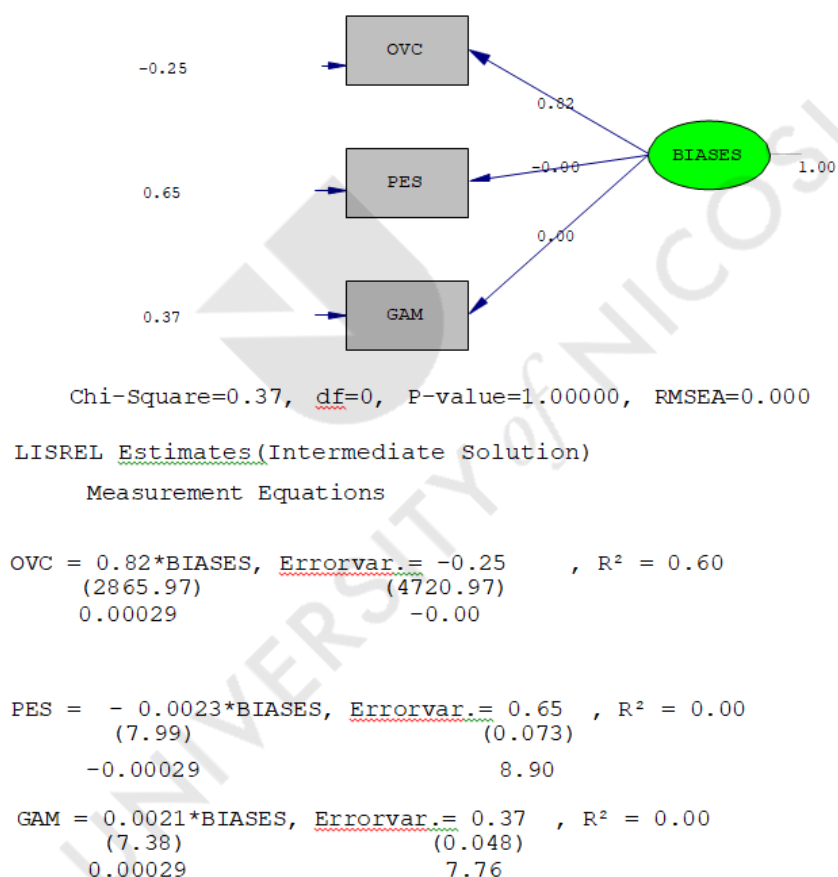


It is obvious that the model fit indicators are enhanced after the elimination of the disposition effect and mood variables, as shown in figures 5.4. The chi-square decreased to zero, which is equal to the new degree of freedom (zero), and also the non-centrality parameter and the RMSEA are equal to zero, which indicates the absolute fitness of this construct.

The third construct represents the biases construct, which is proposed to be composed of overconfidence, pessimism and gambler fallacy. The following figure 5.5 shows that there are three measurement equations: one for each observed variable with three factor loadings shown by the lines between the observed variables (overconfidence, pessimism and gambler fallacy)

and the latent biases construct in addition to three measurement errors. This construct is rejected as the fit indices are not within the acceptable ranges. The Normed Fit Index (NFI) is 0.016, less than cut off level of 0.95; the Comparative Fit Index (CFI) is 0 also the Parsimony Normed Fit Index (PNFI) is 0 for this construct.

Figure 5.5: Confirmatory factor analysis of the biases construct

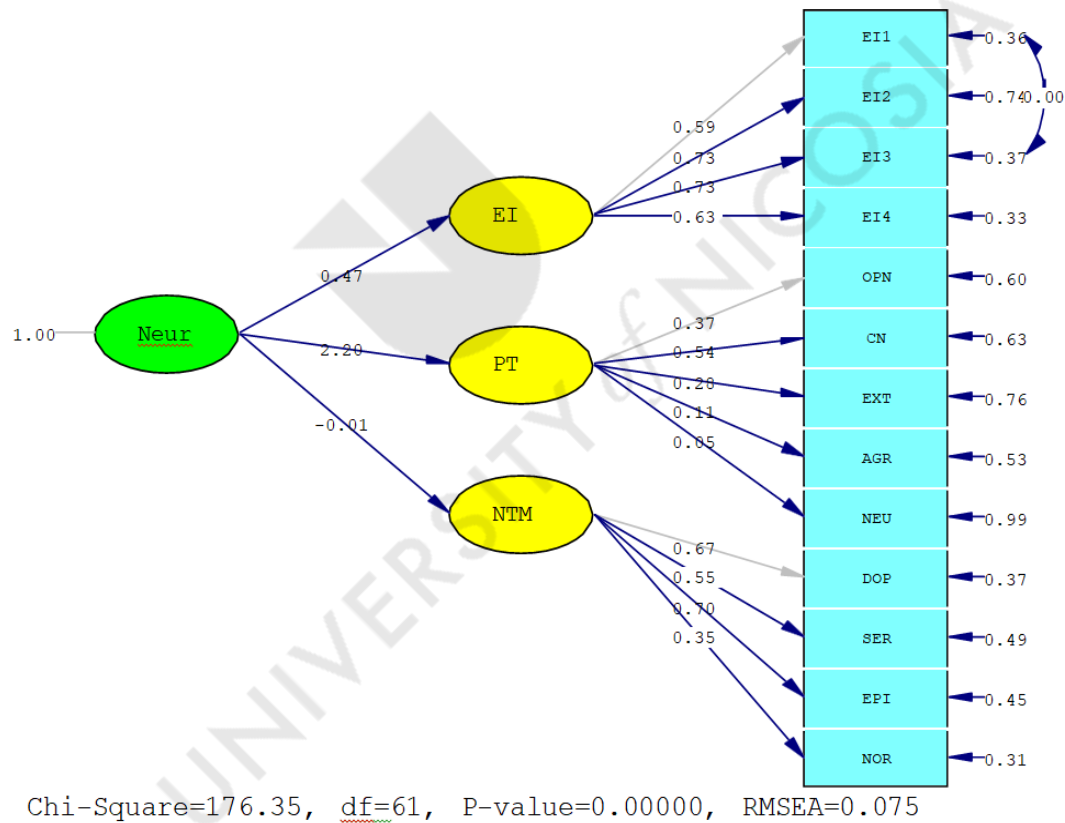


However, the significance of the factor loading of overconfidence allowed its inclusion in the final model as a single variable.

For the fourth construct, which is proposed to be composed of emotional intelligence, personality traits and neurotransmitters. The emotional intelligence is measured by four items

(four questions), while personality traits is measured by the big five traits: Openness, Conscientiousness, Extraversion, Neuroticism, Agreeableness. As for neurotransmitters, they are measured by four hormones which are serotonin, norepinephrine, epinephrine and dopamine. The fit indices indicate the reasonable fit of the neuro-psychology construct, whereas the value of chi square adjusted by degree of freedom is less than 3 ($\chi^2/df \leq 3$). This means that the construct formed here is reliable as $\chi^2/df = 2.89 \leq 3$. The root mean square error of approximation is 0.075, the goodness of fit index (GFI) is 0.90. The Normed Fit Index (NFI) is 0.94, Comparative Fit Index (CFI) is 0.92 and the Parsimony Normed Fit Index (PNFI) is 0.8. All of the above indicators reveal the fitness of this construct.

Figure 5.6: Confirmatory factor analysis of the neuro-psycho construct



The following table 5.5 shows a summary of the results of confirmatory factor analysis for the four constructs with their corresponding items and their fit indicators. Also, it should be highlighted that personality traits and neurotransmitters were examined as distinct models and proved their fitness.

Table 5.5: The results of the Confirmatory Factor Analysis

Constructs	Sub-constructs	GFI (Cutoff point \geq 0.9)	CFI (Cutoff point \geq 0.9)	PNFI (Cutoff point \geq 0. 5)	NFI (Cutoff point \geq 0.95)	RMSEA Cutoff= \leq 0.0 8 or 0.05
Seasonality	Environmental	Unidentified				
	Weekend-weekdays effect					
Cognitive and Heuristics	Representativeness	0.98	0.87	0.4	0.8	0.074
	Availability					
	Anchoring					
	Disposition effect					
	Mood					
Modified Cognitive and Heuristics	Representativeness	The fit is perfect				
	Availability					
	Anchoring					
Biases	Overconfidence	1	0	0	0.016	0
	Pessimism					
	Gambler fallacy					
Neuro- psychology	Personality trait	0.9	0.92	0.8	0.94	0.075
	Emotional intelligence					
	Neurotransmitters					

5.2.3.2 Structural Equation Modeling (SEM)

Hair *et al.* (2014) explained that SEM is a collection of statistical models used to examine the relationship between multiple variables. It is considered as a unique combination of two familiar multivariate techniques, which are factor analysis and multiple regressions. It has the ability to incorporate unobserved variables, known as latent construct, which can be measured using a set of observed variables. Since the aim of this section is to develop a behavioral model out from the variables extracted from systematic literature review and to explain the relationship between the developed constructs and investment decision, the structural equation modeling is regarded as the most appropriate tool.

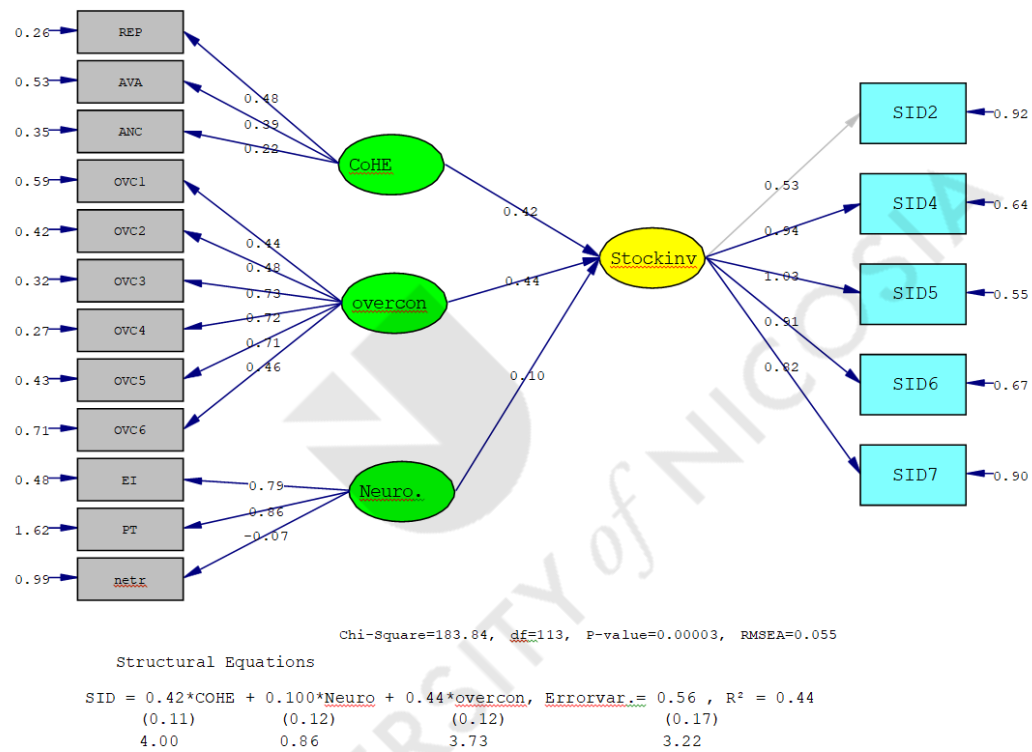
The model examined using SEM represents testing the impact of the neuro-psychology construct, the modified cognitive and heuristics construct, in addition to overconfidence against investors' investment decision. The following figure 5.7 presents the output of the structural

equation modeling. As explained before, the neuro-psychology construct as a latent variable, is drawn in a circle and it is measured by three observed variables (emotional intelligence, personality traits and neurotransmitters) which are always drawn in rectangles, the lines between them represent the relationship known as factor loading. The values written on the lines directed to the observed variables are the measurement errors and represent that there is a portion of each observed variable used in measuring something other than the hypothesized factor. The same for the modified cognitive and heuristics construct and overconfidence. The reviewing of the fit indicators of this model revealed that they are within the acceptable ranges, such that the value of GFI is 0.91, CFI is 0.96, NFI is 0.9 and RMSEA is 0.055.

The results show that the model has a sufficient explanatory power as the R^2 is 0.44, which means that 44% of the variation in the Egyptian investors' investment decision is explained by the used behavioral constructs and variables.

It is obvious that the entire factor loadings have significant values. The first construct "cognitive and heuristic" has a coefficient of 0.42 and is significant at 0.05 significance level. This construct has positive loading on representativeness, availability and anchoring. The second variable "overconfidence" has a coefficient of 0.44 and is also significant at 0.05 significance level, while the third construct "neuro-psychology" has a coefficient of 0.1 but not significant. This third construct has positive loadings on personality traits and emotional intelligence and negative loading on neurotransmitters. Similarly, it is found that the path coefficient of 0.48, 0.39 and 0.22 of the sub-constructs (latent variables) representativeness, availability and anchoring of the cognitive and heuristics construct are significant at 99% confidence level. The path coefficient of 0.79 and 0.86 of the sub-construct emotional intelligence and personality traits of the neuro-psychology construct are significant at 99% confidence level while the neurotransmitter is not significant.

Figure 5.7: The relationship between the stock investment decision and the behavioral constructs



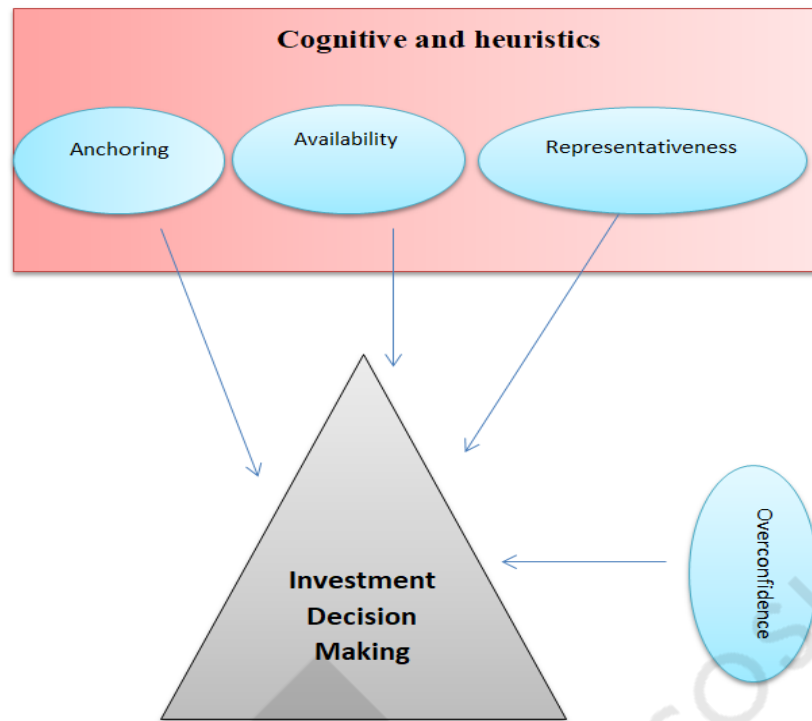
LISREL Estimates (Maximum Likelihood)

Measurement Equations

REP = 0.48*Cognativ, Errorvar.= 0.26 , R² = 0.47	
(0.074)	(0.063)
6.42	4.07
AVA = 0.39*Cognativ, Errorvar.= 0.53 , R² = 0.22	
(0.076)	(0.067)
5.12	8.01
ANC = 0.22*Cognativ, Errorvar.= 0.35 , R² = 0.12	
(0.056)	(0.038)
3.97	9.24
OVC1 = 0.44*ovvercon, Errorvar.= 0.59 , R² = 0.25	
(0.061)	(0.060)
7.27	9.74
OVC2 = 0.48*ovvercon, Errorvar.= 0.42 , R² = 0.36	
(0.054)	(0.044)
8.95	9.39
OVC3 = 0.73*ovvercon, Errorvar.= 0.32 , R² = 0.63	
(0.056)	(0.043)
12.98	7.53
OVC4 = 0.72*ovvercon, Errorvar.= 0.27 , R² = 0.66	
(0.053)	(0.038)
13.48	7.10
OVC5 = 0.71*ovvercon, Errorvar.= 0.43 , R² = 0.54	
(0.061)	(0.051)
11.74	8.35
OVC6 = 0.46*ovvercon, Errorvar.= 0.71 , R² = 0.23	
(0.067)	(0.073)
6.88	9.80
EEII = 0.79*Neurolog, Errorvar.= 0.48 , R² = 0.56	
(0.098)	(0.13)
8.01	3.69
PPTT = 0.86*Neurolog, Errorvar.= 1.62 , R² = 0.31	
(0.13)	(0.21)
6.67	7.60
NNEE = - 0.074*Neurolog, Errorvar.= 0.99 , R² = 0.0055	
(0.083)	(0.097)
-0.90	10.25

According to the results reached above, the hypothesized behavioral model developed in chapter three can be modified to the following applied model figure 5.8. The seasonality construct is removed, the cognitive and heuristics construct is reduced to include representativeness, anchoring and availability; the biases construct is rejected, but overconfidence is selected as a single variable because of its factor loading and R^2 , while the neuro-psychology construct is removed because of its insignificant impact.

Figure 5.8: The behavioral applied model



This reached applied behavioral model fits within the Egyptian stock markets context as it represents the most prominent behavioral factors affecting investment decision, with respect to the Egyptian individual investors only. These prominent behavioral factors may differ from one country to another, resulting in different applied models with respect to each country investors' behavioral deviations. Accordingly, financial advisors of each stock market can use the developed behavioral conceptual model and test it using the previously employed tools to develop a customized applied behavioral model that fits within each country context. Furthermore, each applied behavioral model can be used to build a framework including individual investors' most prominent behavioral deviations, as this will enhance the level of the financial advice provided to clients.

5.2.3.3 The multiple regression analysis

To complete the objective of this study, a multiple linear regression analysis is run between the dependent investors' investment decision and the independent behavioral variables to determine the direction of the relationship between each behavioral variable and investors' investment decision and how each behavioral variable directs investment decision, which will eventually affect stocks' prices. All the behavioral variables presented in figure 3.9 are run against investors' investment decision. Table 5.6 presents the results of the multiple regression

analysis. As for the tests required before running the multiple regression analysis, autocorrelation, multicollinearity, normality and heteroscedasticity tests were employed. Durbin Watson test is conducted for autocorrelation and is found to be 2.095 i.e., within the acceptable range. VIF is used for the multicollinearity test and found that values are less than 10 for all variables with 0.10 tolerance level reflecting no multicollinearity problem between the independent variables as shown in the following table. The Kolmogorov-Smirnov test proved the normal distribution of the variables. The scatter plot of the standardized residuals against the unstandardized predicted values is used to check the heteroscedasticity assumption visually, and the results indicate that the relationships among variables are homoscedastic.

Table 5.6: The results of the multiple regression analysis.

		Model Coefficient				Collinearity statistics	
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	
		B	Std. Error	Beta			Tolerance
1	(Constant)	-.707	.721		-.980	.328	
	EI	.264	.101	.213	2.628	.009***	.505
	OPN	-.130	.080	-.121	-1.639	.103	.609
	CNS	-.022	.073	-.023	-.301	.764	.570
	EXT	-.031	.070	-.031	-.443	.658	.695
	AGR	-.141	.080	-.111	-1.767	.079*	.828
	NEU	.169	.061	.182	2.765	.006***	.764
	DOP	-.043	.079	-.042	-.548	.584	.586
	SER	.013	.075	.012	.172	.864	.662
	EPI	-.143	.075	-.150	-1.916	.057*	.542
	NOR	-.020	.095	-.014	-.206	.837	.532
	REP	.370	.085	.277	4.374	.000***	.822
	AVA	.136	.078	.121	1.731	.085*	.680
	ANC	.185	.094	.126	1.968	.050**	.801
	DIS	-.052	.083	-.045	-.629	.530	.646
	MOD	-.045	.052	-.057	-.870	.385	.774
	OVC	.501	.095	.351	5.264	.000***	.746
	PES	-.066	.078	-.058	-.843	.400	.706
	GAM	.092	.090	.060	1.020	.309	.961
	SEA	.068	.106	.041	.641	.522	.813
	WDWE	-.025	.112	-.013	-.222	.824	.901

*** significance at 1%, ** significance at 5%, and * denotes the significance at 10%.

As displayed in the previous table, the behavioral variables that are found to have positive impact on investment decision are representativeness, availability, anchoring, overconfidence, gambler fallacy, environmental variables, emotional intelligence, neuroticism aspect of personality trait and the serotonin hormone of the neurotransmitters. On the other side, the rest of the behavioral variables are found to have a negative impact on stock investment decision. Financial advisors of each stock market can extend their work after developing the customized behavioral applied model and conduct the multiple regression analysis to determine how each behavioral variable in the applied model directs the investment decision and accordingly the stocks' prices.

Based on the results provided by SEM and multiple regression analysis, it is obvious that the Egyptian individual investors exhibit a great level of overconfidence and show a risk seeking attitude when conducting their investment decision; this could imply retaining losing stocks to their portfolios. Also, it is found that as the level of overconfidence increases, the investment decisions are affected positively, which support the claim that overconfidence is not always associated with bad decision but sometimes it depends on knowledge, experience and solid background whereas the descriptive statistics of the participants revealed that 92% of them have trading experience more than a year while 65% have been trading for over five years. The significance of overconfidence can also be linked with the trading frequency level, where 28% of the participants are trading on a daily base and 25% on a weekly base. Additionally, 85% of the participants are males, which justifies the high significance of overconfidence as male investors possess a high confidence level compared to female investors.

The significance of the availability sub-construct of cognitive and heuristics implies that the Egyptian investors' investment decisions are directed by the recent and easily accessible information that is overwhelming around them and can be used easily in their investment decision. Additionally, they tend to prefer adding to their portfolio limited stocks they know more about than adding many stocks they do not know much about, which increases their preferences to the local stocks over the international ones. This could be linked with the results retrieved from the macroeconomic model analysis, where the results proved the insignificance of the exchange rate risk over the Egyptian stock market.

The significance of representativeness shows that investors fail in diversifying their portfolios; they invest on stock based on similar characteristics with other stocks and wrongly believe that

higher prices stocks are associated with higher returns. The same results were reached by Rasheed *et al.* (2018) when testing the impact of representativeness and availability on stocks' return of the Pakistani market.

The significance of the anchoring heuristics indicates that investors are persistent to certain points and use them as reference points for their market entry or exit decisions, believing that the market will reach the points that were set. The significance of these heuristics variables implies the dependence of the Egyptian investors on the traditional information of the companies when making their investment decision. If this could be linked with the results retrieved from the analysis of the microeconomic results, the most prominent indicator used by the Egyptian investors is the profitability variable.

On the other side, the insignificance of the neuro-psychology construct indicates that this construct does not explain investors' decision; however, the results revealed the positive significance of emotional intelligence as a sub-construct of the neuro-psychology construct and the significance of personality trait of the neuro-psychology construct. The positive significant role of emotional intelligence shows that the investment decisions made by the Egyptian individual investors are positively and significantly affected by emotional intelligence. This indicates that individual investors with high levels of emotional intelligence implied by setting personal goals and encouraging and motivating own self are able to understand, use and manage their emotions in a positive way that minimizes the stress and can turn the feelings into actions. The same for the way of acting toward the uncertainty inherent in the decisions related to investments in the stock markets. The same results were reached by Ahmad (2018) and Tanvir *et al.* (2016) who proved the positive significant impact of emotional intelligence on investment decision. Among the five personality traits, the regression analysis declared significance of the agreeableness and neuroticism personality traits, which shows that these traits are the dominant ones that direct the investment decision in the Egyptian stock markets. What is common about these two traits is that both reflect risk aversion behaviour (Akhtar and Das, 2020). The agreeableness trait is associated with cooperation, high levels of trust in others as a result of a low self-confidence level and pleased feelings by having close relationships with others and believing them (McCrae and John, 1992). Thus, they tend to accept misleading information from others without any evaluation (Akhtar *et al.*, 2017), while neuroticism is associated with worry and unsecured feelings, recklessness and sensitivity; neurotic investors tend to feel depressed and negative, easily disturbed and sometimes behave with hostility (McCrae and

John, 1992). Additionally, they tend to have pessimistic feeling regarding market return and expected economic growth (Jiang *et al.*, 2020); these pessimistic feelings make the neurotic investor gather as much information as possible before making any decision (Akhtar *et al.*, 2017). The results also show that investors who scored high levels of agreeableness had a negative impact on their stock investment decision, which indicates that the increase of investors' trust in others' information without assessing them had a negative impact on their investment decision. As for investors with high score of neuroticism, this had a positive impact on their investment decision, which means that the stress and worry felt by investors made them afraid of loss and more focused on the used information to make better investment decisions. The regression analysis showed that among the neurotransmitter's hormones, only epinephrine hormone is significant with negative impact. Epinephrine hormone is also known as adrenaline, which is secreted as a result of fear or anger feelings; it works on managing pressure and arousal levels. Scientists explained that epinephrine is involved in the "fight-or-flight" responses in human, which occurs when someone is exposed to a threat (Scott, 2020). The threat feeling increases the level of anxiety and that explain the reason behind its negative impact on investment decision. However, it is also explained that epinephrine is also secreted as a result of positive stress under a case known as eustress which works on increasing energy and activity levels (Scott, 2020). Thus, it is recommended to advise the investors to manage their feeling from threat to challenge such that the investment decision can be viewed as an opportunity to prove oneself and the personal capabilities.

Based on the explanation provided by Hair *et al.* (2014) who explained that in order to generalize the results the ratio of the observation to the independent variables should be between 15 to 20 observations for each independent variable, which means that for the current study, the sample size should be not less than 195 observations and as the current study succeeded in collecting 212 participants; this enable generalizing the results for the whole population of the Egyptian individual investors. Taking into consideration that the analysis of the demographic characteristics of the sample collected as shown in table 5.3 showed variation in the participants' years of trading experience, their knowledge about investing in the stock market, their trading frequency in addition to the nature of their job, these variations add to the ability to generalize the results retrieved.

5.3 Conclusion

This chapter presents the realization of the fourth objective to reach the aim of this study of developing an applied augmented stock pricing framework. In this chapter, the applied behavioral model is built, in addition to determining the significant behavioral variables and detecting their impact on investment decisions with respect to the Egyptian individual investors. The applied behavioral model was reached after conducting Confirmatory factor analysis (CFA), which is used to confirm or disconfirm the built conceptual model through the use of model fit indicators; then, Structural equation modeling (SEM) is used to determine the significance of these behavioral variables, while the multiple regression analysis is conducted to explore the impact of each behavioral variable on individual investors' investment decision.



CHAPTER 6 CONCLUSION



UNIVERSITY of NICOSIA

6.0 Introduction

This study introduces the technique through which an augmented framework of stock pricing determinants is developed by integrating three of the most prominent stock pricing theories (micro, macro and behavioral theories). The conclusion extracted from this study is going to be provided in this chapter in addition to recommendations for future work. The chapter starts by providing a discussion on the reached results and the link between the current study's results and the literature. Then the chapter illustrates how the study's aim and objectives are covered, followed by the theoretical and practical contribution of this study and ends by illustrating the limitation upon which further studies are going to be pointed out.

The rest of the chapter is organized as follows. The next section summarizes the results retrieved from the examination of each theory and the link between them and the results reached in previous studies. Section 6.2 evaluates the realization of aim and objectives. Section 6.3 presents the study's contribution to theory and practice. Study's limitations are illustrated in section 6.3. Finally, section 6.4 presents the suggested recommendations for further work.

6.1 Research Finding discussion

This study targeted to build an augmented framework that capture stock pricing determinants through considering three different perspectives that affect the stocks' pricing (micro, macro and behavioral perspectives). The methodology chapter provided the steps through which the three theories employed in the current study are examined to extract the most significant variables from each theory. This section discusses the results retrieved from the analysis of the three theories and highlights the link between the current study and the literature. The discussion is presented for each model thus, it is divided into three subsections as follows.

6.1.1 The microeconomic model results discussion

The microeconomic model employed in this study used the firm specific characteristics presented in Fama and French five factor model (2015) to determine the most significant ones with respect to the Egyptian stock market, which is selected as the market upon which the empirical analysis of the current study is applied on. Fama and French five factor model is composed of market excess return and four microeconomic variables: size (SMB), value (HML), profitability (RMW) and investment (CMA) that were run against portfolios' excess return, using time series regression analysis. The dependent variable of portfolios' excess return

are 18 portfolios constructed based on 2x3 sorts: size-BE/ME, size-profitability and size-investment. The results of the time series regression showed the significant impact of size (SMB), whose coefficient is positive for the small sized companies and negative for the big sized companies across the three sorting methods. Also, value (HML) and profitability (RMW) variables showed significant role with negative relation. While the results rejected the role of market excess return and found a weak explanatory power for investment.

These results are consistent with the results reached by Mosoeu and Kodongo (2020), who implemented a study on six selected emerging markets, among which Egypt and two developed markets. This reflects the dependence of the Egyptian investors on the accounting data to make their investment decision. Also, this could be justified back to the weak liquidity and the heavy trading frequency characterized by the emerging markets that lead to the dependence on the accounting data rather than the market-based indicators, along with size and value, which showed their prominent impact, while investment showed weak impact with respect to the Egyptian stock market, which is the same as to what was reached by Fama and French (2017). The results of the microeconomic model analysis support the role of profitability and size, the same as what was reached by Ragab *et al.* (2019) when conducting a study on the Egyptian stock market using time series regression for the period from 2005 to 2016, however in Ragab *et al.* (2019) study, size showed the most powerful role while in the current study, profitability is found to be the most significant microeconomic variable among the examined ones. This indicates the dependence on profitability variable as guidance for future return based on the recent data employed in the current study that ends on July 2020, while Ragab *et al.* (2019) study ended June 2016.

6.1.2 The Macroeconomic model results discussion

As for the macroeconomic perspective, the study built a macroeconomic model composed of five macroeconomic variables, selected with respect to the Egyptian stock market. Three variables are domestic (exchange rate, inflation rate, industrial production index) and two are global macroeconomic factors (federal fund rate and global commodity index). Time series regression analysis is run between the macroeconomic variables and portfolio excess return to determine the most significant variables among the selected ones. The results have revealed that the only significant variable is the industrial production index (IPI) with a positive impact using the 2x3 sort method. Lazarus's (2017) reached the same results when studying 8 sectors from Kenneth French's 17 industry Portfolios data set. Also, Adesanmi (2018) proved the

positive significant impact of IPI in the Mexican and Indonesian stock market when analyzing the data from 1993 to 2014. Similarly, Mohamed and Ahmed (2018) in the Jordanian stock market and Amarasinghe (2016) in Colombo stock exchange of Sri Lanka. The results of IPI found in the Egyptian stock market complement on the studies found in the literature as the latest study that examined the role of the IPI in the Egyptian stock market dated back to 2015 that was implemented by Abouwafia and Chambers (2015). Abouwafia and Chambers (2015) used IPI to measure the real output in Egypt. The results found that the shocks in stocks' prices led to an increase in output in Egypt, measured by the IPI.

As for the other examined macroeconomic variables, although they were not of significant but their impact was supported by economic theory as explained in section 4.2.3. The negative role of inflation measured by core CPI was supported by Mohamed and Ahmed (2018)'s study in Jordanian stock market for the period from 1976 to 2016. Also, Akbar *et al.* (2018) proved the significant negative impact of inflation in Pakistani stock market while Jareno *et al.* (2019) proved the limited role of inflation on the stock market of six countries (Germany, Italy, Spain, France, UK and US). While Barakat *et al.* (2016) found a positive relationship between CPI and EGX30 and a negative relationship between CPI and the Tunisian index when implementing a study for the period from 1998 to 2014 on the Egyptian and Tunisian stock markets.

Regarding the role of exchange rate, the current study found a positive insignificant impact for exchange rate on the constructed portfolios. Ouma and Muriu (2014) reached different results to what is presented in this study as a significant negative impact is found to be affecting the stock market in Kenya. Similarly, Majid and Yusof (2009) in Malaysian stock market and Saleem and Alifiah (2017) in Pakistani stock market. However, Barakat *et al.* (2016) found a positive relationship between exchange rate and EGX30 in the Egyptian stock market, while Alshogeathri (2011) found a positive insignificant relationship between the Saudi stock market and exchange rate. Also, Buyuksalvarci and Abdioglu (2010) showed an insignificant impact for exchange rate and that was justified by the adoption of floating exchange rate regime during the period under study. This situation is similar to the current situation of the Egyptian stock market, which may justify the limited role of exchange rate as the floating regime started in Egypt in 2016.

The sign of FFR is not as what was expected, as the current study finds a positive role for the increase in FFR on portfolios' excess return. Adesanmi (2018) reached different results in his

study of the MINT countries, such that a negative impact is found in Nigeria and Mexico, in Indonesia a negative relationship in the short run, and a positive relationship on the long run was found, while a positive impact for FFR is found in the Turkish market. Also, the results of the current study contradict what was reached by Abou-Zaid (2013), who proved the sensitivity of Egyptian stock market to the anticipated changes in the US monetary policy with an inverse relationship, when examining the impact of expected and unanticipated changes in US monetary policy using the federal fund rate on stock markets of Egypt, Israel and Turkey.

The role of the global commodity index found in the current study moves in line with what is explained by economic theory as a negative relationship is detected between GCI and portfolios' excess return. Different results were found by Adesanmi (2018), who tested the impact of the commodity index on the stock market of four emerging economies. The analysis of the long- and short-term relationships has revealed that all the examined countries had a positive relationship with GCI in the short and long terms. When Manurung *et al.* (2015) implemented a study between Jakarta Composite Index of Indonesia and Global Commodity index, the results revealed that the commodity index, composed of oil, gold, coal and crude palm oil, did not have a significant effect on the Jakarta Composite Index, while the results of the impulse response function indicated that the coal, crude palm oil and oil had a negative impact, but gold had a positive impact on Jakarta Composite Index. Limited studies examined the role of the whole commodity index while this study is the first to examine the role of the GCI on the Egyptian stock market.

6.1.3 The behavioral model results discussion

The study developed a conceptual behavioral model after conducting systematic literature review, then survey has been employed to examine the relationship presented in the hypothetical behavioral model (figure 3.10) in order to determine the significant behavioral variables affecting investment decision. The data is analyzed by structural equation modeling (SEM) using the confirmed behavioral constructs. The results of SEM proved the significant role of anchoring, availability and representativeness as variables in the cognitive and heuristics construct, in addition to overconfidence bias.

Regarding the significant of overconfidence, the same results were reached by Chen *et al.* (2007) when applying a study on the Chinese stock markets and also by Bakar and Yi (2016) when studying the psychology of the Malaysian investors using a sample of 200 participants. While Chandra and Kumar (2012) reached the same results regarding the significance of the

representativeness, availability, anchoring heuristics, in addition to the significance of overconfidence bias when implementing a study on Indian individual investors. As for the behavioral empirical studies conducted in the Egyptian stock market, Metawa *et al.* (2019) proved the impact of herding behavior, along with investor sentiment, over and underreaction, overconfidence on investment decisions.

The results of the behavioral model analysis complement on the earlier implemented studies. The current study is the first study to examine and prove the existence of representativeness, anchoring and availability heuristics among the Egyptian individual investors trading in the Egyptian stock market. This means that financial analysts and advisors should pay close attention to these biases that are the reasons behind the deviation of the Egyptian individual investors away from behaving in a rational and logical way.

6.2 Realization of research aim and objectives

The aim of this study is to develop an augmented framework capturing stock pricing determinant through integrating different theories (micro, macro and behavioral). The methodology described in chapter three worked on realizing the six objectives to achieve the study's aim.

Research objective 1: To determine the most significant microeconomic variables and their impact on stock prices in the Egyptian stock market using Fama and French five-factor model.

As the first notion of the factors that cause variation in stock markets' prices are firms' specific characteristics, many researchers demonstrated that firms with special features are more prone to realize special gains (Fama and French, 1996; 1993; Statman, 2011; Tan *et al.*, 2016). Accordingly, the latest microeconomic model developed by Fama and French has been employed in this study to identify the most significant microeconomic variables with respect to the Egyptian stock market. Market excess return and four microeconomic variables: size (SMB), value (HML), profitability (RMW) and investment (CMA) were run against portfolios' excess return, using time series regression analysis. The dependent variable was presented by 18 portfolios constructed based on 2x3 sorts: size-BE/ME, size-profitability and size investment. The results showed the significant impact of size (SMB), value (HML) and profitability (RMW) variables on portfolios' excess return using the different sorts. The variables value (HML) and profitability (RMW) have a negative impact on excess return of all

the constructed portfolios, while size (SML) has a positive impact on return of small sized companies and a negative impact on the return of big sized companies.

Research objective 2: To identify the most significant macroeconomic variables and test their effect on the Egyptian stock market using preselected macroeconomic variables.

This objective was realized by addressing two steps, where firstly a review of the previous articles was done concerning the macroeconomic variables impact on stock markets and, more specifically, the emerging ones. The review has resulted in realizing a gap in the empirical studies that have investigated the impact of global macroeconomic variables on emerging stock markets; accordingly, five macroeconomic variables are selected with respect to the stock market under examination, such that three variables are domestic (exchange rate, inflation rate, industrial production index) and two are global macroeconomic factors (federal fund rate and global commodity index). Secondly, a time series regression analysis is run between the macroeconomic variables and portfolio excess return to determine the most significant variables among the selected ones. The results have revealed that the only significant variable is the industrial production index (IPI) with a positive impact on excess return of portfolios constructed using the 2x3 sort method.

Research objective 3: To present and analyze comprehensively the literature and topics related to the effect of investors' psychology on stock market returns as a prelude to this research.

A systematic review of the published behavioral literature has been conducted concerning the impact of the behavioral factor on investors' investment decision. The review has resulted in extracting 41 behavioral variables and formulating the theoretical model. The extracted variables have been integrated and consolidated to build the behavioral conceptual model that was investigated in this study.

Research objective 4: To identify the most significant behavioral variables and test their impact on the investment decision with respect to the Egyptian individual investors.

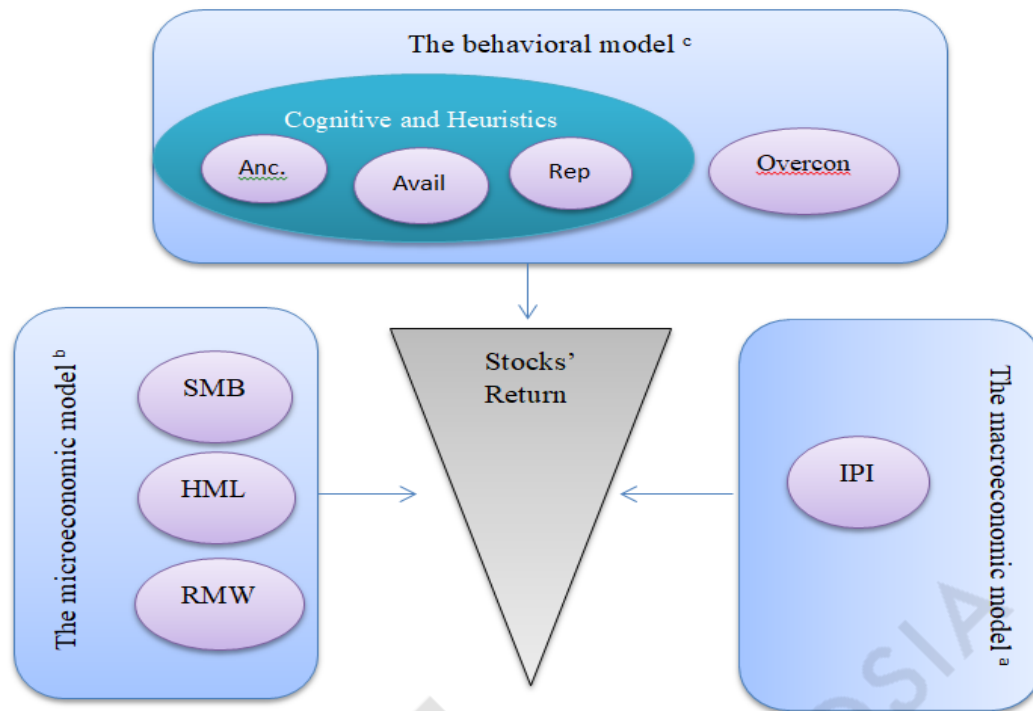
On the basis of the developed conceptual behavioral model, a survey has been conducted to examine the relationship prescribed by the hypothetical behavioral model. Then, the data were analyzed, using firstly the confirmatory factor analysis to confirm or disconfirm each behavioral measurement model constructed. Following that, a structural equation modeling (SEM) is employed using the confirmed behavioral constructs emerged from the first step as independent variables against investors' investment decision as a dependent variable to reach the statistically

significant behavioral applied model. The results of SEM proved the significant role of anchoring, availability and representativeness as variables in the cognitive and heuristics construct, in addition to overconfidence bias. As for determining the relationship between each behavioral variable and investment decision, multiple regression analysis was run to explore their impact.

Research objective 5: To develop an augmented framework that integrates the most significant variables from the three tested theories based on the conducted empirical study.

After determining the most significant variables from the three examined theories, the augmented applied stock pricing framework is developed that takes into consideration the rational and irrational biases. Figure 6.1 represents the final applied augmented framework after modifying the augmented conceptual framework presented in chapter two in figure 2.1. The applied framework has been reached after conducting an empirical study on the Egyptian stock market.

Figure 6.1: The applied augmented stocks pricing framework.



a: the macroeconomic variables: IPI = Industrial Production Index.

b: The microeconomic variables: SMB = small minus big, CMA= conservative minus aggressive, RMW= robustness minus weak.

c: The behavioral variables: Anc=Anchoring, Avail= Availability, Rep= Representativeness within the heuristics and cognitive construct and Overcon. = Overconfidence.

Figure 6.1 shows the applied augmented framework with respect to the Egyptian stock market, such that the behavioral variables that are of a significant impact on the Egyptian investors' investment decisions are representativeness, availability and anchoring, which belong to the cognitive and heuristics construct, in addition to overconfidence which is included as a single variable. As for the macroeconomic model, only the industrial production index is found significant, while in the microeconomic model size, value and profitability are the significant ones. Table 6.1 shows the decisions regarding the developed hypotheses based on the reached results.

Table 6.1 Supported/ not-supported research hypotheses.

Research hypotheses	Supported / not-supported hypotheses	Previous studies in line with the research findings.
The microeconomic variables presented in Fama and French five-factor model have a significant effect on the stocks' return.	Partially accepted, as only size, value and profitability are of significant impact on portfolio's excess return of the Egyptian stock market.	Acaravci and Karaomer (2017). De la O González and Jareno (2019). Mosoeu and Kodongo (2020)
The selected five macroeconomic variables have a significant effect on the stocks' return.	Partially accepted, as only the industrial production index showed a significant impact on portfolio's excess return of the Egyptian stock market.	Ross (1976) Ibrahim and Aziz (2003) Amarasinghe (2016) Lazarus (2017) Mohamed and Ahmed (2018) Jareno <i>et al.</i> (2019)
The investors' psychological variables have a significant impact on the stocks' return.	Partially accepted, as only representativeness, availability, anchoring and overconfidence are of significant impact Egyptian investors investment decision, in addition to emotional intelligence, epinephrine hormone, agreeableness and neuroticism traits retrieved from the multiple regression analysis	Ciner (2014) Spilioti (2016) Kourtidis <i>et al.</i> (2017) Rasheed <i>et al.</i> (2018) Chandra and Kumar (2012) Metawa <i>et al.</i> (2019)

Research objective 6: To explain validity of the applied stock pricing framework.

The reached applied augmented stock pricing framework has passed through validity tests that prove its appropriateness. Since the data used in regression analysis of the micro and macroeconomic model are secondary data represented in archival records acquired from the stock market, governmental and companies' reports, a validity test is thus not required for these two models. As for the behavioral model, the instrument used to measure the significance of the behavioral variables on investors' investment decision is a structured survey, which is categorized as primary research. The initial survey has passed through a content validity test that involved two tests: a face validity test, done by field experts and academic experts, and a pilot test. The results of the pilot test were tested for validity, using Average Variance Extracted (AVE) and factor loading. Also, the final version of the survey was tested for validity, using the Average Variance Extracted (AVE), factor loading and discriminant validity. All these tests

are sufficient to prove the validity of the instrument employed and hence the applied augmented stock pricing framework.

The previous section illustrates the fulfillment of the research objectives, using the research methodology, and thus the research aim has been achieved. The research contribution to knowledge and practice is provided in the next section.

6.3 Research contribution

This study introduces a distinctive contribution by introducing a framework through which a stock pricing framework is developed through augmenting three theories (micro, macro and behavioral). To the best of our knowledge, this intention has not been studied to date, which will make this work original and contemporary. Although this study used the Egyptian stock market as the only unit of analysis, it paves the path to be applied to determine the factors that affect any developing stock markets. Also, the findings of this research will provide the most recent viewpoints in the body of knowledge of asset pricing theories for the practical use in addition to the academic value as follows:

6.3.1 Theoretical contribution:

The main theoretical contribution of this study is the development of an augmented conceptual stock pricing framework. This model gathered Fama and French's five-factor model as the most recent developed microeconomic model with five macroeconomic variables selected after going through an extensive review of macroeconomic literature, in addition to the conceptual behavioral model. This developed conceptual framework can be considered as a foundation stone subject to updates, using newly detected microeconomic, macroeconomic and behavioral variables from continuous empirical findings.

Indeed, the study tested comprehensively the effect of the micro and macroeconomic variables on the Egyptian Stock Market, using the most recent financial and accounting data, as the study used monthly data for the period from June 2010 to June 2020. The result of the macroeconomic model contributed toward determining the sources of systematic risk that cannot be diversified away. It has broadened the focus to include the global variables, beside the domestic ones, when aiming to determine the macroeconomic variables affecting stocks' return, especially in the emerging countries.

The results of these two models will add value to the financial literature by determining the macroeconomic and microeconomic variables that affect the stock market in Egypt, an emerging market economy. Furthermore, to the best of our knowledge, this study is the first to

test macroeconomic variables against portfolios constructed using the 2x3 sorts employed in the microeconomic model, which enriches the macroeconomic literature.

In addition, this research adds to the existing behavioral finance literature and complements on earlier works by gathering the investor's psychological variables affecting investment decision on various stock markets, which resulted in the development of the conceptual behavioral model.

The results of the behavioral model will enrich the international behavioral literature in general and that of the emerging markets in specific. The study tested the impact of 13 behavioral variables on the investment decision made by Egyptian investors to extract the most significant ones. To the best of our knowledge, the existing literature has only studied the effects of either a single or a limited number of behavioral factors on different stock markets. Also, it worth highlighting that, there is now a valid and reliable Arabic survey that can be used to check the impact of these examined behavioral variables on investment decision in any Arabic country.

6.3.2 Practical contribution:

This study has practical implications, such that the developed conceptual augmented framework can be examined in various markets using the methodology followed in this study. This will enable reaching a customized applied stock pricing framework that fits within each country's context.

Even though this study is conducted in the Egyptian stock market, it can help in understanding what affects stocks' prices in other similar capital markets. The results of this study are beneficial to brokerage companies, financial analysts, policy makers and individual investors, as they increase their understanding to the connection between new concepts, such as the behavioral biases and investment decision making. This would increase the understanding of how investors react to market announcements and movements, and thus how investors plan for their future investments.

The results of the behavioral finance section can also be used to develop a framework of investors' characteristics that improve the performance of the stock market. As overconfidence and other behavioral variables can result in increasing the investors' risk tolerance to an extent that increases market volatility, financial advisors' recommendations to investors should be enhanced, such that their advice depends on their close understanding of their clients' behavior, their personal preferences and profile. As shown, the agreeable individual investors in the Egyptian stock markets depend on their surrounding relations to get information; this proved

to have a negative impact on their investment decision, which means that those investors should avoid the influence of others on their investment decision and also indicates the need for adequate investment education as they tend to depend on false information for their investment decision. The significance of epinephrine highlights the need for forming portfolios based on each investor's risk tolerance as there is not a wrong investment choice; rather, there is a mismatch between risk taking propensity and investment objectives for the individual investor (Akhtar *et al.*, 2014).

There is a value added to financial managers as well while making strategies by taking into consideration investors' concerns and judgments that promote their future policies and plans. Also, the microeconomic results highlighted the prominent role of profitability variable in addition to size and value, which should attract financial managers' concern to the importance of these variables as the most examined variables by the investors.

The positive significant impact of the industrial production index as the only significant macroeconomic variable among the examined variables under the three kinds of sortation (size-BM, size-profitability, size-investment), sheds light toward the importance of the industrial production index in flourishing the stock market and indicates that the Egyptian government should focus on its industrial production levels for the stock market development.

Moreover, the results can assist governments in developing policies that encourage all level of investors to participate in stock markets through improving the financial education and linking it with investor psychology, in addition to introducing tools that determine investors' needs and deviations that convert them into actions.

Furthermore, being aware of human behavioral deviations and the impact of psychology on decision making will improve the performance of the traditional model to better explain the real market behavior. This awareness will minimize the appearance of market anomalies and deviations while enhancing the global stock market performance.

Finally, this study acts as an eye opener in revealing the investors' psychological factors affecting the Egyptian stock market along with microeconomic and macroeconomic variables. The findings will help in building a stable way toward the development of the Egyptian economy.

The study's practical and theoretical contributions are summarized in table 6.2.

Table 6.2: The theoretical and practical contribution

Research value	Theoretical contribution	Practical contribution
Developing the conceptual behavioral model.	This model represents a starting point toward building a complete behavioral model, gathering the behavioral variables affecting stock markets. This model can be updated using newly emerging behavioral variables from every day's empirical findings.	This conceptual model can be examined in different stock markets to build a customized applied model based on the humans' behavioral differences in each economy.
Developing an applied behavioral model for the Egyptian stock market.	This model will enrich the behavioral finance literature in general and that of the emerging countries in specific. It is the first study to examine that number of the behavioral variables in one model.	This model can be used by brokerage companies and financial advisors to develop a profile of investors' characteristics and behavioral deviation. This profile can be used to provide the appropriate investment advice for each investor.
Developing the conceptual augmented stock pricing framework.	This framework is a contribution toward developing a stock pricing model, gathering the most prominent notion (micro, macro and behavioral theories) dominating the financial markets.	This conceptual framework can be examined in different stock markets to build a customized applied augmented framework.
Developing the applied augmented stock pricing framework with respect to the Egyptian stock market.	This framework will enrich the stock pricing literature as it determined the most significant microeconomic, macroeconomic and behavioral variables affecting the Egyptian stock market- a class of the emerging markets.	The integration of the behavioral theory with the micro and macroeconomic theories will improve the performance of the traditional model to better explain the real market behavior. This will enhance the performance of the stock markets and minimize the appearance of anomalies. Moreover, this will assist the governments and policy makers in promoting legislations that boost the economy.

6.4 Research limitations

Based on the previous section, this study has provided distinctive contributions to knowledge; however, there are some limitations concerning the application of the research procedures.

The study has employed monthly data for the macroeconomic and microeconomic model, which has resulted in not taking into account possible deviations as the stock market prices change on a daily basis. However, the study was restricted to the data availability as the microeconomic and macroeconomic data are only available in either monthly or quarterly basis. The stocks used in constructing the portfolios for the microeconomic and macroeconomic models are limited to the stocks that are listed on the EGX100 for the period under investigation, in addition to the stocks that exited the index for a limited time and entered again.

In the behavioral model, the questions used in the survey conducted to test the impact of emotional intelligence variable on investment decision applied only one branch of the factor based on Mayer and Salovey's EI Ability model.¹⁶ The study could not use all four branches as the survey included various behavioral factors under scope, and there were restrictions on the number of questions to be included in the survey, as explained in the face validity test. Accordingly, the study selected the most appropriate ability branch related to the scope of the study.

The questions used in the survey to measure the environmental variables are measuring the level of Seasonal Affective Disorder or "winter blues".

The validity of the conceptual behavioral model and the conceptual augmented stock pricing framework was tested in only one emerging country (the Egyptian market).

6.5 Research recommendation for further research

The study suggests promising ideas for further work:

Testing the developed behavioral conceptual model in other developing economies in addition to developed economies to build a customized applied behavioral model based on investors' behavioral differences. The test of this conceptual model will support its validity and appropriateness. Also, a comparative study can be done between the behavioral deviations of investors across different economies.

Mayer and Salovey's (1997) four branch model of emotional intelligence includes four types of abilities: perceiving emotion,¹⁶ using emotion, understanding emotion and managing emotion. The study chosen "using emotion" ability branch since it indicates the ability to use emotion in thinking, problem solving and in various cognitive abilities (Tripathy, 2018).

Conducting the behavioral survey using longitudinal studies, not cross sectional as employed in this study, so a wider analysis of investors' behavior can be retrieved.

Applying studies confirming whether the profile developed based on the behavioral survey results helps in making better investment decisions.

As it is assumed that institutional investors and individual investors behave differently, the conceptual behavioral model can be adjusted to include the variables affecting the institutional investors' investment decision while implementing a study that compares the applied model for both perspectives.

Based on the results achieved from the microeconomic and macroeconomic models, other variables can be added with the significant variable retrieved to test for their significance. Additionally, the macroeconomic model can always be broaden to test for the impact of global factors as well as the domestic ones.

Indeed, the proposed conceptual augmented stock pricing framework was tested in only one emerging country, which means that further tests are still needed while comparing the outcomes of each study. Accordingly, further work could suggest examining the conceptual augmented framework in other countries to build a customized applied one that fits within each stock market.

6.6 Conclusion

This chapter showed the fulfillment of the study's aim and objectives, which ended by introducing a technique through which an augmented stock pricing framework is developed. The chapter highlighted the contribution of this study to knowledge and practice and illustrated the research limitations. Finally, the chapter provided ideas and scope for future work.

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Appendices

Appendix 1

The number of stocks that form each portfolio

	Size-BEME portfolios						
Year	SL	SN	SH	BL	BN	BH	total
2010	10	7	7	3	12	7	46
2011	7	12	5	6	8	9	47
2012	7	10	7	6	10	7	47
2013	8	10	6	5	10	7	46
2014	7	11	6	6	8	7	45
2015	7	8	9	6	11	4	45
2016	4	12	8	9	7	6	46
2017	3	11	10	10	8	4	46
2018	5	11	8	8	8	5	45
2019	3	13	8	10	6	5	45
	The number of stocks in each size-BEME portfolio each year						

	Size-OP portfolios						
Year	SW	SN	SR	BW	BN	BR	Total
2010	5	9	10	8	11	4	47
2011	7	7	9	6	12	5	46
2012	8	11	5	5	8	9	46
2013	8	11	5	5	9	9	47
2014	6	11	7	6	9	7	46
2015	8	10	6	5	10	8	47

2016	10	8	6	3	12	8	47
2017	6	12	6	7	8	8	47
2018	8	11	5	5	9	9	47
2019	9	12	3	4	8	11	47
The number of stocks in each size-OP portfolio each year							

	Size-Investments portfolios						
Year	SC	SN	SA	BC	BN	BA	Total
2010	7	9	8	6	11	6	47
2011	6	10	8	7	9	6	46
2012	7	9	8	6	11	5	46
2013	9	9	6	4	10	8	46
2014	6	11	7	7	9	7	47
2015	7	11	6	6	9	8	47
2016	8	11	5	5	9	8	46
2017	9	9	6	4	10	8	46
2018	7	10	6	6	9	8	46
2019	9	7	7	4	12	7	46
The number of stocks in each size-Investments portfolio each year							

Appendix II

Systematic literature review results

Variables	Authors	Methodology/ measurements used	Findings
Investor sentiment	1. Oktay Tas, Özgüç Akdag. (2012)	1- The study measured investors' sentiment using the natural log of the trading volume of the weekly volume in Turkish Lira divided by the volume of previous week.	1. The results of the study proved the existence of positive relation between investors' sentiment measured by the change in trading volume and the corresponding stock return.
	2. Sujung Choi. (2016)	2- Changes in the University of Michigan Consumer Sentiment Index (scaled by 1/100). <ul style="list-style-type: none"> Monthly H-P detrended Baker and Wurgler's investor sentiment index. (http://pages.stern.nyu.edu/~jwurgler) 	2. The results demonstrated that changes in the University of Michigan Consumer Sentiment Index were correlated with value weighted.
	3. Chuangxia Huang, Xin Yang, Xiaoguang Yang, and Hu Sheng. (2014)	3- Baker and Wurgler index use six variables in its construction which are: the average closed-end fund discount (CEFD), NYSE share turnover (TURN), the number on IPOs (NIPO), average first-day returns on IPOs (RIPO), the equity shares in new issues, and the dividend premium to form an investor sentiment variable based on the Principal Component Analysis. <ul style="list-style-type: none"> This study used Baker and Wurgler index and employed some changes in the construction of this index based on data availability in the Chinese stock market CEFD, NIPO, RNIPO, the number of new investor accounts for A shares (NIA), and 	3. The study concluded that investor sentiment was positively correlated with industry return of the Chinese market of the current period and negatively correlated with that of one lagged period. Also, the coefficient of investor sentiment during the current period was greater than that of the one lagged period. As investor sentiment is classified into two kinds: the optimistic and the pessimistic, the optimism had positive impacts on the return of most of the industrial stocks while the

		Shanghai share turnover (TURN).	pessimistic showed insignificant impact.
4. Elisabete F. Simões Vieira (2016).	4-	The study employed the European Economic Sentiment Indicator data, from Directorate General for Economic and Financial Affairs as a proxy for investor sentiment. The study focused on the share returns of family and non-family firms, using panel data methodology while running the data using ordinary least squares (OLS), the fixed effects model (FEM), and the random effects model (REM)	4. The study proved the existence of negative relation between sentiment and future return. Also, it was noticed that there is no difference between family and non-family firms regarding the impact of sentiment on return. The results showed that young, large and medium growth firms are most influenced by sentiment. Finally, the study suggested that the proxy used for measuring the sentiment affect the relation between the sentiment and return.
5. Subramanian Rama Iyer, Joel T. Harper (2017).	5-	The study used Investors Intelligence survey data as a proxy for investors' sentiment and run it again cash flow volatility as a measure of riskiness This survey produces the Advisors Sentiment report, which shows surveys' results the outlook of 120 independent investment newsletters. It documents the percentage of advisors who are bullish and bearish and the percentage of advisors who expect a correction.	5. The results showed that there is not a significant direct relationship between investor sentiment and portfolio return whether for the risky or safe firms. However, when using individual stocks' return a negative relationship is found between sentiment and return of the subsequent period such that high sentiment is followed by period of low return. Also, safe firms were found to perform better in periods following high investor sentiment compared to more volatile (risky) cash flows firms.
6. Andres Bello , Jan Smolarski , Gökçe Soydemir ,	6-	The study used American Association of Individual Investor as a proxy for individual investor sentiments. Additionally,	6. The study demonstrated that individual investors built their expectations on short-term using momentum indicators. As

	Linda Acevedo (2017)	Survey data of Investors Intelligence, which surveys market professionals, was used as a proxy for institutional investor sentiment.	for the institutional investors, they built long term expectations using business cycle and short-term indicators.
	7. Boonlert Jitmaneeroj (2017)	7- The proxies for market-based sentiment are trading volume (TVO), advance-decline ratio (ADR) and price volatility (VOL). The survey-based measures of sentiment are bull-bear ratio of AAI (BB1) and bull-bear ratio of Investors Intelligence (BB2)	7. The results showed the existence of negative insignificant relation between sentiment and P/E ratio when using the TVO proxy. The use of ADR resulted in having positive and high significant relation, while VOL showed a positive and significant relationship. As for the usage of the two surveys (BB1 and BB2), they both showed positive significant impact on P/E ratio.
	8. Stella N. Spilioti (2016).	8- The study hypothesized that there is a negative relationship between sentiment and return of the subsequent period. The study used time series regression and panel data test for difference between expected return and realized return.	8. The study tested the reasons for deviation away from the fundamental values; whereas the results indicated that the difference was justified by sentiment such as the consumer confidence and the economic sentiment of investor in addition to some macroeconomic variables. Adding that the sentiments demonstrated a large portion of these differences.
	9. Jasman Tuyon. Zamri Ahmad (2018)	9- The study employed two sentiment proxies: business sentiment index (BSI) and consumer sentiment index (CSI) in Malaysia.	9. The study revealed that behavioral risk had more impact in period of losses compared to period of gains when analyzing the risk-price relationship. Similar results were retrieved when examining the risk-volatility relationship. However opposite results were

			shown for the risk- volume relationship.
10. Saumya Ranjan Dash, Jitendra Mahakud (2013).	10- The study measured investors' sentiment using an aggregated Indian investor sentiment index. The index was constructed using: turnover volatility ratio (tvr), buy-sell imbalance ratio (bsir), put-call ratio (pcr), advance decline ratio (adr), share turnover velocity (stv), number of IPOs (nipo), equity issue in total issue (eti), dividend premium (div.P), change in margin borrowing (cmb), fund flow (ff) and cash-to-total assets (cta) in the mutual fund market.	10. The study tested the impact of sentiments on return of portfolios constructed based on size, book to market equity, liquidity and momentum. The results revealed that sentiments had not shown similar impact on returns of the constructed portfolios. Also, the study demonstrated that the stocks which are more sensitive to sentiments are stocks with small size, low and high book-market equity, exceedingly the winner and loser portfolios.	
11. Daniel Perez Liston (2016).	11- The study used two sentiment measures: individual and institutional investor sentiments. Individual investors' sentiment was measured using American Association of Individual Investors survey while institutional investors' sentiment was measured using investor intelligence survey.	11. The study examined the impact of sentiment on portfolios constructed using stock of alcohol, tobacco and gaming companies. The results proved that individual and institutional sentiment had impact on the return of sin stocks, also they showed impact on stock's volatility.	
12. Mouna Abdelhédi-Zouch, Mouna Boujelbène Abbes and Younès Boujelbène (2015)	12- The study employed three measures of investors' sentiments VIX, VXN and put and call ratio. VIX is a volatility index shows the expected volatility in S&P 500 over thirty calendar days whereas VXN shows volatility in Nasdaq 100. The put and call ratio is a measure of optimism and pessimism such that high level of put and call ratio reflects high pessimism	12. The study revealed the negative relation between investors' sentiments and index prices. Also change in sentiments found to be significantly affecting volatility.	

		while the decrease in this ratio reflects optimism.	
13. Ann Shawing Yang and Ming-Lung Wu (2011).	13- The study measured investors' sentiment using four categories and eight variables. The first category is the overall trading including: Price volatility, trading volume, Buy/sell order changes. The second category: margin trading including: Margin purchase amount changes and short sales changes, the third category is foreign and institutional investors including: qualified foreign institutional investors' total buy / sell changes, securities investment trust companies (SITC) total buy/sell changes and Dealers total buy/sell changes. The fourth category is TAIEX option including: open interest put/call ratio changes.	13. This study examines the relation between investors' sentiment and stocks' price volatility of the Taiwanese market. The study proved the existence of sequential relation between the employed measures of sentiments and price volatility. The results ranked the sentiment measures based on their leading impact on price volatility whereas short sales volume is the most leading one followed by open interest put/call ratio, changes in buy/sell order then margin purchases. This means that TAIEX options and margin trading are the most influential variables while the least ones are foreign institutional investors.	
14. Sanjay Sehgal, G.S. Sood and Namita Rajput (2009)	14- This study aimed at determining the definitional aspect of investor sentiment, determining the factors affecting investor sentiments and defining the relationship between sentiment and market performance of the Indian market. The study conducted a survey to get the information needed and test the relation between sentiment and stocks' return.	14. The results of the study revealed that 55.36% of the respondents agreed that investor sentiment and stock returns influence each other, while 22.32% expressed that past return affect sentiment. Additionally, 17.86 % viewed that the increase in investor sentiment will increase future return.	
15. P. corredor, E. Ferrer, and R.	15- The study employed consumer confidence index as a measure of investors' sentiment.	15. The study aimed to test the relation between sentiment and future return. The results rejected the	

	Santamaria (2015)		hypothesized negative relation and justified this to the failure of the local index employed to catch the whole effect of investors' sentiment
	16. Maria Elisabete Duarte Neves, Luís Miguel Aragão Duarte Gonçalves, Mario Joaquim Silva Ribeiro, Paulo Jorge Santiago Feiteira, Clara Margarida Pisco Viseu. (2016)	16- Consumer confidence index is used to measure investor's level of optimism and pessimism. This is measured as the difference between consumer confidence index and the expected consumer confidence index	16. The study targeted to identify the relation between return of Portuguese benchmark and the market sentiment. The results demonstrated the existence of one-way relation such that sentiment is affected by return.
Herding behavior	1. Nousheen Zafar and Arshad Hassan (2016)	1- The study used Cross Sectional Standard Deviation (CSSD) and Cross-Sectional Absolute Deviation (CSAD) to measure herding between market and individual stock return.	1. The study aimed to test the existence of herding behavior among the Pakistani investors in extreme market conditions. 5% and 10% up and down levels were used to determine extreme market conditions. The results denied the existence of herding behavior at 5% in up markets. However, herding existed in down market of 5% extreme conditions and both up and down 10% extreme conditions. The same results were reached between CSSD and market return during the nonlinear and asymmetric examination.

2. Charilaos Mertzanis and Noha Allam (2018)	2- Cross Sectional Standard Deviation (CSSD) and Cross-Sectional Absolute Deviation (CSAD) to measure the herding phenomena.	2. The study tested the presence of herding behavior in the Egyptian stock market. The results denied the existence of the herding behavior however proved the existence of adverse herding that showed non-linearity relation.
3. Satish Kumar and Nisha Goyal (2016).	3- The study employed a structured questionnaire to test the relation between rational decision making and behavioral biases among the Indian individual investors.	3. The results demonstrated that the herding was not directly related to decision making steps. The steps of rational decision-making process are: problem identification, seeking essential information and evaluating alternatives solutions.
4. Haruna Babatunde Jaiyeoba , Razali Haron (2016)	4- The study used semi structured interviews to examine the investment decision made by the Malaysian retail investors.	4. The study found that retail investors in the Malaysian market tend to prefer domestic stocks and are affected by behavioral biases as they tend to herd on the information.
5. Houda Litimi (2017)	5- The study used a modified version of CSAD that includes trading volume and investors' sentiment that excite herding	5. The study proved the existence of the herding behavior during period of crisis in the French market. Also, it existed during the whole period for only some sectors. The results suggested that the factors affecting herding differed from one sector to another.
6. Imed Medhioub and Mustapha Chaffai (2018)	6- The study measured herding using CSAD but with modification for Islamic countries.	6. The study tested the presence of herding behavior in Islamic stock markets of GCC. The results showed the presence of herding behavior in the stock markets of Saudi and Qatar.
7. Lakshman M.V.,	7- Herding was measured using Hwang and Salmon	7. This study aimed to test the existence of herding

	Sankarshan Basu, R. Vaidyanathan (2013)	(2004) methodology which uses the CSSD estimation.	behavior in the Indian stock market and the role of institutional investors on herding. The results proved the presence of herding phenomena to a certain level in addition to the presence of adverse herding. Also, the results revealed the role of mutual fund in increasing herding.
8.	Sakshi Saxena, Harish Purohit and Vibha Dua Satija (2016)	8- The study employed a questionnaire to measure the psychology of the retail investors and examine their performance to herding behavior.	8. This study aimed to examine the herding behavior among the Indian retail investors. The study demonstrated that several psychological factors affected the retail investors' investment decision like: intuition power, self-confidence and the risk-taking power. Also, their herding behavior is the result of: low confidence level, insufficient levels of awareness, optimism, speculation, global market volatility, factors related to reputations, bandwagon effect and the social proof.
9.	Zhuo Qiao, Thomas C. Chiang, Lin Tan (2014)	9- The study used CSAD in measuring the herding behavior as this method considers the time varying while using the Kalman filter method.	9. This study measured the existence of herding behavior in nine Asian countries whereas the results supported the existence of herding. The study proved the presence of bilateral causality between the return of the nine Asia markets and herding using both the linear and nonlinear granger causality tests.
10.	Anandadeep Mandal (2011)	10- The study employed Hwang and Salmon (2004) price-based model to measure herding.	10. This study measured the herding behavior in the Indian stock market. The empirical results

			demonstrated the existence of herding in Indian market. It was noticed an increase in herding when the market rallies up and a decrease when the market dips down.
	11. Alan Wong and Chuke Nwude (2018)	11- This study employed an online survey to collect the data needed.	11. This study employed a comparative study using seven behavioral biases in US and Nigeria. The herding behavior is found to be greater in Nigeria than in US because of the collective nature of the Nigerian people.
<u>Social media sentiment.</u> 1. microblogs posted on Sina Weibo	1. Yingying Xu, Zhixin Liu, Jichang Zhao, Chiwei Su (2017)	1. The study used social media sentiment using Sino Weibo microblogs to measure the impact of sentiment on stock return of China. wavelet analysis	1. This study measured the relationship between social media sentiment and Chinese stocks' return whereas the sentiments were divided into five detailed sentiments including: anger, disgust, fear, joy, and sadness. The wavelet analysis revealed that the relation between Weibo sentiments and Chinese stock market were positive and not significant all the time. The results also demonstrated that this relation had both frequency and time varying features. Moreover, sadness proved to have the most powerful role over return.
2. Facebook likes.	2. Arne Feddersen, Brad R. Humphreys and Brian P. Soebbing. (2017)	2. This study employed Facebook likes as a proxy for sports sentiments bias and examined changes in bookmakers' prices investors' sentiment.	2. The study used data from seven professional sports in Europe and North America. The results found that bookmakers had impact on increasing prices for bets on teams with more Facebook likes.

3. Google Trends measure investor heuristic recognition	3. Júlio Lobão, Luís Pacheco, Carlos Pereira (2017).	3. The study used Google trends and survey to measure the performance of recognition heuristics.	3. The study targeted to examine the impact of profitability on return of the most prominent stocks in Europe. The results revealed that there was weak evidence regarding the expectations that the increase in companies' monthly search volumes may result in unexpected return in the next month, investment strategy based on recognition heuristic principles would not produce better returns to investors than investing in the market portfolio.
4. Twitter sentiment	4. Gabriele Ranco, Darko Aleksovski, Guido Caldarelli, Miha Grčar, Igor Mozetič (2015).	4. The study used monthly internet search volume and statistical software to illustrate the effect of search volume on future stock returns. The study gathered Twitter Search API using a search query composed of the stock cash-tag (e.g., "\$NKE" for Nike).	4. This paper examined the relation between Twitter sentiment and Dow Jones Industrial Average index. The results showed that the sentiments polarity during Twitters peaks revealed the direction of the upcoming return whereas the amount of cumulative abnormal return I ranging from 1% to 2% additionally the dependence can last for many days after the incident.
5. Media sources, such as internet news sources and social media (sentiment, optimism, fear and joy)	5. Jiancheng Shen, Mohammad Najand and Feng Dong, Wu He (2017)	5. The emotion index constructed on the collective sources represents the market-level emotion as the consensus of the emotion related to information from all individual sources	5. This study aimed to examine the predictable power of media-based emotion on commodity return. The findings of the study showed that commodity-specific emotions employed in this study: (optimism, fear and joy) had significant impact on individual commodity returns. This relation is not

6. economic news represented in Twitter accounts by Reuters and Bloomberg	6. Nadine StrauB, Rens Vliegenthart, and Piet Verhoeven (2017).	6. This study gathered the prominent accounts of Reuters and Bloomberg on Twitter to measure news sentiment. This involved news about mergers and acquisition in addition to news related to developing and emerging markets development	shown on commodity market index returns. Moreover, the results demonstrated the predictability of the commodity-specific emotions on the next five days' individual commodity returns. 6. The study measured the relation between economic news of U.S and Dow Jones Industrial production index. The results of vector auto regression analysis showed that news volume, news relevance in addition to expert opinion in tweets had a positive impact on DJI whereas the impact was shown within one hour.
Negative social mood	1. Sujung Choi (2016)	1. The study used monthly suicide rate to measure the impact of negative social mood on stocks' return of the U.S market	1. The study examined the role of negative social mode using suicide rates in predicting future return of the U.S market, whereas the results confirmed this role. Also, the results demonstrated that companies with small market capitalization are more affected than the large ones. Additionally, the study added that the suicide rates were a result of emotional factor not economic reasons.
	2. Guy Kaplanski, Haim Levy (2010).	3. This study measured the impact of negative sentiment using aviation disasters on stocks' return of the U.S. economy.	2. The study proved that negative sentiment measured by aviation disasters had significant negative impact on stocks' return whereas the impact is the greatest on small and riskier stocks

Investors' attention	1. Zhen-Hua Yang, an-Guo Liu, Chang-Rui Yu, Jing-Ti Han (2017).	1. The study measured the investors' attention using (IAVS) the increments of the attention volume for each stock that measures the daily increments of the aggregate number of every stock selected by investors and added to watch list in the trading platform). Also, the study used (BI) that measures the total number of search volume of all stocks listed in specific index on a certain day.	1. The study quantified investors' attention using IAVS and BI and measured its impact on stocks' movements of Chinese stock market. The findings showed that both methods had significant correlation with the stocks' movements but IVAS was more stable and significant than BI.
	2. Xian Li, James A. Handler, and John L. Teall (2016)	2. The study employed twitter micro-blogging to measure investors' attention.	2. The study illustrated the role of investors' attention measured by noticing investors' tweeting behavior. The results of the study found that active stocks with great attention i.e., greater dispersion had strong correlation between investors' attention and trading volume.
Newspaper reports sentiments.	1. Yochi Cohen-Charash., Charles A. Scherbaum, John D. Kammeyer-Mueller, Barry M. Staw (2013).	1. The study developed an emotion word extracted from pleasant and unpleasant market actions. Then these words were placed in a circumplex to construct mood indices to be used in further analysis.	1. This study used emotions' words extracted from newspaper reports. Time series analysis was run between the moods extracted from the emotion's words and stock prices. The results revealed that good active mood can forecast increase in NASDAQ prices, while bad active mood forecasted a decrease.

	2. Matthias W. Uhl (2014)	3. The study analyzed sentiment found in 3.6 million Reuters' articles using Vector Autoregression (VAR) models.	2. This study measured the ability of sentiments found in Reuters news articles to forecast future return of Dow Jones Industrial Average index. The results of analysis found that both positive and negative sentiments had impact on the return of Dow Jones' stocks but the negative sentiments had more power than the positive ones. Also, the study found that the sentiments impact had a long-lasting power that lasts for months not just days.
Gambler's Fallacy	1. Amjad Amin, Serish Shoukat, Zahoor R. Khan (2010).	1. This study employed a questionnaire to test the impact of Gambler's fallacy on Lahore stock market	1. The results showed that investors trading in Lahore stock market practice gambler Fallacy by wrongly assuming a continuation of a certain trend or its ending.
Optimism	1. Mohammad Tariqul Islam Khan, Siow-Hooi Tan and Lee-Lee Chong (2017).	1. This study measured the mediating role of optimism between past portfolio return and future financial decision of retail and institutional investors using questionnaire whereas the data was analyzed using OLS regression.	1. The results of the study proved that the perception of retail and institutional investors toward past return affects their financial decision, while only retail investors' financial decisions were affected by past return perception through optimism.

	2. Mohammad Tariqul Islam Khan, Siow-Hooi Tan and Lee-Lee Chong (2016).	2. This study employed a survey to measure the Malaysian retail investors' preferences for each firm characteristics, their trading activity and their behavioral biases	2. This study intended to measure the impact of Malaysian retail investors' preferences for firms' characteristics, optimism and overconfidence on their trading activity. The results showed that firm's characteristics like profitability, management, product related features and risk attributes increased trading activity. While firms' liquidity level, trading volume, optimism domains and better than average domain of overconfidence tended to increase trading activity.
	3. Abderrazak Dhaoui (2013)	3. This study explained that optimism existed when the forecast of the mean annual return exceeds its corresponding actual return.	3. This paper studied the factors that are able to explain how the financial markets work of 12 international markets for a period from August 2002 to the mid-September 2011. The results showed that markets' works were driven by terms of animal spirits including optimism, pessimism, overconfidence and spontaneous reaction not directed by rational behavior.

	4. Abderrazak Dhaoui (2015)	4. This study measured optimism when noticing that the sign of variation in stock market price variation is not similar to the sign of the market trend variation.	4. This study tested the effect of investors' psychological state presented in pessimism and optimism on their trading volume in the U.S market for the period from 1987 to 2014. The results of VECM showed that pessimism directed the investors' trading volume. The pessimism and optimism shocks affect the behavior of the investors in different ways. Also, the results revealed that during the pessimistic period, pessimism sentiments were the driver behind the stock market while in normal economic periods, sentiments had no effect.
Investors' competence.	1. John R. Graham, Campbell R. Harvey and Hai Huang (2009)	1. This study measured the impact of investors' competence using survey.	1. This paper studied the impact of investor competence on investors' trading frequency and home bias. The results showed that competent investors tended to trade more frequently and are more confident of their own skills and judgment so they tend to shift part of their investment overseas.
Overconfidence (self-confidence)	1- Mohammad Tariqul Islam Khan, Siow-Hooi Tan and Lee-Lee Chong (2016).	1- This study tested the impact of Overconfidence presented by three domains (illusion of control, better than-average and miscalibration) among the Malaysian retail investors using questionnaire.	1. The results of the study revealed that two domains of overconfidence: illusion of control and miscalibration had not shown significant impact on trading activity, while the third domain: better-than-average increased investors' trading frequency.
	2. Abhijeet Chandra, Kantesha	2. This study employed a structured survey to test the investors' trading	2. This paper studied the factor that affect retail investors' trading

	Sanningamm anavara, Satya Nandini (2017).	behavior using three aspects: changes in fundamental factors, unexpected market events, and personal factors. Additionally, the study viewed a linear function of these three aspects.	behavior. The results revealed that retail investors' trading behavior is affected by self-perceived confidence additionally self-perceived confidence level was positively related reflecting that overconfident investors believe that their own skills are superior and accordingly possess larger than average investment portfolios.
	3. Dimitrios Kourtidis, Prodromos Chatzoglou, Zeljko Sevic (2017).	3. This study measured overconfidence using questionnaire.	3. This study measured the impact of some behavioral biases on the Greek investors' trading behavior. The finding proved that overconfidence affects stock trading volume, frequency and performance in a positive and significant way.
	4. Satish Kumar and Nisha Goyal (2016).	4. This paper employed a questionnaire to measure the relation between rational decision making and behavioral deviations among Indian investors.	4. The results of the study found that a positive relation is found between the second step of the rational decision making, i.e., information search and overconfidence.
	5. Raymond Cox, Ajit Dayanandan, Han Donker, John R. Nofsinger (2018).	5. The study measured confidence level using monthly Consumer Confidence index released by the University of Michigan on a quarterly basis	5. This study studied the impact of overconfidence on the dispersion of US return estimation which is used to forecast the business cycle. The finding showed that the confidence of the financial analyst appeared during the expansion stage of the US business cycle and made them to take un-rational decisions.

6. Stella N. Spilioti (2015)	6. This study measured confidence using the increase in current wealth and the expectation of an increase in future income.	6. This study intended to determine the reasons of the difference between the realized and expected return. The results showed that the consumer confidence was one of the main contributors behind this difference.
7. Syed Zain ul Abdin, Omer Farooq, Naheed Sultana, Mariam Farooq (2017)	7. This study employed a survey to measure the relation between some heuristic's variables and investment performance through the mediating channels of fundamental and technical anomalies.	7. The study showed that the impact of overconfidence on investment performance is positive through the mediating channel of fundamental anomalies.
8. Cetin Ciner (2014)	8. This study used University of Michigan Consumer Sentiment Index (CSI) and Consumer Confidence Index (CCI) of consumer board to measure confidence.	8. This study examined the effect of changes in confidence level on future return of stock index. The finding showed that a time-varying relation was shown between consumer confidence and returns.
9. Abderrazak Dhaoui (2013).	9. This study measured overconfidence through noticing the effect of realized return at the time (t-1) over trading volume at the time "t"	9. This paper studied the factors that are able to explain how the financial markets work of 12 international markets for a period from August 2002 to the mid-September 2011. The results showed that markets' works were driven by terms of animal spirits including optimism, pessimism, overconfidence and spontaneous reaction not directed by rational behavior.
10. Abhijeet Chandra and Ravinder Kumar (2012)	10. This study employed a survey to measure several behavioral biases and heuristics on investment decision making process	10. This study employed a survey answered by 350 individual Indian investor and the findings concluded that individual investors' investment decisions were affected by overconfidence

			as one of the examined behavioral biases.
	11. Alok Kumar (2009)	11. This study used the mean K-day of post trade sell buy return differential (PTSBD) of every stock at the end of every year as a proxy of overconfidence. This approach compares the mean return of the purchased stocks and that of the sold stock whereas a large positive difference in both returns reflects overconfidence behavior.	11. This study tested the existence of behavioral biases when there is a great level of market uncertainty and difficulty in valuing stocks. The findings explained that investors made their investment decisions with great level of overconfidence when the level of uncertainty inherent in the market increases and when it is difficult to value stocks.
	12. Alan Wong and Chuke Nwude (2018)	12. This study conducted an online survey to measure overconfidence level among Nigerian and US. Investors.	12. This study employed a comparative study to examine the impact of seven behavioral biases in US and Nigeria. The results of analysis showed that overconfident had a positive impact in both countries.
Investors' local bias and home bias	1. Alok Kumar (2009)	1. This study measured home bias using: $Dact - Dmkt$. $Dact$: is the distance between an investor's location and stock portfolio, while $Dmkt$ is the distance between an investor's location and the market portfolio. A proxy for home bias is the negative of the proportion of the total investor portfolio allocated to foreign securities.	1. This study examined the use of some behavioral biases when there is a great level of market uncertainty and difficulty in valuing stocks. The finding showed that investors tended to deviate toward familiar and domestic stocks during periods of market's uncertainty.
Familiarity	2. Alan Wong and Chuke Nwude (2018).	2 This study employed an online survey to measure the impact of familiarity on the US and Nigerian economy.	2. The results of the study showed that Familiarity had positive impact in US and negative impact in Nigeria, whereas the difference between both countries was significant.

Risk tolerance	1. Dimitrios Kourtidis, Prodromos Chatzoglou, Zeljko Sevic (2017)/	1. This study measured the impact of risk tolerance using questionnaire.	1. This paper studied the impact of some behavioral biases on the Greek investors' trading behavior. The finding showed a significant positive relation between trading frequency and risk tolerance however a significant negative relation was found between trading performance and risk tolerance.
	2. Zamri Ahmad and Haslindar Ibrahim and Jasman Tuyon (2017).	2. This study employed a survey distributed among foreign and local fund managers trading in Malaysia.	2. The aim of this paper is to study the behavior of institutional investors in the Malaysian market. The study connected the risk tolerance with the personality features of the institutional investors, whereas the results showed that male investors made more risky decisions than female. Also, it was found that extraverted and open investors exhibit high risk tolerance level. Additionally, risk tolerance level increased with age and experience
	3. Michael J. Roszkowski and Geoff Davey (2010)	3. This study used FinaMetrica data to measure risk tolerance. It is an Australian company that produces risk tolerance assessment.	3. This study targeted to measure the risk tolerance pre and post 2008 financial crisis whereas the study considered risk tolerance score pre and post 2008 using FinaMetrica data. The results of analysis revealed that risk tolerance level was not statistically affected by the 2008 crisis however the risk perception was the one that was affected.

Risk avoidance	Sreeram Sivaramakrishnn, Mala Srivastava, Anupam Rasntogi (2017)	This study measured risk avoidance using Zhou <i>et al.</i> (2002)'s scale that is composed of two items.	This study intended to study the effect of some behavioral biases on investment decision in the Indian market. The study combined risk avoidance with other two variables and formed a construct named "Attitude to Investment behavior" which was found to have negative impact on the investment intention.
Sociability	Dimitrios Kourtidis, Prodromos Chatzoglou, Zeljko Sevic (2017).	This paper studied the role of sociability using questionnaire	The results of the study found that sociability positively affected stock trading frequency and performance
Perceived investments of significant others (PISO).	Sreeram Sivaramakrishnn, Mala Srivastava, Anupam Rastogi (2017)	This variable measures the effect of observed social behavior on subsequent social behavior which represents a kind of social influence. The study measured the impact of this variable using questionnaire.	The results found that a strong negative relationship existed between "perceived investment of significant others" and Attitude to Investment behavior.
Perception of regulator	Sreeram Sivaramakrishnn, Mala Srivastava, Anupam Rasntogi. (2017)	This variable measures the trust felt toward government in supervising the capital market The study measured this variable using a questionnaire.	The study combined perception of regulator with other two variables and formed a construct named "Attitude to Investment behavior" which was found to have negative impact on the investment intention.
Subjective financial literacy.	Sreeram Sivaramakrishnn, Mala Srivastava, Anupam Rastogi (2017)	This variable measure confidence level in possessed financial knowledge. The study measured this variable using a questionnaire	The results showed that subjective financial literacy had a great impact on investment intention.
Big five personality traits (moderator variable) • Openness	1. Muhammad Zubair Tauni, Zia-ur-Rehman Rao, Hong-Xing Fang, Minghao Gao (2017).	1. The study measured personality traits using the NEO-Five Factor Inventory (Costa and McCrae, 1989)	1. This study intended to measure the effect of personality on the relation between key sources of information and trading behavior. The results of the study proved the moderating role of personality trait. The

<ul style="list-style-type: none"> • Conscientiousness • Extraversion • Neuroticism • Agreeableness 			<p>results also showed that the usage of financial advisor advice increased the trading frequency of the open, extraverted, neurotic and agreeable investors while decreased it among conscious investors. The usage of word-of-mouth source is effective among extraverted and agreeable investors only, while the press source of information was more reluctant among open and conscious investors.</p>
	2. Mumtaz Ahmad (2018)	2. This study measured personality using the five constructs: openness, extraversion, agreeableness; conscientiousness and neuroticism using items developed by the (John & Srivastava,1999)	2. This study measured the effect of personality traits on the Pakistani individual investor's behavior and investment decision. The results showed a significant negative relation between personality trait and investor behavior. While an insignificant relation was found between the personality and investment decision.
	3. Fatima Akhtar, K.S.Thyagaraj & Niladri Das (2014)	3. This study measured the relation between personality features and investment patterns using Bailard, Biehl and Kaiser (BB&K) personality trait model	3. This study intended to measure the relation between personality features of investors and investment options. The results revealed that there was a significant relation between investors categorized as Adventurer Celebrity, Individualist Guardian Straight Arrows and investment options studied.

	4. Zamri Ahmad and Haslindar Ibrahim and Jasman Tuyon (2017)	4. This study employed a survey distributed among foreign and local fund managers trading in Malaysia.	4. The aim of this paper is to study the behavior of institutional investors in the Malaysian market. The study connected the risk tolerance with the personality features of the institutional investors, whereas the results showed that extraverted and open investors exhibit high risk tolerance level.
Disposition effect	1. Satish Kumar and Nisha Goyal (2016)	1. This study used a structured survey to examine the relation between rational decision-making stages and some behavioral biases in the Indian stock market.	1. This study measured the relation between different behavioral basis and rational decision-making stages. The results revealed that during the last stage of decision-making, i.e., during evaluating alternatives, had a significant relation with disposition effect.
	2. Alan Wong and Chuke Nwude (2018)	2. This study employed an online survey to measure the impact of disposition effect on the US and Nigerian economy.	2. The results demonstrated that both the U.S. and Nigerian economies were affected by the disposition effect without significant difference between the impact on both countries although the reasons could be different.
	3. Alok Kumar (2009)	3. This study measured disposition effect using Odean's (1998) PGR – PLR method	3. This study examined the use of some behavioral biases when there is a great level of market uncertainty and difficulty in valuing stocks. The results highlighted that investors' disposition behavior is high when market exhibit high level of uncertainty.

	4. Justin Birru (2015)	4. This study measured disposition effect using the following equation ($Sale_{i,t} = \beta_0 + \beta_1 Gain_{i,t} + \beta_2 Max_{i,t} + \beta_3 Min_{i,t} + \beta_4 Decem_{i,t} + \beta_5 Decem_{i,t} \times Gain_{i,t} + \beta_6 Xi_{i,t} + \epsilon_{i,t}$.)	4. This study measured the disposition effect pre and post stock split. The results found that investors behave in a way similar to disposition effect before stock split
Fear	Gökçe Soydemir, Rahul Verma, Andrew Wagner (2017)	This study measured the fear factor using The VIX which represented the volatility index released by Chicago Board options Exchange.	This study measured the impact of rational and irrational fear on S&P 500 index. The results explained that both fears had a significant impact on the index however the irrational fear had a stronger role in down market periods.
Representativeness	1. Muhammad Haroon Rasheed, Amir Rafique, Tayyaba Zahid, Muhammad Waqar Akhtar (2018).	1. This study measured the role of representativeness using questionnaire where the questions were gathered from literature.	1. This study aimed to test the impact of two behavioral heuristics: representativeness and availability on the investment decision made by the Pakistani investors. The results explained that representative bias had a positive and significant impact on the degree of irrationality in the investment decision process.
	2. Abhijeet Chandra and Ravinder Kumar (2012)	2. This study employed a survey to measure the role of several behavioral biases and heuristics on investment decision making process.	2. The results of the study concluded the significance of the representativeness in the investment decision making process.

	3. Syed Zain ul Abdin, Omer Farooq, Naheed Sultana, Mariam Farooq (2017)	3. This study employed a survey to examine the impact of representativeness on the investment performance.	3. The study measured the impact of some behavioral biases on the investment decision using the mediating channel of fundamental and technical anomalies. The results revealed that representativeness was among the strong predictor of the investment performance. Also, the results highlighted that the impact of representativeness was through the mediating channel of the fundamental and technical stock market Anomalies
Availability	1. Muhammad Haroon Rasheed, Amir Rafique, Tayyaba Zahid, Muhammad Waqar Akhtar (2018).	1. This study measured the role of availability using questionnaire where the questions were gathered from different surveys available in the literature.	1. This study aimed to test the impact of two behavioral heuristics: representativeness and availability on the investment decision made by the Pakistani investors. The results of the study explained that availability bias had a positive and significant impact on the degree of irrationality in investment decision process.

	2. Doron Kliger and Andrey Kudryavtsev (2010)	2. This study tested the impact of two aspects of availability heuristics. The first one dealt with the positive and negative investment outcomes while the second dealt with the risk availability. The study employed a daily index return as a proxy for availability	2. This study targeted to measure the role of availability heuristic in the financial markets. The results of analysis declared that the positive reaction toward stock prices based on that upgrades guidance were stronger when accompanied by an increase in stock market index. The same for the negative stock price reaction to downward guidance which was found to be stronger when accompanied by a decrease in stock market index. As for the risk availability aspect, it was found that on great stocks' moves the unexpected stocks' price moves to upgrades were weak while the unexpected reaction to downgrades were stronger.
	3. Abhijeet Chandra and Ravinder Kumar (2012)	3. This study employed a survey to measure the role of several behavioral biases and heuristics on investment decision making process.	3. This study employed a survey answered by 350 individual Indian investor and the findings concluded that individual investors' investment decisions were affected by availability heuristics

	4. Syed Zain ul Abdina, Omer Farooq, Naheed Sultanaa, Mariam Farooqc (2017)	4. This study employed a survey to examine the impact of availability heuristics on the investment performance.	4. The study measured the impact of some behavioral biases on the investment decision using the mediating channel of fundamental and technical anomalies. The results revealed that availability did not have a direct effect on investment performance; however, the effect was due to the mediating channel of the fundamental and technical anomalies. The results also showed that the availability heuristic represented the largest contributor in the formation of the fundamental anomalies
Locus of control	Muhammad Haroon Rasheed, Amir Rafique, Tayyaba Zahid, Muhammad Waqar Akhtar (2018)	The study measured the mediating role of internal locus of control between representativeness and availability and investment decision process using a questionnaire.	This study aimed to test the impact of two behavioral heuristics: representativeness and availability on the investment decision made by the Pakistani investors using internal locus of control as a control variable. The results demonstrated that internal locus of control did not moderate the relationship between representative and availability biases and investment decision making process.
linguistically fluent tickers	1. Stanley Peterburgsky (2017).	1. The study implemented an experiment in which the investors were asked to choose between two stocks: a linguistically fluent and non-fluent ticker, which was presented through a survey.	1. This study intended to measure whether investors prefer easily linguistic stock (MAK) over the non-easy ones (WQH). The results of the survey indicated that there was no preferential between both stocks either for the riskless and risky investments

Alphabet bias	2. Jennifer Itzkowitz, and Scott Rothbort (2016)	2. The study collected data from The Centre for Research in Security Prices (CRSP).	2. The target of this study is to test whether the firm's name has an impact on its trading volume and the value of the company. The finding demonstrated that post 1999, early alphabet stocks were found to have high market-to-book ratios and higher Tobin's Q than later alphabet stocks. These results were also reached even after controlling for firm characteristics. Additionally, it was found that stocks that are firstly owned by individual investors implied early alphabetical bias, this behavior was not common among institutional investors.
Anchoring	1. Syed Zain ul Abdina, Omer Farooq, Naheed Sultana, Mariam Farooq (2017)	1. This study employed a survey to examine the impact of anchoring heuristics on the investment performance.	1. The study measured the impact of some behavioral biases on the investment decision using the mediating channel of fundamental and technical anomalies. The results revealed that the impact of anchoring on investment performance was only through the mediating channel of the fundamental and technical anomalies.
	2. Abhijeet Chandra and Ravinder Kumar (2012)	2. This study employed a survey to measure the role of several behavioral biases and heuristics on investment decision making process.	2. This study employed a survey answered by 350 individual Indian investor and the findings concluded that Indian individual investors' investment decision process was affected by anchoring heuristics

Environmental variables (Sunshine, daylight, temperature)	1. QLi and C.H. Peng (2016)	1. The study used daily air-pollution data from 2005 to 2014 from the Ministry of Environmental Protection of the People's Republic of China.	1. This study aimed to test the impact of air pollution which causes depressed mood on stock return of the Chinese market. The analysis showed that air pollution had a significant impact on Chinese stock's return post 2010 when Chinese awareness toward air pollution started to increase. Also, the results found a negative contemporary impact on stock return and a positive two days lagged impact.
Weather temperature (wind speed humidity and cloud cover)	2. Hyein Shim, Hyeyoen Kim, Junyeup Kim and Doojin Ryu, (2015)	2. This study got the weather data are from the Climate Data Service System (http://sts.kma.go.kr). The temperature was measured as the daily maximum and minimum temperatures while wind speed was measured in meters per second. Humidity was calculated as percentage of relative humidity. While cloud cover was, measured using a range from 0 (no cloud cover) to 10 (full cloud cover).	2. This study measured the impact of weather on stocks market volatility. The results of the historical data analysis illustrated that stock market volatility increased in cloudy and wet days while the windy weather decreased the market volatility.
	3. Vijayakumar N., Dharani M., Muruganand an S. (2015)	3. This study measured the impact of weather represented in temperature, dew point and visibility.	3. This study tested the effect of weather on stocks' return and volatility in the Indian stock market. The findings explained that temperature in Mumbai, Delhi and Chennai affected stocks' return. Also, temperature was found to be affecting Indian stocks' volatility.
	4. Guy Kaplanski, Haim Levy, Chris Veld, and Yulia	4. This study tested weather impact through studying the role of Seasonal Affective Disorder (SAD) which is a seasonal illness	4. This study intended to measure the role of noneconomic factors on risk expectation and investment plan using

	Veld-Merkoulova (2015)	represented by episodes of winter depression. It was also named “winter blues.	survey. The finding showed that SAD’s sufferers were expecting lower return in autumn than in other seasons.
	5. William N. Goetzmann, Dasol Kim, QinWang (2014)	5. The study employed deseasonalized cloud cover as proxy of investor’s mood. In addition, the study used survey data from the Yale International Center for Finance to measure institutional investors’ perception toward stock market.	5. This study measured the effect of mood swing caused by weather on the trading decision of the institutional investors. The results proved that institutional investors’ expectation toward stock market mispricing were affected by mood induced by weather. The study showed that optimism resulted by the decrease in deseasonalized cloud cover was negatively related to the overpricing expectation in both individual stock and Dow Jones Industrial index.
	6. Jeffrey R. Gerlach (2010)	6. This study measured seasonal affective disorder (SAD) by using zero during spring and summer months and the number of nighttime hours minus twelve during the other months. Daylight saving time (DST) is related to the number of nighttime hours, which can be calculated through a mathematical equation by considering the time of year and the locational coordinate.	6. This study measured the role of changes in Daylight saving time (DST) and Seasonal affective disorder (SAD) in affecting investors’ risk which causes changes in asset prices. The results revealed that neither DST nor SAD caused a significant change in stock’s return.
Investment Ability	Abdul Lathif and Syed Aktharsha (2016)	Investment decision making using structured survey	This study aimed to measure the impact of: investment ability, and risk appetite and optimism. The analysis of the survey revealed that investment ability had positive influence on investment decision making. Also, investment ability was

			found to have the prominent effect among the examined variables on investment decision.
Risk Appetite	Abdul Lathif and Syed Aktharsha (2016)	Investment decision making using structured survey	The analysis of the survey revealed that risk appetite had positive influence on investment decision making.
Pessimism	1. Abderrazak Dhaoui (2015)	1. This study identified pessimism when the sign of the variation in the stock market price is similar to market trend variation's sign.	1. This study tested the effect of investors' psychological state presented in pessimism and optimism on their trading volume in the U.S market for the period from 1987 to 2014. The results indicated that pessimism had more significant impact on the US market, this reflects the investors' overweighting for the bad probabilities more than the good ones.
	2. Abderrazak Dhaoui (2013)	2. This study considered pessimism when the expectation of actual return is less than the actual one.	2. This paper studied the factors that are able to explain how the financial markets work of 12 international markets for a period from August 2002 to the mid-September 2011. The results explained that the economy's work is explained by animal spirit terms which included pessimism.
Investor mood	1. Guy Kaplanski, Haim Levy, Chris Veld, and Yulia Veld-Merkoulova (2015)	1. This study used a question asking about general feeling ranging from 1 (feels very bad) to 5 (feels great).	1. This study intended to measure the role of noneconomic factors on risk expectation and investment plan using survey. The results showed that when the mood of the individual investor is good their expectation toward individual stock's return was high

	2. John E. Grablea and Michael J. Roszkowski (2008).	2. This study measured mood by choosing one of the three choices given in the study (Happy -Neutral – Gloomy)	2. This study aimed to measure the impact of mood on risk tolerance level. The results of the survey analysis showed that the better the mood the higher the risk tolerance level and that mood can be used to predict risk tolerance. The opposite was found for investors with gloomy mood.
Sports Sentiment	1. Guy Kaplanski, Haim Levy, Chris Veld, and Yulia Veld-Merkoulova (2015)	1. This study used a question asking about how their favorite team performed in the last 3 days. with choices ranged from 1 (bad result, from the individual's point of view, in an important game) to 5 (good result in an important game)	1. This study intended to measure the role of noneconomic factors on risk expectation and investment plan using survey. The findings showed that when the individual's favorite sports team performs well in the day before the completion of the survey this results in having high return expectation and lower risk expectation.
	2. Pei-Hsuan Lee and Ching-Wen Wang (2010)	2. This study measured the role of sports loyalty presented by behavioral and attitudinal loyalty through a questionnaire. measured the fan's willingness to own shares in his favorite team even with low or negative returns)	2. This study aimed to measure the impact of sports loyalty on fans' investment intention in the Taiwan market. The empirical results declared that the investment attention was affected by both behavioral loyalty and attitudinal loyalty. Also, the results indicated that behavioral loyalty is more powerful than attitudinal loyalty.
	3. Guy Kaplanski and Haim Levy (2010)	3. This study measured the impact of sports sentiment by documenting the results of world cup matches on the US market.	3. The results of analysis proved the high significant impact of the world cup matches results was significantly high and long lasting.

	4. M. Hakan Berument, Nildag Basak Ceylan, and Bahar Onar (2013)	4. This study used the results of international sports competition to proxy for investors' mood which affect their investment decision making process.	5. This study measured the impact of sports match results on the assets return and risk aversion level in Borsa Istanbul market. The results of analysis illustrated that the winning of the team results is increasing return and lowering risk aversion level while the opposite happened in case a loss or a tie result.
Day-of-the-Week Sentiment	Guy Kaplanski, Haim Levy, Chris Veld, and Yulia Veld-Merkoulova (2015)	This study measured the impact of weekend weekdays effect as dummy variables to examine the individual mood during weekends and weekdays.	The results of the study showed that the individuals' mood during weekdays was lower than that in weekends but this lower mood had not affected return expectation negatively.
Loss aversion	Abhijeet Chandra and Ravinder Kumar (2012)	This study employed a survey to measure several behavioral biases and heuristics on investment decision making process	This study employed a survey answered by 350 individual Indian investor and the findings concluded that individual investors' investment decisions were affected by loss aversion.
Regret aversion	Abhijeet Chandra and Ravinder Kumar (2012)	This study employed a survey to measure several behavioral biases and heuristics on investment decision making process	The analysis results concluded that individual investors' investment decisions were affected regret aversion which was found to have the most prominent impact.
Prospect theory	Abhijeet Chandra and Ravinder Kumar (2012)	This study employed a survey to measure several behavioral biases and heuristics on investment decision making process	The survey analysis results revealed that individual investors' investment decisions were affected by prospect theory.
Mental accountancy	1. Abhijeet Chandra and Ravinder Kumar (2012) 2. Alan Wong and Chuke	1. This study employed a survey to measure several behavioral biases and heuristics on investment decision making process 2. This study conducted an online survey to measure the impact of mental	1. The finding of the survey demonstrated the role of mental accounting, on individual investment decision making processes in the Indian market. 2. This study employed a comparative study to examine the impact of

	Nwude (2018)	accountancy in the US and Nigerian market.	seven behavioral biases in US and Nigeria. The analysis of the survey deduced that mental accountancy had a positive impact in the US market and no significant impact in the Nigerian market.
Emotions	Mark Fenton -O' Creevy, Emma Soane, Nigel Nicholson and Paul Willman (2011)	This study measured the impact of emotions of traders' decision making using qualitative methodology though conducting interviews	The empirical results deduced that emotions had a significant impact on traders' decision making, also a difference was recognized between high and low performing traders in the degree of intuition engagement decision making. Additionally, it was found that traders applying antecedent-focused emotional regulations got better results than traders applying primarily response focused regulations
neurotransmitters	Mumtaz Ahmad (2018)	This study applied a questionnaire to measure the impact of neurotransmitters on investors' behavior and investment decision in the Pakistani stock exchange.	The survey analysis results concluded a significant positive impact of neurotransmitters on investors' behavior while neurotransmitters domains: dopamine and epinephrine were found to have a significant impact on investor' decisions.
Emotional intelligence	Mumtaz Ahmad (2018)	This study applied a questionnaire to measure the impact of emotional intelligence on investors' behavior and investment decision in the Pakistani stock exchange.	The empirical results deduced a significant positive impact of emotional intelligence on investors' behavior while an insignificant impact was found from emotional intelligence on investment decision.
Framing	Alan Wong and Chuke Nwude (2018)	This study conducted an online survey to measure framing effect among Nigerian and US. Investors.	The results of the survey confirmed the positive impact of framing in both countries
Breakeven	Alan Wong and Chuke Nwude (2018)	This study conducted an online survey to measure breakeven effect among the Nigerian and US. Investors.	The analysis revealed that breakeven effect had a negative effect in the US market but a positive effect in

			the Nigerian market while noticing the significant difference between both countries.
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Appendix III

Survey protocol

An overview of the survey purpose:

Since the emergence of stock markets, researchers and investors became interested in understanding how the stock markets work and how to achieve the best return from these markets under future uncertainties. Over the past 60 years, researchers have been trying to reach the best model explaining stock markets' anomalies.

My study is intended to introduce a model capturing stock pricing determinants that take into consideration the rational expectation as well as the irrational ones, since recent studies have proved the insufficiency of traditional models to explain the stock prices' movement. This criticism led to the development of a new breakthrough called behavioral finance, which emerged as a savior by highlighting the irrationality behind the unexplained trading behavior executed by investors.

However, till now we are still apart from a complete psychological model describing and covering market anomalies or the behavioral variables that affect stock market prices.

Based on these observations and limitations, I have captured all the psychological factors found in literature, which proved their effect on stock prices and used them in this survey to determine the most significant factors and the biases that primarily affect investment decision.

Accordingly, I would like to invite you to be part of this study, your participation is of great importance so that I will be able to collect investors' opinion and determine the most influential psychological factors. Moreover, the results of this study are of great importance to the government and brokerage companies. These results will help the government to know more information about the investors' characteristics and will choose the appropriate policies to be applied. As for the brokerage companies, the results will allow them to know more about their customers, divide the investors into groups according to their behavioral biases thus will be able to give them the best customize advice

Questionnaire Cover Letter

Dear participants,

My name is Silvia Attia, a PhD student in University of Nicosia, Cyprus. I am conducting a study entitled:

“Developing a new stock pricing model that can be adapted to various markets with different context: a case study of the Egyptian Stock market”.

The study will introduce a model, that take into consideration the rational expectation as well as investors' behavioral biases, since recent studies have proved the insufficiency of traditional models to predict the stock prices' movement. On the other side behavioral finance is making a great contribution in this field particularly, after admitting the limited cognitive abilities of human presented in flawed memory, finite computational and conceptual abilities. Also, behavioral finance has proved that investors' decision-making process is affected by cognitive and emotional biases. Based on these observations, this study has captured all the psychological factors found in literature, which proved their effect on stock prices and tends to determine the most significant factors and the biases that primarily affect investment decision.

All the participants of this survey are Egyptian investors, who have stocks in corporate companies registered in the Egyptian stock market.

Accordingly, I would like to invite you to be part of this study, your participation is necessary so that I will be able to collect the investors' opinion to determine the most influential psychological factors on the stock prices.

The participation is free of charge and voluntary; you are free if you decided not to complete the survey. Answering the questionnaire will take from 10-15 minutes and all your answers will be treated with strict confidentiality. The results will be used for the study purpose and this may involve publishing them in academic journals.

Thank you for your participation.

For any information you can contact me via email: silvia-adly@aast.edu or by mobile: (+2) 01285853594.

My study supervisors are: Dr Svetlana Sapuric, University of Nicosia, Cyprus,

Email: sapuric.s@unic.ac.cy.

Dr Sara El Gazzar, College of international transport and Logistics, Egypt,

Email: sara.elgazzar@aast.edu

Dr Ifigenia Georgiou, University of Nicosia, Cyprus, Email: georgiou.i@unic.ac.cy

Thank you for your participation

Yours sincerely,

Silvia Attia



The Research Ethics Committee

Consent Form: Survey

I (optional),

Of

Assure that I am at least 18 years old and I am participating in this research voluntary that entitled “Developing a new stock pricing model that can be adapted in various markets with different context”, that is being conducted at the University of Nicosia by: Silvia Attia and I understand that the purpose of this questionnaire is to determine the most dominant behavioral factors that affect investment decisions making.

I understand that

1. After completing the questionnaire, it will be coded and my name and contact information will be kept separately from it.
2. The answers that I will provide will be secretive and none information will be known to the public by any mean that could reveal my identify i.e. that I will remain fully anonymous.
3. The analysis of the results will be used for the purpose of the study and may be published in any academic journal.
4. Any individual result will not be declared to anyone except after my admission with a written delegation.
5. I am free to retreat my consent at any time during the study in which any information obtained from me will be immediately deleted.

Signature (compulsory):.....

Date.....:

The researcher contact information are by email: silviasawers2013@gmail.com or by mobile: 01285853594.

The researcher supervisor is: Dr Svetlana Sapuric , Nicosia University, Cyprus,

Email: sapuric.s@unic.ac.cy

The initial version of the survey:

Please answer the following validity questions:

Are you 18 years old or older? (required)

☐Yes ☐No

Do you have knowledge or experience in stocks trading? (required)

☐Yes ☐No

What is your nationality? (required)

☐Egyptian

☐Other nationality

What is your email address (optional)

Section 1: Investor's Demographic Characteristics

1. Gender (Please select one)

- ☐ Male
- ☐ Female

2. Age

- ☐ 18 to 25 years old
- ☐ 26 to 40 years old
- ☐ 41 to 60 years old
- ☐ More than 60 years old.

3. Highest level of education

- ☐ University student
- ☐ Bachelor degree holder
- ☐ Master degree holder.
- ☐ PhD degree holder.

4. Your monthly income

- ☐ From \$1,000 to \$2,000
- ☐ More than \$2,000 to \$3,000
- ☐ More than \$30,000 to \$40,000
- ☐ More than \$40,000

5. Your marital status

- ☐ Married
- ☐ Single

6. Nature of employment

- ☐ Businessman
- ☐ Employee

7. What are the years of your trading experience in the stock market

- ☐ 1 to 5 years
- ☐ 6 to 10 years
- ☐ 11 to 15 years
- ☐ More than 15 years

8. How do you describe your knowledge degree about investment matters? (Please select one)

- ☐ Not knowledgeable at all
- ☐ Fairly knowledgeable
- ☐ Moderately knowledgeable
- ☐ Very knowledgeable

9. How often do you trade (buy and sell shares) at the stock market? (Please select one)

- ☐ At least once a day
- ☐ At least once a week, but not more than once a day
- ☐ At least once a month, but not more than once a week
- ☐ At least once a quarter, but not more than once a month
- ☐ At least once a year, but not more than once a quarter (i.e. three months)

Section 2: Information about Your Stock Investment Decisions

Please express your opinion by indicating your preferred statement towards participation in stock market investments/trading

(Key: 1 = strongly disagree; 2 = Disagree; 3=Neutral; 4=Agree; 5 = strongly agree)

	Stock Investment Decisions	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)
SID1	In general Investing in stock market has a high degree of safety.					
SID2	Your Investment has the ability to meet interest payments.					
SID3	Do you believe that investment proceeds generally will be used in a way that benefits society.					
SID4	Investment has recently reported return in the market that you participate - significantly better than expected.					
SID5	Your investment is likely to repay the principal at maturity.					
SID6	Do you think that your investment will have higher than average cash flow projections for the next years?					
SID7	Your own investment has demonstrated increased revenue growth in the past 5-10 years.					

Section 3: Psychological Factors

Please express your feelings and opinions by indicating your preferred statement towards the following questions. Tick one box against each statement. Key: 1 = Strongly disagree; 2 = Disagree; 3=Neutral; 4=Agree; 5 = Strongly agree)

	A. Cognitive and heuristics	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)
	1. Representativeness					
REP1	To what extent you tend to use trend analysis of some representative stock to make investment for the other stock that you invest in.					
REP2	To what extent you consider the past performance of the stocks before investing in it.					
REP3	Do you depend on recent past returns to be representative of what you should expect in the future					

REP4	When buying shares, my focus is always on the most recent price performance of the share in question					
REP5	I am very likely to go for, and pay a high price for stocks that have performed very well in the recent past.					
REP6	A history of consistent pattern of earnings growth of a particular stock, is an indicator that the value of the stock will keep on growing in the future					
REP7	To what extent you believe that the ticker symbol would affect your investment choice (MOK vs WQH)					
REP8	Do you agree that early alphabet stocks are more likely to be bought and sold than later alphabet stocks?					
	2. <u>Availability</u>					
AVA1	To what extent you tend to make investment decision based on similar events that are recalled to your mind rather than evaluating the other alternatives.					
AVA2	To what extent you tend to rely on the already available information rather than examining other relevant information to make an investment decision.					
AVA3	Massive investment returns in recent times can influence your participation in the stock market.					
AVA4	Can the market-related news (e.g., stock price movements) control your investment decisions?					
AVA5	would you add to your stock portfolio, just a few companies that you know well than many companies that you know little about					
AVA6	Do you prefer to buy stocks of your country companies rather than stocks of foreign					
AVA7	When choosing which stock to buy, I tend to consider stocks that famous people, e.g., celebrities, choose					

AVA8	To what extent you refer to your family member in your investment decision					
AVA9	Would you refer to your co-workers in your investments decisions					
AVA10	To what extent would you refer to friends in your investment decision					
	3. <u>Anchoring</u>					
ANC1	Do you rely on your previous experience in the market for your next investment decision?					
ANC2	Do you believe that a higher stock price is associated with higher quality?					
ANC3	Do you forecast the changes in stock prices in the future based on the recent stock prices?					
ANC4	Do you refer to benchmarks in your decisions?					
ANC5	You tend to treat each element of your investment portfolio separately					
ANC6	You ignore the connection between the different investment possibilities					
ANC7	If two out of ten stocks in your investment portfolio fall significantly in their value, you regard it as an overall loss of your investment					
	4. <u>Disposition effect.</u>					
DIS1	you get upset when you find that the decision you made has resulted in a bad outcome					
DIS2	you don't care when you make poor decisions					
DIS3	you feel more sad for the opportunities you missed than for the attempts that failed					
DIS4	you would rather prefer to be safe than sorry					
DIS5	you want to be sure before purchasing anything					
DIS6	Do you avoid risky things					
DIS7	Do you consider investing in shares not safe					
DIS8	It is very likely to lose money when making investments					

DIS9	you are very likely to sell something if it experiences price increase than price decrease					
DIS10	Do you worry of incurring a great loss when making investment decision					
DIS11	In case of loss positions in your investment, you generally wait for a price rebound instead of selling those securities					
DIS12	After a prior loss, you become more risk averse					
DIS13	If the price of an asset you wanted to sell declines after a purchase, you will hold instead of selling it					
DIS14	Do you avoid selling shares that have decreased in value and readily sell shares that have increased in value					
DIS15	You feel more sorrow about holding losing stocks too long than about selling winning stocks too soon					
DIS16	If stock you purchased losses you don't wait to claim your losses					
DIS17	When you sell an asset, whose price has risen, you get a pleasant feeling of having made a good decision in the original purchase					
	5. Mood					
MOO1	To what extent you believe that your emotions or mood may affect your investment decision.					
	<u>B. Biases</u>					
	<u>1. Overconfidence</u>					
OVC1	Are you able to successfully overcome any challenge					
OVC2	Compared to other people, to what extent you do tasks very well					
OVC3	You consider yourself to have great skills and ability to cope with and predict future events					
OVC4	When you make plans, you are almost certain to make them work					
OVC5	You are certain of accurately predicting the outcomes of the things you do					

OVC6	you can pretty much determine what will happen in your life					
OVC7	You clearly understand how to trade at the stock exchange market					
OVC8	To what extent you are confidence of the investment decision you take					
OVC9	You could accurately predict when would other investors decide to buy/sell shares					
OVC10	You assess your own performance in stock investment as much better compared to other investors.					
	2. Pessimism					
PES1	You are not willing to take the risk when choosing a stock or investment					
PES2	Do you prefer a low risk/low return investment with a steady performance over an investment that offers higher risk/higher returns					
PES3	Do you prefer to remain with an investment strategy that has known problems rather than take the risk of trying a new investment strategy that has unknown investment strategy but has great returns					
PES4	Do you view risk in investment as a situation to be avoided at all cost.					
	C. Neurological dimensions	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)
	1. Emotional Intelligence					
EI1	Do you always set goals for yourself and then try your best to achieve them.					
EI2	Do you always tell yourself; you are a competent person					
EI3	Are you a self-motivated person?					
EI4	Would you always encourage yourself to do your best					
	2. Personality traits					
	a. Openness Vs Closeness to experience					
OPN1	I love adventure.					
OPN2	I am imaginative.					
OPN3	I am the first to try new activities					

	b. <u>Conscientiousness vs lack of direction</u>					
CNS1	I am highly self-disciplined.					
CN2	I am very organized and always come prepared.					
CN3	I like to know the plan rather than be spontaneous					
	c. <u>Extroversion Vs introversion</u>					
EXT1	I am the life of the party.					
EXT2	I don't mind being the center of attention.					
EXT3	I am usually the one to start a conversation with someone					
	d. <u>Agreeableness vs antagonism</u>					
AGR1	I tend to trust people and give them the benefit of the doubt.					
AGR2	I am extremely empathetic.					
AGR3	I like to make other people feel at ease.					
	e. <u>Neuroticism (VS emotionally stable)</u>					
NEU1	I stress out easily.					
NEU2	I tend to be moody.					
NEU3	I am a worrier.					
	3- <u>Neurotransmitter</u>					
	a. <u>Dopamine</u>					
DOP1	I have episodes of low blood sugar with light-headedness, irritability, extreme hunger, and cloudy thinking.					
DOP2	I get excessive amounts of sleep and still awaken tired					
DOP3	I am easily angered, irritated, or frustrated					
DOP4	I need medication to cope with or forget my problems					
	b. <u>Serotonin</u>					
SER1	I eat when I am not hungry					
SER2	I eat massive quantities of food at one time					
SER3	I eat unconsciously and wonder why after that					
SER4	I eat such large quantities of food that I get nauseated					
	c. <u>Epinephrine</u>					

EPI1	I feel difficulties or problems with stress, mental clarity, maintaining my focus, organizing my thoughts, making decisions, and feeling out of control					
EPI2	I find it difficult to concentrate on my job or projects					
EPI3	I feel eye fatigue that affects my job, work or reading enjoyment					
EPI4	I feel difficulty while starting work/job/projects					
	<u>d. Norepinephrine</u>					
NOR1	I feel out of control, especially with my hunger					
NOR2	I think about food most of the time					
NOR3	I have strong desire of breads or pastas rather than sweets or junk food					
NOR4	I feel down, depressed, or unexciting					

Gambler fallacy

1- When flipping a fair coin, what are the chances of getting a “head”?

- ☐ 0-24%
- ☐ 25%-49%
- ☐ 50%
- ☐ 51%-74%
- ☐ 75%-100%

2- If the last 5 times you got a “tail” on a coin, what is the chance of not getting another “tail”?

- ☐ 0-24%
- ☐ 25%-49%
- ☐ 50%
- ☐ 51%-74%
- ☐ 75%-100%

3- If a stock price is 100, what are the chances of it going up or down by 10 points

- 0-24%
 - 25%-49%
 - 50%
 - 51%-74%
 - 75%-100%
- 4- Suppose a stock price has been growing up by 5 points for the last 3 weeks (10, 15, 20) what is the probability of the price to increase by exactly 5 points next week?
- 0-24%
 - 25%-49%
 - 50%
 - 51%-74%
 - 75%-100%

Seasonal variables (Weather)

- 1- Do you generally feel better in spring or in autumn?
- Strong preference for autumn
 - Autumn preference
 - neither
 - spring preference
 - Strong preference for spring
- 2- Do you see yourself as someone who is prone to 'winter blues'? (Winter blues is a condition that occurs in autumn and in early winter. The condition is characterized by symptoms such as fatigue, despondency, loss of concentration, less interest in socializing, gloominess, mood changes, and an increased desire for carbohydrates.
- Do not suffer
 - Mildly suffer
 - Suffer

Appendix IV

The finest version of the survey after conducting the pilot test.

Please answer the following validity questions:

Are you older than 18 years old? (required)

- ☐ Yes ☐ No

Do you have knowledge or experience in stocks trading? (required)

- ☐ Yes ☐ No

Are you Egyptian? (required)

- ☐ Yes ☐ No

What is your email address (optional)

Section 1: Investor's Demographic Characteristics

1. Gender (Please select one)

- ☐ Male
- ☐ Female

2. Age

- ☐ 18 to 25 years old
- ☐ 26 to 40 years old
- ☐ 41 to 60 years old
- ☐ More than 60 years old.

3. Highest level of education

- ☐ University student
- ☐ Bachelor degree holder
- ☐ Master degree holder.
- ☐ PhD degree holder.

4. Your monthly income

- ☐ Less than \$1,000
- ☐ From \$1,000 to \$2,000

- More than \$2,000 to \$3,000
- More than \$3,000 to \$4,000
- More than \$4,000

5. Your marital status

- Married
- Single
- Divorced
- Widow

6. If you got married, how many children do you have

- No children
- 1 child
- 2 children
- More than two

7. Nature of employment

- I have my own business
- I am an employee

8. What are the years of your trading experience in the stock market

- Less than a year
- Over a year to 5 years
- Over 5 years to 10 years
- Over 10 years to 15 years
- over 15 years

9. How do you describe your knowledge degree about investment matters? (Please select one)

- Not knowledgeable at all
- Fairly knowledgeable

- Moderately knowledgeable
- Very knowledgeable

10. How often do you trade (buy and sell shares) at the stock market? (Please select one)

- On a daily basis
- On a weekly basis
- On a monthly basis
- On a quarterly basis (every 3 months)
- On a yearly basis

Section 2: Information about Your Stock Investment Decisions

Please express your opinion by indicating your preferred statement towards participation in stock market investments/trading

(Key: 1 = strongly disagree; 2 = Disagree; 3=Neutral; 4=Agree; 5 = strongly agree)

	Stock Investment Decisions	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)
SID2	Investment has recently reported return in the market that you participate - significantly better than expected.					
SID4	Your investment has the ability to meet interest payments					
SID5	Your investment is likely to repay the principal at maturity.					
SID6	Do you think that your investment will have higher than average cash flow projections for the next years?					
SID7	Your own investment has demonstrated increased revenue growth in the past 5-10 years.					

Section 3: Psychological Factors

Please express your feelings and opinions by indicating your preferred statement towards the following questions. Tick one box against each statement. Key: 1 = Strongly disagree; 2 = Disagree; 3=Neutral; 4=Agree; 5 = Strongly agree)

	Psychological Factors	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
				1		

REP 3	I am willing to pay high price for stocks that have performed very well in the recent past.					
REP 4	To what extent you believe that the ticker symbol would affect your investment choice (MOK vs WQH)					
REP 5	Do you agree that early alphabet stocks are more likely to be bought and sold than later alphabet stocks?					
AVA 6	When choosing which stock to buy, I tend to consider stocks that famous people, e.g., celebrities, choose					
AVA 7	To what extent you refer to your family member in your investment decision					
AVA 8	Would you refer to your co-workers in your investment's decisions					
AVA 9	To what extent would you refer to friends in your investment decision					
ANC 1	Do you believe that a higher stock price is with higher quality?					
ANC 3	Do you refer to benchmarks in your decisions?					
ANC 5	If two out of ten stocks in your investment portfolio fall significantly in their value, do you consider it an overall loss of your investment					
DIS 3	you would rather prefer to be safe than sorry					
DIS 4	You want to be sure before purchasing anything					
DIS 5	Do you avoid risky things					
MOO1	To what extent you believe that your emotions or mood may affect your investment decision.					
OVC 1	Are you able to successfully overcome any challenge					
OVC 2	Compared to other people, to what extent you do tasks very well					
OVC3	You consider yourself to have great skills and ability to cope with and predict future events					
OVC 4	When you make plans, you are almost certain to make them work					

OVC 5	You are certain of accurately predicting the outcomes of the things you do					
OVC 6	You clearly understand how to trade at the stock exchange market					
PES 1	You are not willing to take the risk when choosing a stock or investment					
PES 2	Do you prefer a low risk/low return investment with a steady performance over an investment that offers higher risk/higher returns					
PES 3	Do you prefer to remain with an investment strategy that has known problems rather than take the risk of trying a new investment strategy that has unknown investment strategy but has great returns					
PES 4	Do you view risk in investment as a situation to be avoided at all cost?					
EI 1	Do you always set goals for yourself and then try your best to achieve them.					
EI 2	Do you always tell yourself; you are a competent person					
EI 3	Are you a self-motivated person?					
EI 4	Would you always encourage yourself to do your best					
OPN 1	I love adventure.					
OPN 2	I am imaginative.					
OPN 3	I am the first to try new activities					
CN 1	I am very organized and always come prepared.					
CN 2	I like to know the plan rather than be spontaneous					
EXT 1	I love parties					
EXT 2	I love being the center of attention.					
EXT 3	I am usually the one to start a conversation with someone					
AGR 1	I tend to trust people and give them the benefit of the doubt.					
AGR 2	I am extremely empathetic.					
AGR 3	I like to make other people feel at ease.					
NEU 1	I stress out easily.					
NEU 2	I tend to be moody.					
DOP 1	I have episodes of (dopamine) which include any of the following (low blood sugar with light-headedness,					

	irritability, extreme hunger, and cloudy thinking.)					
DOP 2	I get excessive amounts of sleep and still awaken tired					
DOP 3	I need medication to cope with or forget my problems					
SER 1	I eat when I am not hungry					
SER 2	I eat massive quantities of food at one time					
SER 3	I eat unconsciously and wonder why after that					
SER 4	I eat such large quantities of food that I get nauseated					
EPI 1	Do you have episodes of (Epinephrine) which include (difficulties with mental clarity, maintaining my focus, organizing my thoughts)					
EPI 2	I find it difficult to concentrate on my job or projects					
EPI 3	I feel eye fatigue that affects my job, work or reading enjoyment					
NOR 1	I think about food most of the time					
NOR 2	I prefer breads or pastas more than sweets or junk food					
NOR 3	I feel down or unexciting					

Gambler fallacy

- 1- If a stock price is 100, what are the chances of it going up or down by 10 points
 - 0-24%
 - 25%-49%
 - 50%
 - 51%-74%
 - 75%-100%

- 2- Suppose a stock price has been growing up by 5 points for the last 3 weeks (10, 15, 20) what is the probability of the price to increase by exactly 5 points next week?
 - 0-24%
 - 25%-49%
 - 50%

- 51%-74%
- 75%-100%

Seasonal variables (Weather)

1- Do you generally feel better in spring or in autumn?

- Strong preference for autumn
- Autumn preference
- neither
- spring preference
- Strong preference for spring

2- Do you see yourself as someone who is prone to 'winter blues'? (Winter blues is a condition that occurs in autumn and in early winter. The condition is characterized by symptoms such as fatigue, despondency, loss of concentration, less interest in socializing, gloominess, mood changes, and an increased desire for carbohydrates.

- Do not suffer
- Mildly suffer
- Suffer

Publication Arising from This Work

- Saweris, S.A., Sapuric, S. and El Gazzar, S., 2019, September. THE IMPACT OF BEHAVIORAL INCONSISTENCIES ON STOCK RETURN: A THEORETICAL FRAMEWORK. In *12th Annual Conference of the EuroMed Academy of Business*.



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