



NEUROFINANCE AND INVESTMENT BEHAVIOUR IN
BURSA MALAYSIA

BY

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ABSTRACT

The role of neurofinance is significant for understanding the principal neural mechanism of investors' decision making to explore deeply the work of emotions in the financial decision-making process. This research sought to explore the impact of neurofinance and decision making in Bursa Malaysia. The primary focus of this research was to examine the relationships between personalities, emotion, decision making in the neurofinance perspective. A total of 30 investors in Bursa Malaysia were drawn by random sampling. Two instruments were developed to collect data: the first instrument was questionnaire adopted from the international standard of personality traits test and the second instrument was the electroencephalogram (EEG) experiment. The findings indicated that personality and emotion influence investment decision. Also, the study found that elements of personality traits (agreeableness, neuroticism, and openness to experience) influence investment decision making, while emotional arousal influences investment decision making and investor behaviour on stock trading. The research finding contributes to the body of knowledge of neurofinance, extending the understanding of neurofinance from past research. The finding of this study provides some inputs an understanding of decision making in Bursa Malaysia to investor. Consequently, the central authority can formulate rules and regulation to prevent market violation from investors' emotions and biases. It also enriches the theory by adding additional constructs and testing the model of investment decision in the context of the neurofinance application in Bursa Malaysia. Lastly, the finding of this study contributes towards providing an evaluation model of neurofinance and investment behaviour on Bursa Malaysia.

خلاصة البحث

يعتبر دور التمويل العصبي مهم لفهم الآلية العصبية الرئيسية لصنع القرار لدى المستثمرين لاستكشاف العواطف في عملية صنع القرار المالي. لذلك تهدف هذه الأطروحة إلى استكشاف تأثير التمويل العصبي على اتخاذ القرارات في بورصة ماليزيا. تركز هذه الأطروحة بشكل أساسي على دراسة العلاقة بين الشخصية والعاطفة واتخاذ القرارات في منظور التمويل العصبي. تم أخذ عينة عشوائية من 30 مستثمر في بورصة ماليزيا، كما تم تطوير أداتان لجمع البيانات. الأداة الأولى استبيان والذي تم اعتماده من المعيار الدولي لاختبار سمات الشخصية، والأداة الثانية تجربة مخطط كهربية الدماغ. أشارت النتائج إلى أن الشخصية والعاطفة تؤثر على قرار الاستثمار. كما وجدت الدراسة أن عناصر سمات الشخصية (القبول، العصبية، والانفتاح على الخبرة) تؤثر على صنع القرار في الاستثمار، في حين أن الإثارة العاطفية تؤثر على عملية صنع القرار في الاستثمار وسلوك المستثمر في تداول الأسهم. تساهم نتائج هذه الأطروحة في زيادة المعرفة بالتمويل العصبي، مما يوسع من مستوى فهم التمويل العصبي للأبحاث السابقة. بالإضافة إلى ذلك توفر نتائج هذه الدراسة بعض المدخلات لفهم عملية صنع القرار في بورصة ماليزيا للمستثمرين وبالتالي، يمكن للسلطة المركزية صياغة قواعد وأنظمة لمنع انتهاك السوق من عواطف المستثمرين وتحيزاتهم. كما أنها تثري الجانب النظري من خلال بناء نموذج لاختبار قرارات الاستثمار في سياق تطبيق التمويل العصبي في بورصة ماليزيا. أخيراً، تساهم هذه الأطروحة على تقديم نموذج لتقييم للسلوك العصبي والاستثماري في بورصة ماليزيا.

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DECLARATION

I hereby declare that this dissertation is the result of my own investigations, except where otherwise stated. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at IIUM or other institutions.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Neurofinance stands very important for understanding of the role of brain activity in the financial decision making of an individual investor (Rocha, Vieito, & Rocha, 2013). Neurofinance is a fast expanding model that seeks to provide explanations for human decision when irrational behaviour manifests and their choice of buying and selling behaviours under risk by combining fundamental biology, emotion, brain activity, and neural behaviour of investors (C. Camerer, Loewenstein, & Prelec, 2005; Vieito, Massad, & Rocha, 2014).

Neurofinance uses neural activation as well as adopted tools and techniques from the field of neuroscience to gain better finance models of human behaviour and decision making (Mohr & Heekeren, 2012) and to expound on the mechanisms of decision making with a specific focus on models and variables which are often related within economics (e.g., risk and reward, probability, temporal delay) (Smidts, A., Hsu, M., Sanfey, A. G, & Boksem, 2014). This field investigates the role of neuronal networks related to emotion, behaviour, and the brain, which can lead to a better economics model (Padoa-Schioppa, 2008). It will also build good explanations that are appropriate for different investing behaviours and level of organisation to explain the different aspects of decision making (Craver & Alexandrova, 2008). The findings of neurofinance can be useful for identifying the limitations faced by human beings and helping them to replicate success, and for policymakers to take relevant decisions that facilitate better outcomes and increase social welfare (Sulphrey, 2014).

Neurofinance has been developed during the last decade as a newly integrated discipline that combines sciences: neuroscience, psychology, decision science, psychiatry, neurology, sociology, biology, law, ethics, and finance (Peterson, 2010). Neurofinance focuses on investigating the brain activity during financial decision making (Vieito et al., 2014).

Existing studies show that the role of neurofinance is very important for understanding the underlying neural mechanism of investors' decision making to investigate fundamentally the work of emotions in the financial decision-making process. Neurofinance also potentially improves the understanding of investors' decision making, including when and why investors' responses to stock market environmental changes depart from the prediction of a rational economic man (Marchionni & Vromen, 2010; Sahi, 2012; Chorvat, 2016). Therefore, new research needs to be studied in the neurofinance subject for a better understanding of roles human brain and emotions, the reason that investors behave differently even with the same or particular information (Chorvat, 2016).

After the 2008 financial crisis, neurofinance has become a fascinating study for academics, the general public, and policymakers as indicated by the publication of academic journals and a growing number of neurofinance experts and scientific community around the globe. In addition, the growing neurofinance field has stimulated commercial interests, leading to the introduction of neurofinance consultation that provides financial advice services, reports, and commentary on neurofinance research applicable to financial decisions in the stock market (Hytonen, 2011).

In the context of investors' decisions on Bursa Malaysia, evidence shows that most investors are individuals who do not rely on fundamental information and the

analysis of the maximum utility of profit. They are rather influenced by psychological biases, such as cognitive dissonance in stock trading during Monday (Brahmana, Hooy, & Ahmad, 2012).

The main purpose of this dissertation is to assess the neurofinance research method to achieve a better understanding of how emotions, personality, and the brain influence investors' decision making on Bursa Malaysia. The dissertation contributes to the literature by highlighting emotions, personality, and brain activities that influence investors' decision making and behaviours on Bursa Malaysia, given the fact that there is a lack of literature related to neurofinance and investors' behaviour in Bursa Malaysia. This research will, therefore, contribute to the neurofinance model of investors' decision making on Bursa Malaysia and to the formulation of government regulations on stock trading.

1.2 STATEMENT OF THE PROBLEM

Presently, one of the most problems is that economist cannot explain why people are irrational when making financial decisions and how people make financial decisions. They continue with their tradition that focuses merely on the utility function in decision making, which is called decision value (Fehr & Krajbich, 2014), but have not given particular attention to the psychological utility function.

Traditional finance proclaimed that investors are homo economics (Artienwicz, 2016). The framework of this theory is a core concept of economics and finance that attempts to maximise profit and utility based on the rational economic man and self-interest theory. The prominent scholars of the rational economic man, Jeremy Bentham (1748–1832) and John Stuart Mill (1806–1873), measured the rational economic man based on the utilitarian concept, rationality, happiness, and

misery based on wealth accumulation. These assumptions shaped traditional finance or the Efficiency Market Hypothesis (EMH), which believes that investors are rational, and if there are irrational investors, their trading would be either cancelled or arbitrated away by the rational investors (Tseng, 2006). The modern portfolio theory (MPT) is grounded by a postulation that assumes that markets are efficient, investors should conduct their investments based on rules of the mean-variance portfolio theory, and the expected returns should be based on the function of risk and risk alone (Statman, 2008).

Efficiency Market Hypothesis (EMH) was criticized by economist as a root of the global financial crisis and the larger financial institution collapse in 2008: “On a deeper level, the demise of Lehman Brothers conclusively falsifies the efficient market hypothesis.” (Soros, 2008, 165).

Thus, it is essential to understand that traditional finance had various characteristics which were not able to observe investors’ emotions and personality traits. Traditional finance and model of investment decisions relied on the assumption that human are rational and pursue utility maximisation in evaluating are inadequate and non-comprehensive for a decision model (Michl & Taing, 2010).

Ignoring the psychological utility function is very dangerous for investors, the reason that utility assumptions are psychological and utility calculations by investors are assumed to be operated in the brain, especially since economic and financial decisions begin with information. Understanding the utility function located in the brain will allow us to study intrapersonal variations, such as emotions and cognitive biases, as well as physical environmental change, and by measuring the brain’s utility function, we can understand why and how behaviour changes (Park & Zak, 2007).

Investors are facing uncertain situations or a financial crisis in which they are exposed to cognitive biases, such as worry, anxiety, and fears leading to loss aversion that eventually pushes investors to sell all stocks or invest in less risky stocks (Eng, 2014). For instance, some investors with good emotional stability and a strong mind will view a financial downturn as an occasion to buy stocks. Therefore, the role of emotions and cognitive biases in information processing helps us understand why investors decide in particular ways and provide a deeper understanding of the stages that assist investors in avoiding losses in their stock portfolio (Ricciard, 2008).

Every time investors make insignificant decisions in the financial market. The investors' psychological biases brought irrational behavior in stock trading decision.

Neurofinance explains investors' decision making based on neuroscience, psychology, and personality traits to get better understanding of decision making in the financial market (Tseng, 2006). In other words, the objective of neurofinance is to generate a systematic, behavioural, and mathematical theory of choice that shows a neural basis for various judgements and choices (Camerer, 2008).

Another aspect that is interesting to be looked into is the interconnection between emotion produced by the brain's activities and the big five personalities in investment decision-making (Juanchich et al., 2016). The personality traits are extroversion, conscientiousness, agreeableness, openness to experience, and neuroticism. Personality traits assist individual investors to achieve aim of their investment (Tauni, HongXing, & Iqbal, 2016). For instance, extroversion, and emotional stability have high values to decision making (Caliendo, Fossen, & Kritikos, 2014). In addition, openness to experience has been associated with risk taking, and neuroticism has been connected with less risk taking (Lauriola & Levin, 2001). Therefore, the classification of personality traits is to help investors to

understand, to be aware of their characteristic, and to avoid biases in their financial decision making.

Personality traits have impacted the susceptibility of behavioural biases among stock market investors (Rzeszutek, 2015). It also offers a useful model of personality, which can allow a person to overcome emotions and assist an individual in using information more effectively to improve decision making. Some studies have been conducted on personality and investors' decision in the stock market. The results of the researches present that there is a significant correlation between personality traits and stock market investment (Conlin, A., Kyöläinen, P., Kaakinen, M., Järvelin, M.-R., Perttunen, J., & Svento, 2015; Bharadwaj, Chauhan, & Raman, 2015)

The impact of emotions and personality traits to decision making has been subjected to research in behavioural finance on Bursa Malaysia. However, no research involving personality traits, emotions, and brain activation in the context of neurofinance has been conducted. Emotions are assumed to exhibit a similar behavioural pattern to behavioural finance. This assumption, however, requires testing and exploration since behavioural finance does not explain the cause of emotions and behaviour (Peterson, 2011). Furthermore, there is no literature on neurofinance discussions and studies conducted on Bursa Malaysia. Since there is little knowledge about neurofinance research, it will be useful to fill this gap in the body of knowledge, which hopefully is a great contribution in this subject in particular and the study of finance in general. The intent of this study is to conduct an in-depth investigation of the impact of emotion and personality on investment decisions in Bursa Malaysia.

1.3 PURPOSE OF THE STUDY

The purpose of this study is to investigate neurofinance and investment behaviour in relation to stock trading on Bursa Malaysia. As Malaysian investors are irrational, influenced by emotion and psychology as seen by their behaviour in Bursa Malaysia (Tuyon & Ahmad, 2016), the research is focused on neurofinance and investment behaviour in Bursa Malaysia. Neurofinance involves fundamental psychological mechanisms that inspire the emergence of individual biases and irrational behaviour during buying and selling decisions (Peterson, 2010). This research applied the quantitative method to present a clear picture and an in-depth exploration of the subject matter.

1.4 RESEARCH OBJECTIVES

This study has four objectives, which are as follow:

- 1- To assess the implementation of neurofinance theory and investment decision in Bursa Malaysia.
- 2- To investigate investors' personality traits and investment decision in Bursa Malaysia.
- 3- To evaluate how emotions influence the investment decision of investors in Bursa Malaysia.
- 4- To analyze the effect of the personality traits of investors on emotions of the investor towards investment decision making in Bursa Malaysia.

1.5 RESEARCH QUESTIONS

The research questions are focused to provide responses to the subsequent questions:

1. Does neurofinance theory and investment decision implemented in Bursa Malaysia?
2. Does an investor's personality traits affect his/her investment decisions in Bursa Malaysia?
3. How do emotions influence the investment decisions of investors in Bursa Malaysia?
4. Why do an investors' personality traits affect the emotions of the investor towards investment decision making in Bursa Malaysia?

1.6 SIGNIFICANCE OF THE STUDY

Although many research study works related to decision making from neurofinance perspective are available, this study is carried out to make a substantial influence toward both the academic area and the expansion of policies.

First, this research is projected to provide a significant contribution to the academic field as the findings of this research present an inclusive picture of decision making from the neurofinance perspective. This, to some extent, adds an empirical perspective to decision making from the neurofinance perspective. The findings in this regard might be useful for the theoretical building of decision making from the neurofinance perspective.

The findings of these studies can be used by wealth managers, portfolio managers, and fund managers to understand the mindset, characteristic, and behaviour of their clients. This can be useful for constructing a portfolio that may not be optimal and which can be adhered to by the advisor and the client appropriately. It is

especially significant in the situation of managing a portfolio during a recovering market post-recession (Bharadwaj et al., 2015).

Second, for policy makers, this study is estimated to provide some inputs and develop an understanding of decision making in Bursa Malaysia from the neurofinance perspective for the reason that the methodology used in this study is quantitative. It comprises the examination of data from not only the questionnaire on the investors' personality traits but also profiling of emotions and behaviours of the investors from machine learning data, which are not biased.

1.7 LIMITATIONS OF THE STUDY

This study seeks to explore and investigate the decision making from the neurofinance perspective. This research particularly gives emphasis on the relationships of neurofinance, news, and expected return which are constructed in an integrated model. Since neurofinance is a relatively new area of discipline, this research is assumed to face some limitations that may have implications to the outcomes obtained. The selected participants were only those who traded on Bursa Malaysia due to some difficulties and time constraint.

1.8 ORGANISATION OF THE STUDY

This dissertation will be chaptered into five chapters. The first chapter is comprise of an introduction and subsections such as background theories and historical developments in neurofinance.

Chapter Two delivers synopsis of neurofinance field, a development of Bursa Malaysia. The main body of the chapter is focused on journals and article reviews

relating to personality and emotion that are related to decision making in the neurofinance context.

Chapter Three discusses and explains the research methodology. It contains of paradigm of the research, design of research, and the electroencephalogram (or EEG). The EEG is a common method in neurofinance research, and it is also used in the experiments of this dissertation. This chapter have two aims. The first aims to deliver brief information and a basic introduction of the EEG method to the reader and the second objective is to discuss the limitations and advantages of using the EEG as a research tool in neurofinance. This is to explain further on the additional value that the EEG can provide compared to other methods in neurofinance, such as the Functional magnetic resonance imaging (fMRI).

Chapter Four discusses the personality test and EEG findings response of the brain's investors towards investment decision in the stock market, where investors adjust their decision to conform to the gain and value return. We test whether such changes in the decision are driven by emotions and the brain using machine learning.

Chapter Five summarises and concludes the main findings of the EEG experiments and then analyses the contributions and limitations of this study. This dissertation will be concluded with a consideration of interesting possibilities for the upcoming study.

1.9 SUMMARY

This chapter presented and discussed the underpinning of the research. It explained why personality and emotion are essential factors to an investment decision, which was supported by numerous sources and definitions. Furthermore, the statement of the problem was discussed, which covers neurofinance as a new discipline, method, and

significant findings of this research. The section also discussed the aim of the study, which is to describe how neurofinance influences investment decision making and the method used for investigation in neurofinance studies.

This chapter also presented the question of the researches, hypotheses, and aims that discussed research of neurofinance towards investment behaviour, which are the personality and emotion that influence the investment decision. The significance of the study followed, which described how this research fills research gap in the literature of neurofinance and investment decision. Finally, this chapter discussed the research limitations, then highlighted brief definitions and key terms of the research.