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Psychological factors on irrational financial decision making

Case of day-of-the week anomaly

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Abstract

Purpose – This research aims to explore and explain the determinants of irrational financial decision making, especially the day-of-the week anomaly, by using psychological approach.

Design/methodology/approach – As it is a conceptual paper, this research explores the psychological biases literature and links it to the day-of-the week anomaly. Using Ellis' ABC (Activating Event, Belief, and Consequences) Model, the authors survey and classify the stimulant as the occasion that stimulates the psychological biases of investors, and these psychological biases will bring a consequence in behaviour which is irrationality in weekend effect.

Findings – Adopting Ellis' ABC model, the paper constructs a theoretical framework that link the psychological biases and day-of-the week anomaly. The theoretical model is also given as a proposed model for future empirical research.

Research limitations/implications – This paper contributes to research by giving the theoretical model and its framework. The latter, future research can examine the proposed psychological biases as the determinant of day-of-the week anomaly empirically.

Originality/value – This paper conceptually builds a framework and derives a proposed equation model linking the psychological biases (weather, moon, attention bias, heuristic bias, regret, and cognitive bias) to the day-of-the week anomaly.

Keywords Rational behaviour, Day-of-the week anomaly, Psychological biases, Decision making, Psychology

Paper type Research paper

Introduction

The basic tenet of traditional finance is rational behaviour. It means an individual is assumed to be always rational in making decision. An individual is assumed to have an objective and purpose in achieving his/her utility. Traditional finance is assumed to be rational in two ways:

- (1) the agent's decision making confirms the axiom of expected utility theory; and
- (2) the agent's decision making does not have bias forecasting ([Thaler, 1990](#)).

Nicholson and Snyder (2007) stated that expected utility theory is the behaviour of agents is having concave utility function and risk averse, meaning that the asset pricing is a set by investor's rationality. If the asset prices attained the rational equilibrium, this would be confirming the market efficiency theory. Therefore, the rational based market equilibrium is achieved.

One of the supporting bodies of traditional finance is market efficiency theorem. After observing the random walk movement in share prices, [Fama \(1971\)](#) introduced



this theory by classifying the random walk of the informational efficiency into three categories: weak form efficiency, semi-strong efficiency, and strong efficiency. He stated the shares returns confirm to the leptokurtic distribution.

In modern finance theory, market efficiency is not only determined by the information adjustment acceleration, but also how the market fully reflected of all available information (Fama, 1990). It means asset prices incorporate all information and estimates the true value through the times. This incorporation confirms the rational behavior assumption.

Conversely, French (1980) with his day-of-the week anomaly (DOWA) had started opening a new point of view that the anomalous condition in the market should be explained from the other side of market efficiency. He addressed that there must be another explanation besides market efficiency.

Chorafas (1995) addressed market efficiency and its fairly priced is utopian case. He discussed further that information availability and its stability random walk implies a lack of sensitivity of emotional forces such as lust, greed, and fear. This is aligned with Tvede (2002) who argued market efficiency should overlook under behavioural approach. Hence, behavioural approach is popping-up as alternative way to examine the market anomalies existence in financial markets.

As one of the evidence of the violation of rational behaviour and hardly to be explained by using market efficiency, DOWA has been explored extensively. DOWA is an anomalous condition in stock market where the returns in certain day are dispersing highly compared with other days. It indicates the irrationality of investor in trading. This anomalous condition violates the main assumption in finance, which is rational behaviour (Dimson and Mussavian, 1998; Malkiel, 2003), implying the inability of conventional finance theory to explain the phenomenon. Much research on DOWA has examined the explanation beyond this anomaly with other approaches.

There are three explanations of this anomaly, which are: trading settlement (Jaffe and Westerfield, 1985; Agrawal and Tandon, 1994), trading behaviour (Abraham and Ikenberry, 1994; Wong *et al.*, 2006), and information asymmetry (Lakonishok and Maberly, 1990). The proponent of traditional finance, such as Fama (1998), addressed the anomaly as the miscalculation of the model such as variance errors. In other words, the trading settlement explanation on DOWA cannot be used because introducing the lagged return in the model is more to calculation issue, not solving the finance issue. In the end, the trading behaviour and information asymmetry are still left unsolved.

Much research in DOWA also gauged investor behaviour as the explanation of anomalous condition in the market (Abraham and Ikenberry, 1994; Clare *et al.*, 1995; Berument and Kiymaz, 2001; Wong *et al.*, 2006; Yahyazadehfar *et al.*, 2006). In their conclusion and limitation section, these mentioned research proposed to investigate further the role of investor behaviour in DOWA. Thus, even though much research suggested and recommended the psychology approach as the explanation, a research that examines the DOWA using the psychology point of view is rare.

As mentioned earlier, DOWA is the evidence of investor's irrationality. Psychology perspective can be used to explain the irrationality of investor. Krebs and Blackman (1990) address three stimulants in human behaviour (affection, learning, and cognitive) can award biases in decision. To our knowledge, it is rare to find a research that tries to linkage how DOWA can be explored psychologically. This research offers a conceptual paper that hub DOWA with psychological approach. Based on the consensus wisdom

of the literature, the psychology biases consist of affection biases and cognition biases. Affection biases consist of weather-induced moods and moon-induced moods. Meanwhile, the cognition biases consist of attention bias, heuristic bias, regret bias, and cognitive dissonance bias. In a nutshell, this conceptual paper offers weather, moon phase, attention bias, heuristic bias, regret, and cognitive dissonance as the determinant of DOWA.

Day-of-the week anomaly

One of the contrary evidences of rational behavior assumption is the existence of DOWA. This calendar anomaly can be defined as a circumstance whereas the returns in certain day are negatively high dispersing compare to other days. It is a fact that daily returns deviate from normality distribution. Scholars believe this anomaly caused by irrational behavior of market and investors.

Cross (1973) and French (1980) are the first scholars who observed the negative on Mondays which-so-called as “day-of-the-week effect” and/or “weekend effect”. After their studies, Gibbons and Hess (1981) and Rogalski (1984), and others have also found the similar empirical result that strengthens the existence of this anomaly. French and Roll (1986) and Damodaran (1989) found that Monday’s variance is more than three times that of other days of the week. Further, He attributes 3.4 per cent of the Monday return differential to delay in corporate announcements after Friday close. Gibbons and Hess (1981) adjusted Monday returns to market averages, to autocorrelations and heteroskedastisity, but find no substantial explanation for the observed anomaly. Jaffe and Westerfield (1985), Abraham and Ikenberry (1994), Sias and Starks (1995) and Tong (2000) addressed trade-orders on Monday as a conditional event related on the previous week or Friday’s return.

In UK, the DOWA was firstly investigated by Board and Sutcliffe (1998). The paper attempted to explain the DOWA in UK by relating the measurement error between over-estimation of Friday’s closing price and the under-estimation of Monday’s closing price. Further, they suggested that part of the DOWA in UK market could be described by the gap between settlement and trading day. It is confirmed by Agrawal and Tandon (1994) who also conducted an investigation of Monday effect in 18 countries. Empirical result also found the DOWA in other developed markets such as, Italy (Barone, 1990), France (Solnik and Bousquet, 1990), Athens (Alexakis and Xanthakis, 1995), Turkey (Bildik, 1999) and Ireland (Lucey, 1994).

Table I addresses several papers in DOWA with its findings and explanations. Reported in the table, we can surmise that these papers have offered three big drivers of the anomaly: trading settlement, trading behaviour, and asymmetry information. Even though these explanations were offered in their discussion and conclusion, there is no conceptual paper attempts to linkage them, especially between DOWA and trading behaviour.

The incapability of traditional finance to explain DOWA

The anomalies in stock market are contrary result of rationality. The weaknesses of expected utility in explaining anomalies have contributed to the resurgence of behavioral finance theories (Shiller, 1998). The basic argument of behavioral finance is investor does do irrational decision making in investing (Kahneman, 2003). This argument is supported by Kahneman and Tversky (1979) prospect theory which disagreeing with the von Neumann-Morgenstern expected utility theory.

Name and year	Sample	Findings	Explanation
Jaffe and Westerfield (1985)	International	DOWA occurred in most markets	Settlement, and opportunity cost
Lakonishok and Maberly (1990)	NYSE	There is irregularities of institutional and individual tradings during Friday and Monday	Information dissemination (herding), liquidity, predictable pattern
Porter (1992)	USA	DOWA was found in USA	Market maker
Agrawal and Tandon (1994)	18 markets	Daily Seasonal, monthly, holiday, are in most markets, DOWA in only nine markets	Settlement process and private information
Abraham and Ikenberry (1994)	USA	There is DOWA in the market	Trading behaviour and liquidity needs
Clare <i>et al.</i> (1995)	UK	The DOWA seasonality was occurred	Gains opportunity and size effect
Kamara (1997)	USA	The seasonal is caused by firm size	Trading cost and institution herding
Wong <i>et al.</i> (1997)	USA	There is DOWA in the market	Timing transaction
Dimson and Marsh (2001)	UK and USA	Seasonality occurred in the market according to size	Small firm effect, conventional trading, dividend, premium effect
Berument and Kiyamaz (2001)	USA	There is DOWA in S&P500 based on volatility and returns	Gain expectation
Kok and Wong (2004)	ASEAN 5	Strong DOWA in pre-crisis, no DOWA during crisis for Thailand, different pattern of calendar anomalies post crisis	The economic condition made investors not believing seasonality
Wong <i>et al.</i> (2006)	Singapore	The anomalies has disappeared recently	Trading behaviour of seasonality awareness
Chandra (2006)	Asia Pacific	The DOWA is not comovement in asia pacific	The market has specific characteristic
Yahyazadehfard <i>et al.</i> (2006)	Tehran	There is DOWA in Iranian Market	Short term perspective and speculation motivation
Chia <i>et al.</i> (2006)	Malaysia	There is DOWA in Malaysia based on EGARCH and TGARCH	Asymmetrical reaction
Rezvanian <i>et al.</i> (2008)	China	There is no calendar anomalies	The market has certain level of efficiency
Galai and Kedar-Levy (working paper)	Tel-Aviv	DOWA fade in high moment of extreme returns	Information dissemination and momentum

Table I.
The empirical research
on DOWA

Early study of Allais (1953) and Ellsberg (1961) addressed preferences that violates the expected utility but still have considerable normative appeal. Herbert Simon in 1955 introduced the concepts of satisfaction and bounded rationality, which can be interpreted as defining realistic normative standard for an organism with a finite mind (Kahneman, 2003).

Tversky and Kahneman (1986) had directly challenged the rationality assumption based on their study about preference and framing. They argued that the demonstrated susceptibility of people to framing effects violates a fundamental assumption of invariance, which has also been labelled Arrow's extensionality (1982), and Hammond's

consequentialism (1989). Table II depicts the contrary empirical evidence of traditional finance than cannot be answered empirically.

Thaler (1987) stated that calendar anomalies are the disconfirming evidence in traditional finance. It has been attempted by many scholars to explain it, but fail to show it empirically. So far, Coursey and Dyl (1986) is the early scholars that propose psychological factors on DOWA. In their explanation, preference for compound gambles over simple gambles is the driver of the DOWA. Other behavioral explanations might incorporate variations in the mood of the market participants (good moods on Fridays and before holidays, bad moods on Mondays, and so on). It is well known, for example, that suicides occur more frequently on Monday than on any other day.

Lakonishok and Maberly (1990) address the behaviour of institutional investor as the source of the problems, not market efficiency. They stated that individual investors typically do not have time during the weekday trading hours and therefore process information and make investment decision only during the weekend. Furthermore, they explained when the market reopens on Monday individual investors tend to increase trading activity on that day. Indeed, this behaviour violates the rational behaviour and cannot be explained in market efficiency approach.

If we explore more research on DOWA, the evidence of the inability of market efficiency hypothesis to explain will be more and more. Since the market efficiency was introduced by Fama (1965), it surmised that the expected return of stock price should be uniformly distributed across different units of time. Thus, DOWA becomes the denial of this hypothesis as it violates the weak form of efficient market hypothesis (Rahman, 2009). In weak form efficiency, the stock returns are time invariant which means there is no seasonality pattern in the market. The subsistence of market seasonality implies that a market is inefficient and price is not made according to information but by another circumstance.

Pricing behaviour of stocks is being discovered by dully and painstakingly thorough examination the data. It is hardly to reveal the true determinants of this anomalous condition by using market efficiency approach. The challenge, then, is that to understand the seasonal price movements not from the traditional approach, but jump to the other side, which is psychological approach. Hence, we propose to use psychological biases in explaining the DOWA.

Traditional finance prediction	Contrary empirical evidence
Asset prices move as random walk overtime	Month of year, week of month, day of week, hour of day, long run return mispricing, bid ask spread, mean reverting
New information is rapidly incorporated into asset prices, and currently available information cannot be used to predict future excess returns	Information cost, momentum, post earning announcement, foreign exchange, market microstructure
Fund managers cannot systematically outperform the market	Close end mutual fund, winners curse, growth-value, equity risk premium, market microstructure
Asset prices remain at level consistent with economic fundamental that is, they are not aligned	Law of one prices, utility maximization, size effect, accrual economics

Note: Summarized from many sources

Table II.
Traditional finance
prediction and its
contrary evidences

Psychological biases in finance

In finance, psychology factors are including in behavioral finance. In psychology field, this behavioral approach is clustered in functionalism which more well known as behaviorism. The central goal of behaviorism is to foster the prediction and control the behavior (Krebs and Blackman, 1990). It emphasizes on stimulus and responses in relation (Krebs and Blackman, 1990). Further, the father of behaviorism, John Watson, argued that every decision taking by human is uniquely attached to personals' behavior (Krebs and Blackman, 1990). Over time, empirical result showed the incorporation between psychology factors and economy decision making. This psychology factor can help to explain the irrational behavior.

Fuller (2000) addressed behavioral biased as the anomalous condition factors. He surmised:

Scholars in psychology and decision making science have documented that in some circumstances investors do not try to maximize wealth and in other circumstances investor make dynamic mental mistakes. Both these cases can result in mispriced securities and both are the result of behavioral biases.

There are many versions of psychology biases. Practically, the easiest way is referring the www.wikipedia.org. Based on this encyclopedia web site there are eight psychology biases which are: bounded rationality, attribute substitution, salience, cognitive dissonance, heuristics, introspection illusion, adaptive bias, and misuse of statistic. However, as the reliability of this website is questionable, there are also versions of psychology bias academically.

Corney and Cummings (1986) is one of the earliest studies that proposed psychology bias in economics. They mentioned that human is apt to demonstrate rather consistent biases when cognitively processing information. [Wagenaar \(1988\)](#) investigating the heuristic bias in economics decision making by taking gamblers as the sample. Based on his findings, he found 16 psychology biases in gamblers which are: availability, problem framing, confirmation bias, fixation on absolute frequency, concrete information bias, illusory correlation, inconsistency processing, non-linear extrapolation, reliance on habits, representativeness, justifiability, reduction on complexity, illusion on control, biased learning structure, flexible attribution, and hindsight bias. The later, Griffith (1994) revised it and found only six psychology biases.

Griffith (1994) six psychology biases in finance cognitively are:

- (1) Illusion of control.
- (2) Flexible attribution.
- (3) Representativeness.
- (4) Availability bias.
- (5) Illusory correction.
- (6) Fixation on absolute frequency.

He addressed the biasness in psychology based on cognitive psychology. In his papers, he addressed illusion of control as an expectancy of achievement higher than objective probability would permit. Griffith referred the flexible attribution as the distortion of cognitive process in which risk takers attribute their successes as due to their own skill and deteriorations as due to some external importance. Further, Griffith explained

representativeness as an event where people insist on finding a representative relationship between samples drawn from a population and the population itself. It is totally similar with Tversky and Kahneman (1971) representativeness heuristic (Guhbermann, 2005).

The availability bias can be defined as an evaluation occasion of the probability of chance even compose the judgment in term of the ease with which relevant instance come to mind. Moreover, Griffith explained illusory correlation as a superstitious behaviour in which people's belief vacillates when in fact they do not. Lastly, Griffith referred the fixation on absolute frequency to an occasion where the measurement of success made by people is using an absolute benchmark rather than the relative frequency of wins.

Yudkowsky (2006) addressed ten psychology biases in finance. First bias is availability. Yudkowsky defines Availability as a heuristic process in judging the frequency of an occasion by its availability, the ease with which examples of the result come to mind. The availability bias of Yudkowsky is the same with Tversky and Kahneman's (1973) availability bias. Second, it is hindsight bias. According to Yudkowsky, hindsight bias or the I-knew-it-all-along effect is an event when subjects, after learning the eventual outcome, provide a much higher projection for the estimation of that outcome than subjects who estimate the outcome without advance knowledge. Third bias is black swan which is derived from Taleb's (2007) book. Yudkowsky took the explanation of black swan from Thaleb as black swan is the incision of hindsight bias and availability bias that bear primary responsibility for the sentinel against the fat tail. Fourth, Yudkowsky addresses conjunction fallacy as the psychology bias. It is a logical fallacy that occurs when it is assumed that specific conditions are more probable than a single general one. The fifth psychology bias of Yudkowsky is confirmation bias. It refers to an event where people seek confirming but not falsifying evidence.

Further, Yudkowsky introduced as the sixth psychology bias: anchoring and adjustment. It is taken from Tversky and Kahneman (1974). It refers to a psychology heuristic that influences the way people intuitively assess probability (Tversky and Kahneman, 1974). According to this bias, there is an implicit reference point (the "anchor") in people mind and people tend to make adjustment to the anchor value to reach their estimate.

The seventh psychology bias is affect heuristic. Yudkowsky defined it as the way in which subjective impressions of goodness or badness can role as a heuristic, capable of generating fast perceptual judgments, and also systematic biases. The next psychology bias is scope neglect. Yudkowsky described scope neglect as a fallacy in decision making as people tend to neglect the size of scope. The ninth psychology bias is calibration and overconfidence. Yudkowsky referred it as a bias in which people subjective confidence in their judgments is reliably greater their objective accuracy.

The last of psychology bias is bystander apathy. It refers to an event where large numbers of people are less likely to act in emergency, not only individually, but collectively. This bias is an explanation of the responsibility diffusion and pluralistic ignorance. Further, this bias is similar to cognitive dissonance as individual will feel comfort being part of a group as it can reduce the responsibility. In this psychological bias, everyone expects that someone else will take over the problem, and this decrease the individual pressure to the point that no one does anything.

Tversky and Kahneman (2010) addressed 16 psychology biases in decision making under uncertainty which are:

- (1) Representativeness.
- (2) Insensitivity to prior probabilities of outcomes.
- (3) Insensitivity to sample size.
- (4) Misconception of chance.
- (5) Insensitivity to predictability.
- (6) Illusion of validity.
- (7) Misconception of regression.
- (8) Availability.
- (9) Biases due to retrievability instances.
- (10) Biases due to the effectiveness of a search of set.
- (11) Biases due to imaginability.
- (12) Illusory correlation.
- (13) Anchoring and adjustment.
- (14) Insufficient adjustment.
- (15) Biases in the evaluation of conjunctive and disjunctive events.
- (16) Anchoring in the assessment of subjective probability distribution.

However, most of the biases above is more to cognitive rather to affection. Meanwhile, Gray (2004) addressed that affection (proxy of emotion) and cognition are “the same player” in human behavior. Further, he/she explained that there should be an integration of affection and cognition in human behavior.

According to Tvede (2002), certain phenomenon is caused by certain psychology bias. As DOWA is a falling trend, Tvede addressed affect heuristic, regret theory, mental compartments, cognitive dissonance, overconfidence, and knowledge attitude. It is in line with the explanation of Akerloff and Shiller (2009) regarding the animal spirit by using ABC model. Tvede (2002) mentioned that the attitude of investor is not only driven by cognitive but also the affection. The affection here is similar with affect heuristic. Saunders and Edward (1993), Hirshleifer and Shumway (2003) and Slovic *et al.* (1990) mentioned that the affect heuristic is more to mood caused phenomena rather than cognitive.

There are four cognitive explanations of the irrational behavior of investor:

- (1) Prospect Theory;
- (2) Mental Account;
- (3) Regret; and
- (4) Self Control ([Shefrin and Statman, 1985](#)).

This research will narrow the scope of cognitive to:

- Mental Account;
- Regret; and
- Herding.

The justification is based Grinblatt and Hahn (2005) and Scharfestien and Stein (1990). Grinblatt and Hahn (2005) stated that prospect theory can be explained through the mental account. Meanwhile, Scharfstein and Stein (1990) argued that herding is also the self-control matter. Further, Grinblatt and Hahn (2005) addressed that mental account as one of heuristic bias.

Again, it is aligned with Gaulin and McBurney (2004) who addressed that behavior and attitudes is influence by the psychology in affection and cognition. Indeed, it is in line with Ellis' ABC model, a psychology framework that links stimulant, affection/cognition process, and behaviour. Therefore, we can hypothesize that there are five main psychology biases in finance for DOWA which are affection (mood disorder), attribution in attention (knowledge), heuristic, regret, and cognitive dissonance.

DOWA and psychological biases

The psychology biases can be the explanation of DOWA in their own unique situation. For example, Forster and Solomon (2003) studied weather and found that there is weekend effect in global weather, whereby from Saturday to Monday weather is relatively hotter than other days (Figure 1). This is consistent with the DOWA concept where Monday returns are relatively dispersing higher than in other days. Some literature also indicates the relationship between weather condition and stock market (Saunders and Edward, 1993; Dichev and Janes, 2003; Kramer and Levi, 2002; Kamstra *et al.*, 2002; Hirshleifer and Shumway, 2003; Pardo and Valor, 2003; Cao and Wei, 2005).

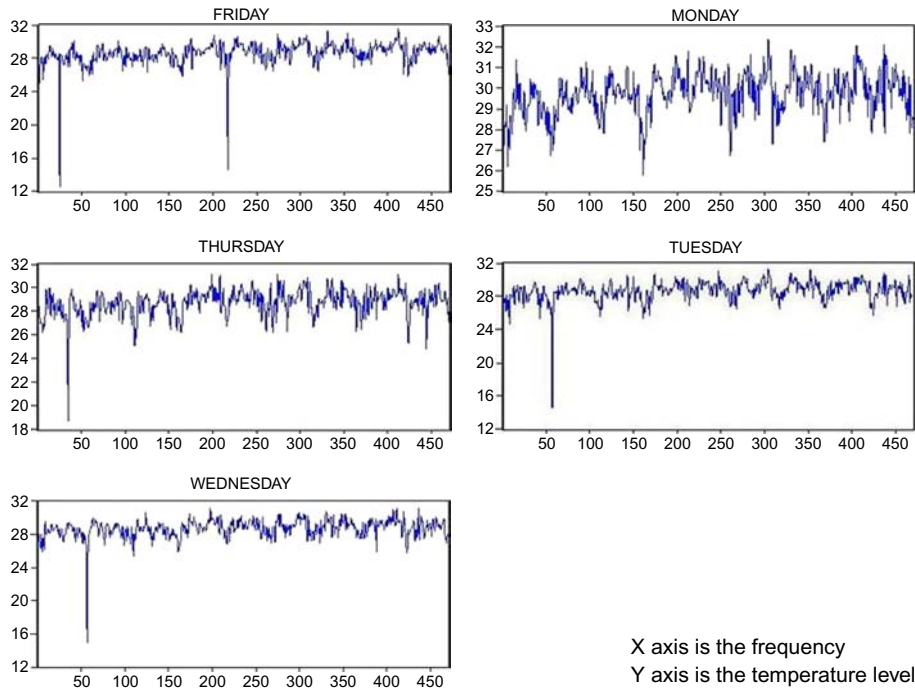


Figure 1.
The temperature level in
Indonesia day-by-day

X axis is the frequency
Y axis is the temperature level

Source : Indonesia Meteorology Office Agency

Next hypothetical issue on the relationship between psychology biases and DOWA in affection is moon phase. As shown in Figure 2, the full moon has more occurrences and less new moon phase circumstances during Mondays compared with other days. This is in line with the DOWA concept. Theoretically, the moon phase can affect investor behaviour (Dichev and Janes, 2003; Yuan *et al.*, 2006). From the compilation of moon phase theories, it is concluded that moon phase can affect investor irrationality.

In terms of cognition, attention can hypothetically influence DOWA. Huge study has shown that people make decision in choosing based on experience (Shefrin, 2000), memory (Cloitre and Liebowitz, 1991), anxiety (Bradley *et al.*, 1999), fear (LeDoux, 1998), and happiness (Eysenck, 2001). In psychology, they called it as attribution to attention and heuristic or “attention bias”.

Attention bias is a psychological event of an individual because of the activity of the brain mechanism on the response and detection of stimulants such as threat-related, anxiety, curiosity, and emotion (LeDoux, 1998; Fox *et al.*, 2002). In finance, the attention bias can be found as the investor behaves differently in the extremely high volume and extreme return situation (Barber and Odean, 2007). It is called as attention grabbing.

Yantis (1998) and Barber and Odean (2007) addressed the general knowledge, fear, and memory of market behaviour stimulate investor attention in trading. It implies that if investors have knowledge and experience of seasonality, they will trade in the seasonality. Abraham and Ikenberry (1994), Berument and Kiymaz (2001) and Wong *et al.* (2006) suggested that the DOWA may be caused by the investor intention to beat the market. These mentioned papers suggest investigating further the explanation of DOWA by using investor behaviour perspective. Hence, based on the literature, it will be very interesting to investigate the role of psychology bias in the DOWA by using attention grabbing perspective.

Other psychology biases of cognition are heuristic, regret, and cognitive dissonance. Previously, it stated that attention bias was assumed to be the result of response and detection of stimulants, implying it also covers the heuristic. Grinblatt and Hahn (2005) viewed disposition effect as the “proxy” of heuristic and regret. It indicates that

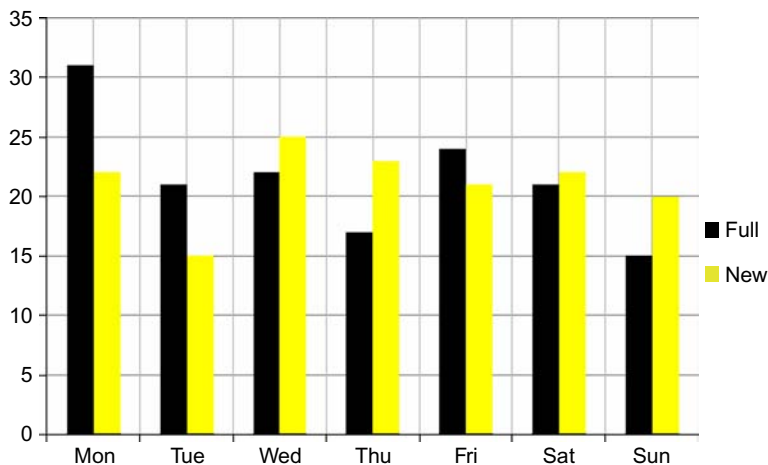


Figure 2.
The frequency of full
moon and new moon

heuristic can be captured by attention grabbing and also disposition effect. This disposition effect hypothetically forms DOWA.

Disposition effect is an occasion where investors have a tendency to sell winners stocks too early and ride losers stocks too long (Shefrin and Statman, 1985). This disposition effect can explain the seasonality. Odean (1998), Grinblatt and Keloharju (2001) and Grinblatt and Hahn (2005) for example, found that the disposition effect weakened in December. The returns of January revert to normal positive as the disposition effect starts diminishing. It implies that the regret of investor can be used to explain the seasonality. Therefore, DOWA might be caused by the regret feeling of the investor.

Another psychology bias affecting anomalous condition in stock market is cognitive dissonance by herding. Cognitive dissonance is the mental conflict experienced by an individual when they are faced with an evidence that their beliefs or assumptions are wrong (Montier, 2002). Meanwhile, herding means an event where under certain conditions most of investors only focuses on a subset of securities formation, while overlooks other securities with identical exogenous characteristics (Hirshleifer *et al.*, 1994).

Porter (1992) suggested that weekend effect can be caused by the flocking behaviour of individual investor. Lakonishok and Maberly (1990) addressed the information dissemination as the explanation for DOWA. In a study by Scharfstein and Stein (1990), the information dissemination is the driver in herding. Therefore, DOWA can be caused by investor cognitive dissonance which is shown in their herding behaviour.

These variables are believed to be the stimuli of investor decision making. Hypothetically, literatures showed the market anomaly has confirmed the investor irrationality. Much research on DOWA suggested investigating further the explanation the behaviour of investors. This irrationality of investor can be explained by using psychology approach. In psychology, the behaviour of human is stimulated by the activating events. Investors will react to these activating events based on their affection and cognition. Then, it generates a consequence called DOWA.

This stimuli-behaviour can be explained by using Ellis' ABC model. This research caters the irrationality of investor by proposing the psychological biases on decision making as the belief process. This process is stimulated by several factors such as high volume trading, extreme weather, full moon, and others stimulant factors in stock market. In a brief, the stimulant is the market behaviour in certain days; the emotional-cognition is based on affection, attention, heuristic, regret, and cognitive dissonance; and the consequence is the DOWA (Figure 3).

Constructing the theoretical model

As a result of literature review, this paper considers two important core belief of human behaviour in decision making: affection and cognition. Mentioned earlier that there are five proposed psychological biases to explain the DOWA, this research adopted Ellis' ABC (activating event, core belief, consequence) Model as the underlying theory to link the stimuli, psychological biases, and irrational behaviour. Ellis' ABC model addresses how complex cognition, emotion, and behavior are and how they inevitably include and interact with each other (Ellis, 1991).

According to Ellis (1991), there are two important theories which constructing this model. There are the ancient philosophers epictetus and Marcus Aurelius, and stimulus organism response theory of Robert woodworth. It constructs that activating events (A) in people's lives cater to their emotional and behavioural disturbances

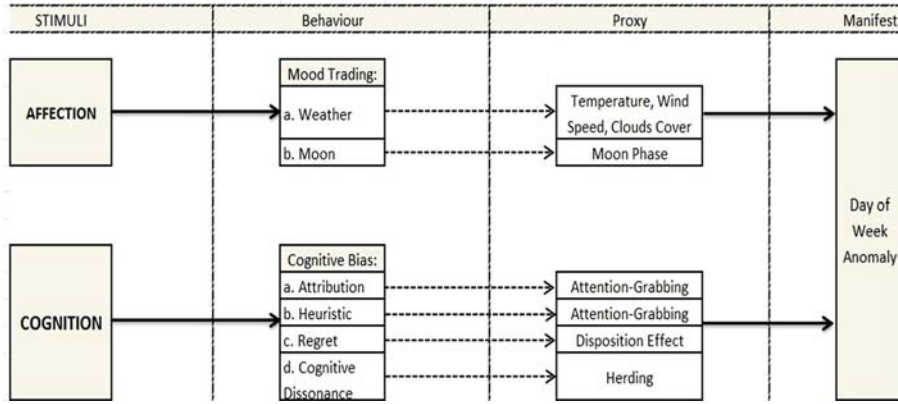


Figure 3.
The framework

or consequences (C) largely because they are fused with or acted upon by rational-emotive or beliefs (B) about these activating events (A) (refer to Kelly (1955) and Seligman (1991) for full detail explanation). It was introduced in 1956 as a rationale-emotive therapy. Indeed, this is in line with Gaulin and McBurney (2004) that also mentioned that human has both rational-irrational behaviour and affection-cognition as their personality. This is contradicting the previous research in finance which argued the rationality of investor and proposed irrationality (Benartzi and Thaler, 1995; Laibson, 1997; Odean, 1998; Kahneman, 2003). It can be summarized in the following function:

$$f : \text{Affection} \rightarrow \text{Behavior} \cap \text{Cognition} \rightarrow \text{Behavior}$$

The preposition is that behavior of investor could be driven by affection and cognition. Both affection and cognition are considered psychology factors. In the context of behavioral finance, it is these irrationalities that cause the anomalies (DOWA) in the market:

$$DOWA = f(Z_{\text{affection}}, Z_{\text{cognition}})$$

Adopting Ellis' ABC model, our research framework can be shown in Figure 4.

For the example is that the high negative returns in certain day are the consequence. The cause of the consequence is the belief. The stimulant of the belief is the activating event. Therefore, we can write the function:

$$\text{Consequence} : f\{-r_t\}$$

where: $-r_t$ is the negative return in t day, indicating the DOWA. This function explains that the consequence of certain stimulants is the DOWA.

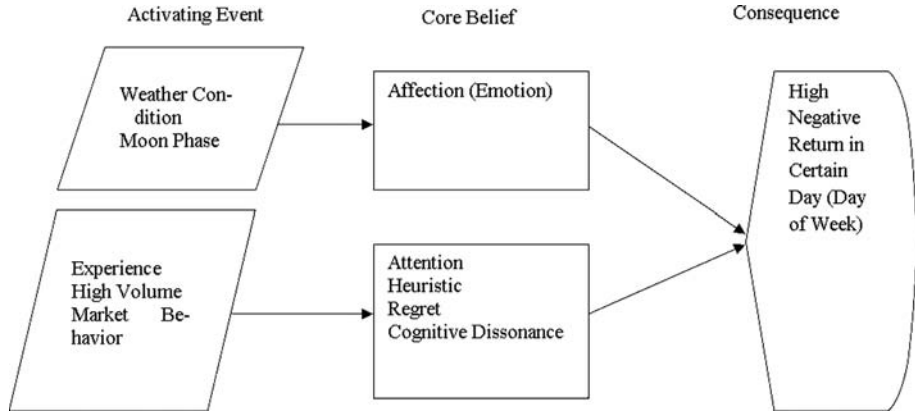
The stimulants or activating events and the core belief can be written in the function:

$$\text{Belief} : f\{\text{Affection, attention, heuristic, regret, cognitive_dissonance}\}$$

$$\text{Stimulant} : f\{\text{moon, weather, experience, hi-volume, market_behavior}\}$$

$$\therefore f : \text{Stimulant} \rightarrow \text{Belief} \Rightarrow \text{Consequence}$$

Figure 4.
Adopting ABC model
in finance



As already discussed, “belief” is equal to psychology biases. If “belief” is equal to psychology biases, the causes of irrational behavior are affection and cognition. The function will be:

$$PB \sim \text{Belief} : \text{belief} = \{\text{affection}, \text{cognition}\} \Rightarrow \text{DOWA}$$

$$\text{as } PB \subseteq \text{Belief} \cup PB \supseteq \text{Belief}$$

In conclusion, we hypothesize that the DOWA, the consequence of irrational behaviour, is influenced by the psychology biases. If in regression model, DOWA is explain by the influences of psychology biases, which can be decompose into affection and cognition. The equation below provides a theoretical ground on how the DOWA can be caused by the affection biases or cognition biases:

$$\text{DOWA} = \alpha + \beta \text{Affection} + \beta \text{Cognition}$$

The theoretical model for affection

In behaviorism model (Gaulin and McBurney, 2004), affection can influence the behavior in two ways: externally and internally. It can be written as function:

$$\text{Affection} = f(Y_{\text{External}}, Y_{\text{Internal}})$$

There are two important effects has to be addressed regarding external affection as proxy (Tvede, 2002). First, behaviorism mentioned that environment condition causes an individual to behave in a particular way. Second, the perception and knowledge might be subject of bias due to external factors. The core belief can be caught by certain activities.

This research emphasizes on the external factors as there is limitation in statistical process and data collection for internal factors as the data for internal factors is primary data that based on perception, and experimental, which is beyond the scope of this study.

This research proposes weather condition and moon phase as the proxy of the external affection:

$$\text{External Affection} = f(\text{Weather}, \text{Moon})$$

The influence of weather condition and moon phase will leads to mood disorder, which is consistent with irrational behavior and a reflection of affection bias:

$$Affection\ Bias = f(X_{Weather}, X_{Moon})$$

Therefore, the information set of affection can be written as ABC function as:

$$f : \{weather, moon\} \rightarrow Affection\ Bias \Rightarrow DOWA$$

The theoretical model for cognition

Summarizing Corney and Cummings (1986), Shefrin and Statman (1985), Wagenaar (1988), Scharfstein and Stein (1990), Griffith (1994), Tvede (2002), Grinblatt and Hahn (2005), Gaulin and McBurney (2004) and Yudkowsky (2006), it addresses that there are four psychology biases of cognition which are attention, heuristic, regret, and cognitive dissonance. Therefore, the function is:

$$Cognitive\ Bias = f(X_{attention}, X_{heuristic}, X_{regret}, X_{Cognitive\ Dissonance})$$

The attention, heuristic, regret, and cognitive dissonance of investor will generate attention bias, memory bias, judgmental bias, and associative bias. This is in line with Mineka and Sutton (1992).

The DOWA has high volume and extreme returns, it will influence the information process of investor. The high volume and extreme returns can catch the attention of the investors, inserted a heuristic memory, causes judgmental bias to avoid regret, and leads to associative action of investors to the market trend (herding). This consequently causes DOWA. In short, the cognition model according to ABC framework is:

$$f : \{high\ volume \cup\ exterm\ returns\} \rightarrow Cognition\ Bias \Rightarrow DOWA$$

The full model

Summarizing the theoretical model of affection and cognition, we propose a model to explain the role of psychology biases on DOWA. The function of our model is:

$$Psychology\ Bias = f(X_{weather}, X_{Moons}, X_{attention}, X_{heuristic}, X_{regret}, X_{Cognition\ Dissonance})$$

Shown in Figure 4 we postulate that investors receive stimulation from both affection and cognition factors: extreme weather and full moon, and extreme volume and extreme returns. These stimulations will bring to psychology biases into core belief through affection and cognition. After acting according our affection biases and or cognition biases, it results a consequence which is DOWA. The relationship of psychology biases and DOWA is vividly shown in Figure 5.

Future research

This paper aims to linkage the DOWA and its determinants conceptually. The proposition is that psychological biases are the factors that influence the trading behaviour and generating DOWA. Future research can investigate which psychological biases have effects on DOWA. It can tested in three ways:

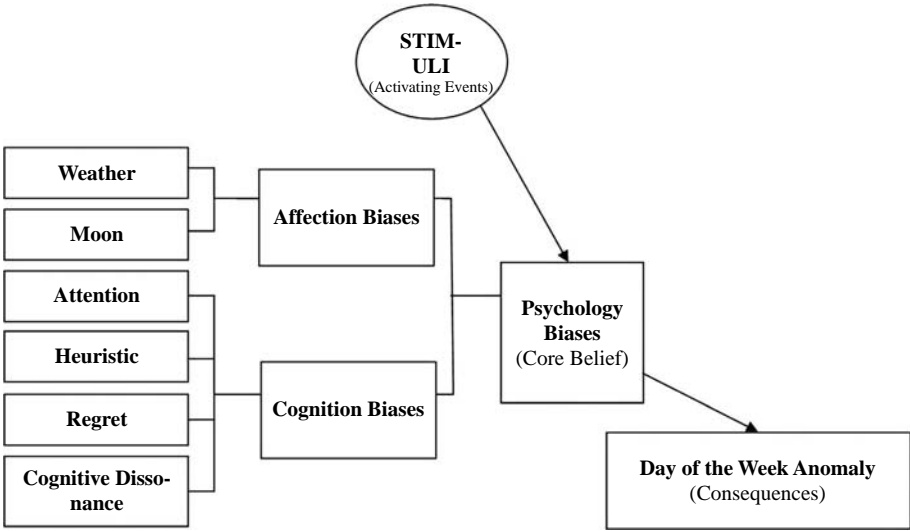


Figure 5.
The theoretical framework

- (1) using dummy interaction (traditional approach);
- (2) tested day by day (innovation model); and
- (3) taking the intercept of the firms/industries/markets DOWA as index and run it as dependent variable (logistic regression model).

Investment strategy implication

Much research has shown that DOWA can result higher returns compare to using buy-and-hold strategy. [French \(1980\)](#) showed that if there is no transaction cost, investors can gain 134 per cent returns over 1955-1973. It is much higher compare to buy-and-hold strategy which only gained 55 per cent. By adding the psychological biases as the determinants, the investment strategy can be formed more robust. As active investment relies more on daily trading, adding psychological bias would make the strategy even more robust. It is because the psychological of investor will affect their investment decision.

Market efficiency implication

The conceptual discussed above indicate that the DOWA might be due to investor trading behaviour. Perhaps the most obvious explanation for this result is that the investor has had bias decision towards information released over weekend. For example, if the panic selling suddenly occurs during Monday, investors start losing their investment objective and just followed the market irrationality. Another example is if the investors have mood disorder on Monday due to extreme weather or full moon phase, they might reformat their objectives following their emotion or affection.

DOWA usually remarks negatively dispersed returns of Monday compare to other day of the week. The volume of Monday is also significantly different from other days. These factors lead investor to have psychological bias, affectively or cognitively. They will not follow the true information of the firm in making investment strategy.

If this case is true, it indicates investors probably discounts or overvalues the stocks according to their bias decision. In other words, the market efficiency cannot be longer hold as actually price does not show the true information. Price might contain of the biases decision of investors, a postulate that contrary to market efficiency.

Conclusion

Rational behavior is the main assumption in traditional finance. It lays investors objectives on utility function. However, there are many issues in finance than cannot be answered using this approach. One of it is DOWA. This paper conceptually explores the role of psychological biases on the DOWA. Moreover, this paper has shown how academicians can use psychological biases as the explanation on DOWA. Under Ellis' ABC model, we addressed five psychological factors that might influence the DOWA.

It is necessary to rethink on the basic tenet of traditional finance to make a more robust tool for investors trading in financial market. Future research on DOWA can test its relationship on the five psychological factors:

- (1) extreme weather;
- (2) moon phase;
- (3) attention;
- (4) disposition effect; and
- (5) herd behavior empirically.

In short, this paper remarks that psychological biases can be used and tested in traditional finance to explain the anomalous condition in the market, more robust than market efficiency explanation.

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