Debunking the Monday Irrationality through the External Affection of Investors

Rayenda Brahmana,[1] Chee-Wooi Hooy,[2] and Zamri Ahmad [2]

[1] Faculty of Economics and Business Universiti Malaysia Sarawak

[2] School of Management Universiti Sains Malaysia

Abstract: This study aims to reveal the mechanism of the influences of the full moon and high temperatures on investors' Monday irrationality. In contrast to other studies, this research was built under a retroductive approach by using a time series quasi experimental study. Investors were directly assessed for their irrationality by using an adapted psychometric test on 4 occasions. The results indicate that there were indeed effects of the full moon and high temperatures on investors' irrationality. Because the full moon and high temperatures frequently occurred on Mondays, it is most probably those two variables that were the drivers of the Monday irrationality. In the end, we concluded that the rational behaviour assumption can no longer be held. Instead of rationality, the investors were quasi rational. The utility function of Von Neumann-Morgenstern in decision making has to be replaced by the hedonic utility.

Abstrak: Penelitian ini bertujuan untuk mengungkap mekanisme pengaruh bulan purnama dan suhu tinggi terhadap irasionalitas Senin pada investor. Berbeda dengan studi lain, penelitian ini dibangun di bawah pendekatan *retroductive* dengan menggunakan studi eksperimental kuasi runtun waktu. Investor dinilai secara langsung untuk irasionalitas mereka dengan menggunakan tes psikometrik yang dilakukan empat kali. Hasil penelitian menunjukkan bahwa memang ada efek bulan purnama dan suhu tinggi pada irasionalitas para investor. Karena bulan purnama dan suhu tinggi sering terjadi pada hari Senin, hal ini sangat mungkin kedua variabel tersebut yang menjadi pendorong irasionalitas pada hari Senin. Pada akhirnya, kami menyimpulkan bahwa asumsi perilaku rasional tidak dapat lagi menjadi pegangan. Bukannya rasionalitas, para investor merupakan pelaku rasional semu. Fungsi utilitas Von Neumann-Morgenstern dalam pengambilan keputusan harus diganti oleh utilitas hedonik.

Keywords: experimental economics; high temperature; Monday irrationality; moon phase; psychological biases

JEL classification: C93, G02, G19, O16

* Corresponding author's e-mail: brkhresna@unimas.my

Introduction

The rational motive for investment is value optimization, where investors tend to buy low, wait for the price to increase, then hopefully sell at the peak, and thus make a profit. This mechanism is modeled by conventional economics under the assumption of rational behavior. However, this traditional tenet has been hugely disputed by behavioral scholars; for instance Kahneman and Tversky (1979), who proposed the prospect theory, that stated that the behavior of individuals was different due to different situations of uncertainty, and argued that losses hurt more than gains felt good. This theory addressed the psychological biases that have intervened in the process of editing and evaluation in decision making (Daniel et al. 1998; Brahmana et al. 2012b).

One of the tenet violation dossiers of traditional economics is the day-of-the-week anomaly or the Monday Irrationality (hereafter MI). First documented by French (1980), it shows that stock returns on Mondays have significant differences compared to the other days, indicating that investors behave differently on Mondays. The importance of the MI has been addressed by many scholars. For instance, Bell and Levin (1998) found the role of MI on the efficiency of the market. Chen and Singal (2003) labeled the best day for speculative trading or active trading is during the MI. There are also Angel *et al.* (2003) who mentioned that the best trading day for short selling is during the weekend effect. In short, MI has practical importance for active investing.

Much research into MI has proposed the investors' behavior as an explanation of the anomalous market conditions (see Abraham and Ikenberry 1994; Clare et al. 1995; Berument and Kiymaz 2001; Wong et al.

1992; Yahyazadehfar et al. 2006). Thus, research that has investigated it empirically, especially from the psychological point of view, is rarely found. Hence, linking the trading behavior with psychological perspectives might give a new explanation for MI. This is in line with what is proposed in the psychology literature, such as by Krebs and Blackman (1999), who addressed three stimulants of human behavior, affection, learning, and the cognitive, in human psychology which can cause biased or irrational decision making.

In the perspective of the prospect theory, this MI is driven by psychological factors, and might be caused by a perception bias. This means that MI's occurrence might be due to psychological factors such as affection and cognition. Previous research by Abraham and Ikenberry (1994), and Wong et al. (1992), addressed trading behavior as the explanation of this MI, yet rarely found that research had investigated it empirically; a gap that this study wants to fill. Therefore, this research aims to investigate the psychological drivers of MI from the psychological perspective.

Interestingly, the anomalies in our natural environment are in line with this MI, for instance the research paper of Forster and Solomon (2003). By using surface measurements of maximum and minimum temperatures from the Global Daily Climatologically Network data set, they documented that many climate stations in the world reported high temperature levels from Saturday to Monday, similar occasions to MI. Our plot also showed the same. Temperature seasonality in global temperatures documented the Monday temperatures as being relatively higher than those of other weekdays. The range of the Monday temperatures rises from around 26°C up to around 33°C. However, the temperature range for the other days is between 16°C up to 30°C; which implies that

Mondays are relatively hotter than the other days on average. This is in line with the MI in the stock market. Mother nature also has another anomaly, where the full moon-new moon occurs more on Mondays than on other weekdays (see Figure 1). This preliminary finding encourages us to surmise the role of the full moon on the investors' MI. If the full moon occurs more on Mondays, and contributes to human behavior, it is possible that MI is caused by the phases of the moon.

Malaysia is chosen as the sample for the research because this country offers a unique environment for examining the role of external factors on stock trading performance. *Firstly*, Malaysia is one of the fast-growing emerging markets, with a high FDI, stable economic growth, and huge market capitalization (see Goh and Wong 2011). *Secondly*, in terms of the behavior of market participants, many research papers have found the irratio-nality. For instance Muhammad and Ismail (2008) addressed that Malaysian investors tended to follow sentiment. It is strengthened by Wong and Lai (2009) who stated that Malaysian investors had representativeness bias and overconfidence in their trading activities. However, these arguments were refuted by Lai and Lai (2010) who found that Malaysian investors were rational in terms of their reference dependence. *Lastly*, the unique environment of Malaysia, because of its position in the equatorial region, means the temperatures should be the same throughout the year. Hence, it makes this research more interesting, as many scholars have found no relationship between temperatures and stock returns (see Trombley 1997; Kramer and Runde 1997; Pardo and Valor 2003). As those researchers tested in developed and four-season countries, the findings of this research enrich the available literature.

Figure 1. **Frequency of the New Moon and the Full Moon Across the Weekend**
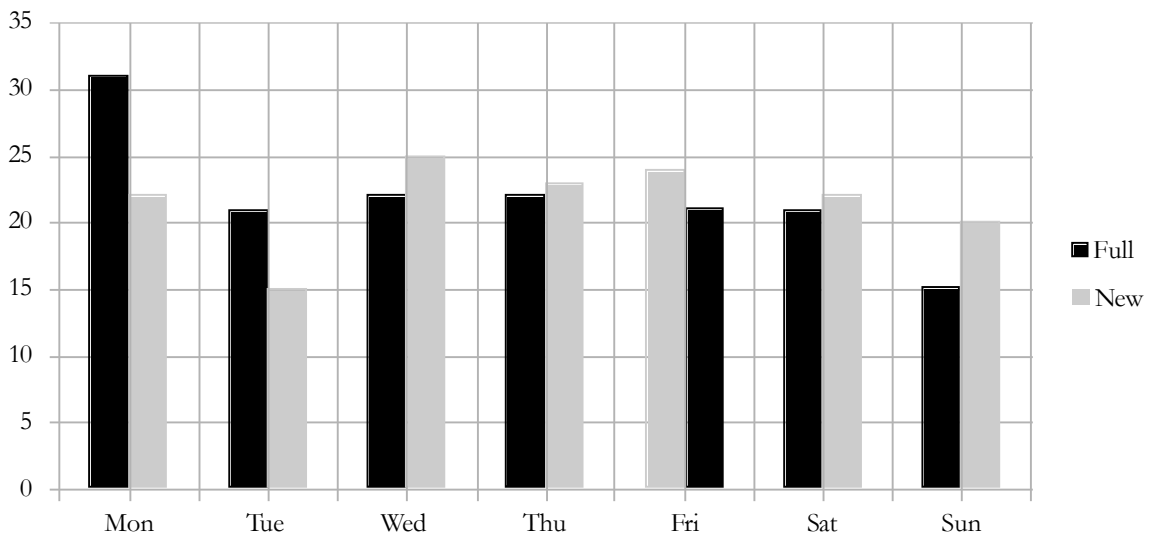
Note: Y axis is the numbers of occurrences; Mon is Monday, Tue is Tuesday, Wed is Wednesday, Thu is Thursday, Fri is Friday, Sat is Saturday, and Sun is Sunday
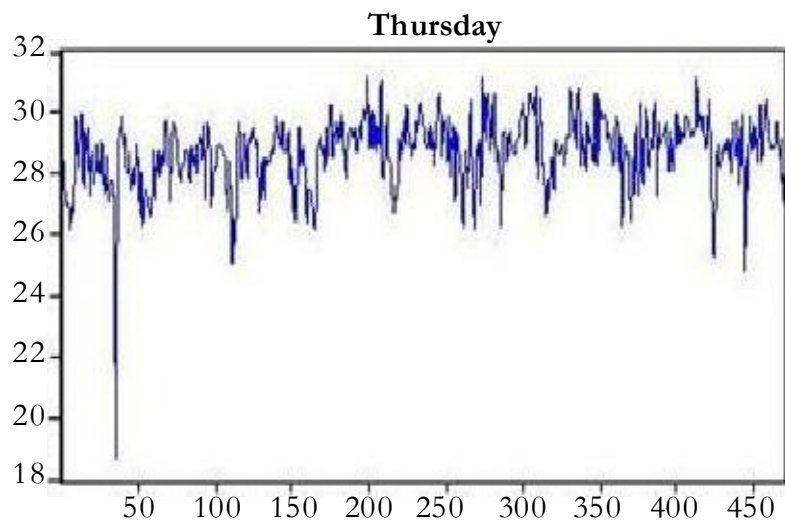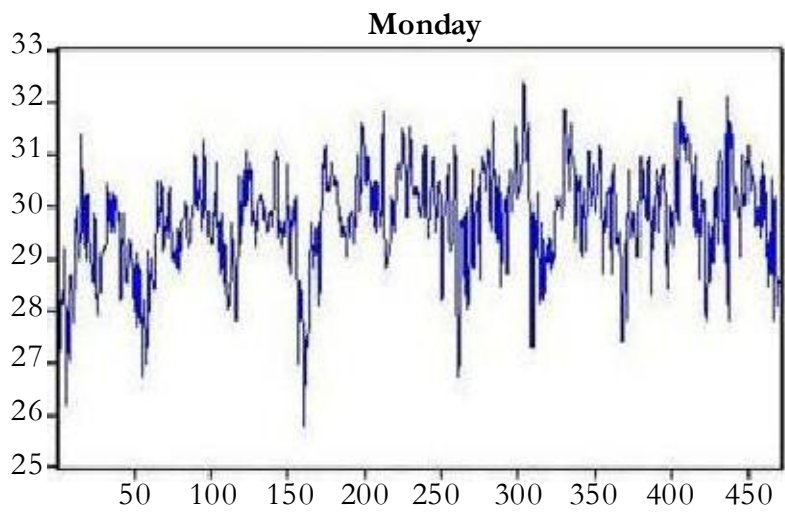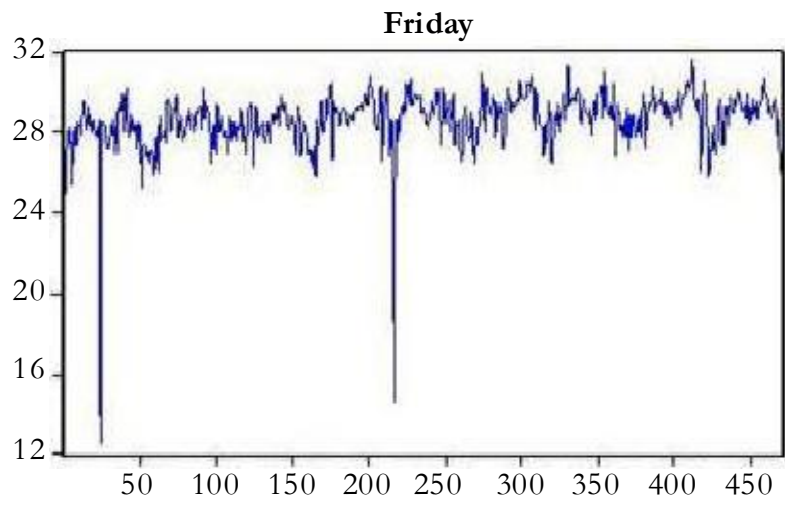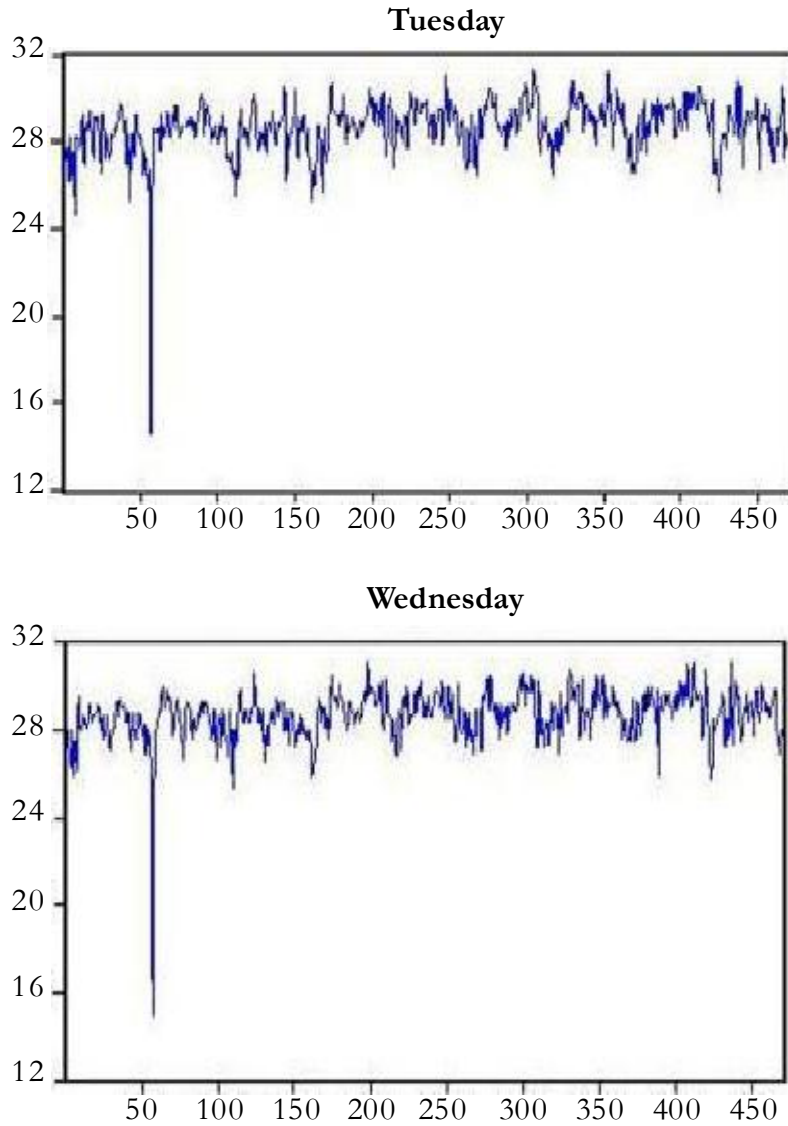
Friday

Monday

Thursday

Figure 2. **Continued**

Tuesday

Wednesday

Note: X axis is the frequency; Y axis is the temperature level

The main focus of our study is how nature influences the investors' trading decisions, whereby full moon phases and temperature are the sources of the investors' irrationality. Those two variables shape the moods and the cognition of investors, which leads to their stock performances. Note that even though much research has attempted to explore the determinants of this MI (see Abraham and Ikenberry 1994; Clare et al.

1995; Berument and Kiymaz 2001; Brahmana et al. 2012b), based on our knowledge, no research has examined the relationship, especially in an experimental study.

This study is different from other studies in 4 senses. *Firstly*, it takes and elaborates the behavioral psychological perspective, which states that external factors are the source of moods, in answering the market anomaly. *Secondly*, it is constructed under a

retroductive design where an experimental study is used to confirm the mechanism of the influences of the moon and temperature on MI. *Thirdly*, unlike standard behavioral economic studies, our study interacts directly with the investors. These investors were the subject of the time-series quasi experiment. *Finally*, this study used a robust analysis which was a partial least regression. This regression included the latent variables in the model to minimize variance errors.

Conceptual Background

This research aims to investigate the role of temperature and the full moon on investors' behavior. It is postulated based on prior studies in psychology which document how the temperature and full moon affect human behavior. The research into the relationship between moods and decision making has been conducted since the early 1980s. For instance, there was Tversky and Kahneman (1992) who concluded that there is a significant relationship between moods and rational choices. Forgas (1995) stated that moods affect decision making strategies. The feelings of happiness, sadness, and a neutral feeling have rewarded efficient decision making, inefficient and costly decision making, and controlled decision making respectively. Forgas concluded that the effects of the various moods were generally dependent on the personal relevance of the decision. Hockey et al. (2000) surmised that negative moods encouraged people to take risky decisions. They named the states of fatigue, anxiety, and depression as the key determinants of negative moods in triggering risky decision making. This indicates moods have a significant influence on decision making. Further, Loewenstein and Lerner (2003) stated that there were cognitive errors that people made

in their decision making. They offered the role of emotion in decision making as the causal factor for the cognitive errors. Further, they argued that the role of emotion, which was induced by various moods, degraded the quality of the decision making.

There are many proxies for moods in psychological studies. Yet, this study stands on the affection-driven mood where the weather and full moon may become one of the factors (see Brahmana et al. 2012a). Weather is a comprehensively researched source of misattributed moods. Schwarz and Clore (1983) found that people received greater satisfaction when the weather was sunny rather than when the weather was reported as being rainy. Further, Howarth and Hoffman (1984) summarized that weather affected an individual's mood or emotional state, creating a particular kind of behavior. A study by Hansen et al. (2008) examined the role of high temperatures on mental, behavioral, and genitive disorders. By estimating hospital admissions and mortalities attributed to mental, behavioral, and cognitive disorders during the period from 1993-2006, they suggested that high temperatures pose a salient risk to mental health. This finding is aligned with previous results that also stated that high temperatures had a relationship with mental health (Basu and Sumet 2002; Kovats and Ebi 2006).

There is also a widespread belief that the moon's cycles affect human behavior through peoples moods (Dichev and Janes 2003). In medical science, the moods of humans seem to increase the levels of psychotic disorders, violence, and other deviant behaviors during the full moon phase. These beliefs have been present since the Greek and Roman times, all throughout the middle ages, and to the present day (Dichev and Janes 2003). Religious ceremonies were often timed

to match precise phases of the lunar month, including Islamic, Hebrew et al. (Yuan et al. 2005). Because of these patterns, psychology scholars have investigated the role of the moon's phases on human moods.

Early studies of the full moon's impact were conducted by Kane et al. (1967). They examined the role of the moon's phases on human behavior. They found that the lunar phases, especially in the full moon phase, affected human moods and changed them to more depressive behavior, emotional disturbance, and other normal changes. Dewey (1971) also documented that births and deaths exhibited a moon cycle effect. Dewey stated that more births occurred during the waxing rather than the waning of the moon; death rates increased after a full moon. Cuningham (1979) investigated the role of temperature and the moon on the feeling of generosity. Cuningham found the full moon phase affected the generosity of humans. Wilkinson (1997) found that moon cycles really affected the moods of humans. He continued by explaining that the moon's cycle can cause anxiety and depressive mood disorders. Another study was conducted by Barr (2000), who conducted a study comprising of 100 samples by using the ANOVA statistic to investigate the role of the moon's cycle. Bar concluded that the moon's cycle had a significant relationship to the quality of life of humans, in terms of their moods.

In finance, these mood factors, the weather and moon, have been employed as a factor for investors' behavior. For instance, Saunders's work (1993) found a relationship between the cloud cover level in New York and the equity returns in New York. Sauders (1993) found when the level of cloud cover was 100 percent, the stock returns were significantly below average, and when the cloud cover level was 0-20 percent, the stock re-

turns were significantly above the average. These findings are very important in supporting the behavioral finance theory. When replicating Saunder's work, Hirshleifer and Shumway (2003) documented the same results within broader markets over a longer period. Pardo and Valor (2003) found the effects of weather on the financial markets in the behavior of the markets' traders. Kramer and Runde (1997), Brahmana et al. (2012b, 2014a, 2015) found a positive relationship between the weather conditions and stock market returns.

In terms of the effects of the moon on investors' behavior, empirical results have proved that the moon's cycles influence decision making in financial matters. One of the early studies was conducted by Dichev and Janes (2003), who investigated the major US stock index over 100 years and all the major stock indices of 24 other countries over 30 years, and found the moon's cycle was aligned with market returns. Yuan et al. (2005) investigated the role of the moon's cycle on market returns in 48 countries. Their findings indicate that the returns are lower on full moon days than on the days around a new moon. The return difference is around 3 percent to 5 percent between the new moon and the full moon. However, they argued that the moon's cycle did not affect the volatility and trading volumes. Herbst (2007) also conducted research into the relationship between the moon's cycle and market returns. The results of the relationships were varied and not consistent. Herbst explained that either the daily returns or the price volatility of the Dow Jones index were inconsistently explained by the moon's cycle. Herbst concluded that the moon's cycle was not consistent to predict market returns or price volatility. Sivakumar and Satyanarayan (2009) investigated the relationship between moon cycles and the

Bombay stock exchange's returns. After investigating 17 years of stock returns, they concluded that the moon's cycles did link with the returns. Gao (2009) also investigated the relationship between the moon's cycles and market returns in two major Chinese stock markets over 16 years. Gao concluded that the lunar phases did affect the stock returns. Gao showed that the returns are relatively lower when there is a new moon and relatively higher during a full moon. Further, Brahmana et al. (2014b, 2014c) have found the same conclusion, that the occurrence of the full moon may affect the investors' trading behavior.

Therefore, based on the studies mentioned above, this research hypothesizes that the existence of a full moon and high temperatures influence the behavior of investors. The seasonality of the full moon occurrences and temperature conditions generate the MI.

Research Design

This research employed a time series quasi experimental study to achieve its objective. Investors were asked to fill in the adopted psychometric test to measure their moods, cognitive disarray, aggressiveness, decision making style, risk behavior and stock trading performance. The mood was measured by a Profile Of Mood State (hereafter POMS). This is a psychometric assessment which measures mood disturbances in 6 domains: fatigue-inertia, vigour-activity, tension-anxiety, depression-dejection, tension, and confusion-bewilderment. This psychometric assessment has been adopted to capture human mood disorders. Instead of using a lengthy version of POMS such as McNair et al. (1989) with 65 items, and Shacham et al., (1987) with 37 items, this research adopted

Cella et al. (1987) with 11 items as the adopted psychometrics to precisely mimic mood disorders.

Note that in choosing which POMS psychometric items would be used, a pilot study was conducted on 182 undergraduate and postgraduate students with the McNair et al. (1989) items. The factor analysis result suggested deleting up to 48 of the items as the cross loading factors were very high. The respondents also complained about the length of the study. Moreover, as there were only 17 items of Cella et al. (1987), it was decided to use that as the measurement.

The disarray of cognition was adopted from the Cognitive Style Index (CSI). The Allinson and Hayes (1996) CSI questionnaire was used to capture cognitive disarray, which can be defined as the mental behavior involving a pattern of deviation in judgment that occurs in a particular situation. Additionally, the Buss and Perry (1992) aggressiveness (AGGR), Risk Behavior Index (RBI), and the Decision Making Style Index (DMSI) were introduced to capture the psychological conditions on a particular day and occasion. In the latter, psychometrics constructed a research model/framework with stock performance as the endogenous factor. In addition to that, the return performance was retrieved by asking "How much return did you gain today?"

This research comprised of 4 studies which were compared to each others. There was a time series quasi experimental study which was similar to an interrupted pre-test-post-test of one group. The studies were: (1) a day with a high temperature and a new moon, (2) a day with a high temperature and a full moon, (3) a day with a low temperature and a full moon, and (4) a day with a low temperature and a new moon. The models

were run under a partial least square regression, a nonparametric regression that considers the latent variables of the equation.

The object of the experiment was chosen by following the non-probability sampling method. This was done by distributing an adopted psychometric question to all the investors in Malaysia on a certain day. Using an online survey, this research sent the survey website link at 6am and closed the survey at 8pm. The email stated that participation in the test was voluntary, to agree to do it during the first break or after the trading day, and to agree to do it four times. The survey recorded the times and encoded the names of the investors. For instance Mr. Lim, the second respondent completed the survey at 5.32pm. This was recorded and the system automatically gave him the code R_2. Because the number of respondents in this research was 316, the codes ranged from R_1 to R_316; however, only 274 samples were used because not all the respondents completed the study process. Note that the investors were not informed that we were conducting research into MI and psychological biases. They only knew that the form was purely for psychological profiling only.

The experimental study timetable can be reviewed in Table 1. The first study took place on the 4th of April 2011 (Monday) when the temperature was 31.3 degrees Celsius; the highest temperature for that particular week (4th-10th of April 2011). The moon phase on that day was a new moon. In the first study, there were 316 subjects. The second experiment was conducted on the 18th of April 2011 (Monday) when the temperature was 28.4 degrees Celsius; the highest temperature for that particular week (18th-24th of April 2011). The moon phase on that day was a full moon. Study 3 was conducted on the 12th of October 2011 (Wednesday) when the temperature was 26.7 degrees Celsius; the second lowest temperature for that particular week (10th-16th of October 2011). The moon phase on that day was a full moon. Lastly, the fourth study was conducted on the 26th of October 2011 (Wednesday) when the temperature was 26.5 degrees Celsius; the lowest temperature for that particular week (24th-30th of October 2011). The moon phase on that day was a new moon. This research only used the 274 respondents who completed all four psychometric tests, which means 42 subjects were excluded from this research. In short, the experiments were conducted according to the following timeline schedule. Wednesday was chosen as a representative day for the weekday trading because stock returns on Wednesdays were usually free from anomalies and noise, which implies that the investors' aggressiveness or tranquillity on Wednesdays were at normal levels. Tuesdays might have been influenced by Monday trading, and Thursdays might have been influenced by Friday (the Friday effect), which is why they were not chosen.

Table 1. **The Eexperimental Study Schedule**

	Monday	**Wednesday**
Full Moon	18 April 2011	12 October 2011
New Moon	4 April 2011	26 October 2011

Results

Goodness of Measures[1]

The validity and reliability are commonly used for testing the goodness of measures. Reliability tests how consistently an instrument measures its construct, whereas validity is a test to measure how well an instrument measures the particular concept it is intended to measure (Sekaran and Bougie 2010).

The reliability results were based on Cronbach's alpha results, where all alpha values were higher than 0.6 as suggested by Nunnally and Bernstein (1994). The Composite Reliability (CR) also ranged from 0.61 to 0.846 for the entire study. Interpreted as a Cronbach's alpha for the internal consistency reliability estimate, a CR of 0.70 or greater was considered acceptable (Fornell and Larcker 1981). As such we concluded that the measurements were reliable.

The discriminant validity results showed the squared correlations for each construct were less than the Average Variance Extracted (hereafter AVE) by the indicators measuring that construct, indicating adequate discriminant validity (refer to Compeau et al. 1999). In total, the measurement model demonstrated adequate discriminant validity. The

AVE values ranged from 0.5084 to 0.6160. The convergent validity results were also passed the threshold, as suggested by Hair et al. (2010). The CR results ranged from 0.610 to 0.8465 for the entire study. They exceeded the recommended value of 0.5 by Barclay et al. (1995). Hence, we concluded the items used in the study were convergently valid.

Does Monday Irrationality Truly Exist?

The results showed that the returns performance on Monday were significantly different to the returns performance on Wednesday (see Table 2). The mood state and cognitive disarray on Mondays were also significantly different to those on Wednesdays. The findings demonstrated that the behavior of investors on Mondays was significantly different to Wednesdays. This conclusion supported the MI hypothesis, i.e. investors cannot be assumed to be rational as they have a different mood state and cognitive disarray on Mondays. The hedonic utility, where the decision making in satisfying the needs is built under emotion-feeling, is supported by our quasi experimental results.

These findings support both the previous research studies in the psychology literature (i.e., Dobbins 1982; Willich et al. 1994; Koeske et al. 1994; Gill and Scharer 1996;

Table 2. **The Paired T-Test Results**

		Mean	T	Sig. (2-tailed)
Pair 1	return_m - return_w	0.074	-35.032	0.000
Pair 2	Mood_state_M - Mood_state_W	0.779	54.198	0.000
Pair 3	cognition_disarray_M - cognition_disarray_w	0.706	43.587	0.000

[1] The results of the reliability, discriminant validity, and convergent validity are provided upon request

Card and McCall 1996; and Muvakami et al. 2004) and in the economic literature (i.e., French 1980; Lim et al., 2010; and Lim and Chia 2010). Koeske et al. (1994), and showed that both personal and job satisfaction on Mondays was less when compared to other days. This idea of the Monday blues hypothesis continued in Gill and Scharer's (1996) research, in which they showed how students nervously misspell words on Mondays. The emotion of nervousness means that the students could not score highly in exams. Muvakami et al. (2004) showed that blood pressure levels on Mondays were significantly different compared to other days. This was tested by monitoring the community-dwelling population and observing the repeated ambulatory information. Blood pressure had a deviant behavior, especially on Mondays. The psychology literature has confirmed our quasi-experiment, whereby the stock trading performance, mood states and cognition disarray of the investors on Mondays were significantly different from the norm. The causes could be the occurrence of the full moon and or a high temperature on that particular day.

Result of the Study 1[2]: 4th of April 2011

The first study was conducted on Monday during the new moon phase. The quasi experimental results documented the effect of temperature. In this experimental study the temperature was not the room temperature, but the outdoor weather temperature which was obtained from the Malaysian meteorological office and found to be 31.3 degrees Celsius on that particular day. Investors were presumed to be inside air-conditioned rooms. It can be argued that a hot outdoor tempera-

ture can be eliminated by a cold indoor temperature because of air-conditioning. However, if one believes this hypothesis, only the sensation of temperature not the sentiment would be examined. In the psychology literature, it is stated that temperature has an effect on the cognitive process and transforms the sensations of heat into perception or memory.

The results show the psychological bias on investors during Monday trading (See Appendix 2). The R-squared values were 13.5 percent, 3.4 percent, and 8 percent for the aggressiveness model, risk behavior model, and decision making style model respectively. The full model itself was 10.2 percent of R-squared, which validates the goodness of the model.

The first quasi-experiment showed that investors' were aggressive and indulged in a risky decision making style. However, only the decision making style had an effect on the stock trading performance. It implied that the high temperature had an effect on the investors' stock trading performance. The result is analogous to previous results in finance studies such as those by Saunders (1993), Kramer and Runde (1997), Kamstra et al. (2000), Pardo and Valor (2003), and Brahmana et al. (2012a). In the psychology literature, this result is in line with Basu and Samet (2002), and Kovats and Ebi (2006).

Based on our quasi-experiment, the investors did not ultimately follow the Von Neumann-Morgenstern utility function. The investors did not have rational judgment when the temperature was high. The choices made by the investors might contain emotion or affection. Rational behavior can no longer be held to be the basic assumption because

---

[2] We modified the SmartPLS graph by using Microsoft Publisher. We summarized the PLS algorithms graph and PLS bootstrapping result to a single graph.

of the findings, as it is indeed the case that temperature has an effect on investors.

Study 2: 18th of April 2011

The second study was conducted on a Monday in a full moon phase and with a high temperature. It confirms the hypothesis of the moon and temperature affecting investor irrationality on this particular day. The model is much better than that of the first study (the best among the others) as depicted by the R-square result. The full model shows 8.1 percent of R-squared indicating that variance can explain the model well enough. Meanwhile, the aggressiveness model was up to 41.3 percent of the R-squared value, indicating that 41.3 percent of the variance can explain the model. The risk behavior and decision making style model was documented at 29.9 percent and 14 percent of R-squared respectively, which surmises the model is robust.

In terms of investor moods, Study 2 demonstrated a positively significant effect on the psychological bias outcomes (aggressiveness, risk behavior, and decision making style), and was significant at a level of 1 percent. The positive sign implies that the higher the mood disturbance, the higher the psychological bias outcomes. For instance, the higher the mood disturbance is, the more aggressive the investors become. Similarly, cognitive disarray influenced the outcomes, except for the decision making style. It was also positively significant on the outcomes at a 1 percent level. Aggressiveness influenced the performance at a 1 percent level with a negative coefficient value of 0.162. Meanwhile, risk behavior and decision making style shaped performance at a 10 percent level. The risk behavior coefficient value was -0.101 implying that risk behavior was inverse to performance; the higher the risk behavior, the lower the performance. The quasi experimental results supported the hypothesis. It should be noted that the high temperature and the full moon were during the day of the experiment. In other words, the full moon and high temperature interacted with each other to influence the investors' behavior.

The results showed that the mood state and cognitive disarray made the investors more and more prone to engage in risky behavior and decision making (See Appendix 3 for detail). This aggressiveness, risky behavior and decision making partially mediated the relationship between the mood state, aggressiveness, and stock trading performance. In other words, when a full moon and high temperature were present, there were effects on the relationship between the mood state and stock trading performance, as well as the relationship between the cognitive disarray and stock trading performance. The interaction between a full moon and a high temperature had a different level of magnitude in influencing the investors. This is in line with Isen et al. (1978), Janis and Mann (1977), Warneryd (2001), Basu and Samet (2002), Slovic et al. (2004), and Lucey and Dowling (2005).

Study 3: 12th of October 2011

The third study was performed on Wednesday in a full moon phase and a low temperature. In terms of model robustness, the R-squared values of the models are considered high. As depicted in Appendix 4, the aggressiveness model, risk behavior model and decision making style model had 31.5 percent, 19.1 percent, and 28.7 percent of R-squared respectively. Meanwhile, the full model was 3.7 percent of R-squared, which proved the latent of the exogenous variable was good enough to explain the model. The moods of the investors on this particular day

had a consequence on the psychological outcomes (aggressiveness, risk behavior, and decision making style) at a 1 percent level. The directions of the relationship were positive with coefficient values of 29 percent, 39.3 percent, and 29.7 percent on aggressiveness, risk behavior, and decision making style respectively. The effect of cognitive disarray only occurred with a 1 percent aggressiveness level; however, it did not influence the risk behavior and decision making style at a 10 percent level. The coefficient values were 5.1 percent and 9.7 percent for risk behavior and decision making style respectively, which implies that the cognitive disarray on the day of the least disturbance did not bias the risk behavior or the decision making style of the investors. The results also showed that the outcomes of the psychological biases failed to generate changes in the trading performance on Wednesday, as it was insignificant. The decision making style had a significant effect at a 10 percent level, but aggressiveness and risk behavior failed to determine the performance. The coefficient values were 3 percent, 3.4 percent, and 19.3 percent for aggressiveness, risk behavior, and decision making style respectively.

In summary, the results documented that psychological biases failed to determine the investors' performance on Wednesdays. Psychological biases had an effect on the outcomes, but not as far as the performance of the investors. These findings support the hypothesis whereas psychological biases are the determinants for the MI only. The result is in line with previous financial study results such as Dichev and Janes (2003), Yuan et al. (2005), Herbst (2007), and Gao (2009). The results are also the same as those found in several psychology papers, such as Wilkinson (1997) and Barr (2000) who discovered the role of the moon's cycles on human behav-

ior. Therefore, the quasi-experimental results confirmed that the full moon effect influences mood states and cognitive disarray, but only the decision making style from the mood state successfully influences stock trading performance.

Study 4: 27th of October 2011

Study 4 is the last study conducted to confirm the hypothesis. It was performed on a Wednesday in a new moon phase and with the same respondents. The purpose is to compare the results with the other new moon results. It also aims to show the difference between a Wednesday with a full moon and a Wednesday with a new moon. As shown in Appendix 5, the results were expected to confirm there was no role for psychological bias in the trading performance.

The investors' moods did have an effect on the aggressiveness, risk behavior, and the decision making style of the investors, and was positively significant at a 1 percent level. The magnitudes, which are shown by the coefficients, were also relatively high, which indicates that the investors' moods on Wednesdays induce aggressiveness, risk behavior, and the decision making style. On the other hand, the cognition of the investors did not show any frenzy, as it influenced the decision making style, but not aggressiveness or risk behaviors. The cognitive disarray of the investors had an effect on the decision making style at a 1 percent level. Additionally, the structural model showed that the investors' performance was not affected by any psychological factors, and that aggressiveness, risk behavior, and decision making styles did not have any effect on the trading performance. The indirect relationship of the moods and cognition confirm this. The findings show that a Wednesday, in a new moon

phase, only affected the psychological biases outcome but did not influence the trading performance on that particular day. The magnitudes of the influence are also highly dispersed. For instance, the mediating effect of risk behavior has a negative influence on the performance by up to 1.2 percent. However, mood has a positive influence on aggressiveness by up to 43.3 percent. There is a negative relationship between aggressiveness and risk behavior on stock performance. Even though it is not significant, it shows temperature has a negative effect on performance. In terms of the model's robustness, the R-squared of the full model is only 1.6 percent. Meanwhile the R-squared of the aggressiveness model, risk behavior model, and decision making style model are 19 percent, 8 percent, and 18.4 percent, respectively, which confirms that the predictors are good enough to explain the model.

A normal day on the fourth experimental study confirmed the quasi rational behavior. Quasi rational means that irrational behavior was not present in all decision making. If there are no psychological biases such as sentiment or mood disturbance, the investors will remain rational (Thaler 1994). Indeed, it is in line with the utility equation function of the prospect theory which is addressed by Kahneman and Tversky (1979). The evaluation of choice can be rational and maximize utility, if the individual has not received any psychological sentiments. Daniel et al. (1998) documented the role of overreaction under uncertainty to momentum anomaly. They stated that if there are no psychological biases on the investor, the market will not experience under-reactions and over-reactions. Butler and Loomes (2002) and Nelson

and Bessler (2006) reached the same conclusion by using an experimental approach. The non-existence of the psychological biases means that the investor makes rational decisions. Hence, the fourth experimental study showed that without a full moon and a high temperature, the mood and the cognitive disarray of the investors did not affect the stock trading performance.

Theoretical Explanation for the Findings

The role of a high temperature and a full moon on the investors' moods and cognition, and how they affect the stock trading performance can be explained by examining 3 main theories which are: (1) the cognition process, (2) the affect infusion model, and (3) the psychologically biased decision making.

Cognition Process – In the cognition process, human senses are the media to capture incoming stimuli.[3] The stimuli could be high temperatures or the gravity of the full moon. For instance, the temperature on the day of the experiment was the highest in that week. The temperature affected the investors when they were outside (going to the office, having lunch, opening the curtains, etc). At that second, their senses (skin or eyes) captured the incoming stimuli and sent it to their nerves. The nerves encoded the stimulant (the effect of the temperature) as energy and transformed it to a perception. This perception went to their cognition process and was matched against previous experience (our memory would restore the cognition process and also keep it). During the decision making process, this memory affects the verdict

---

[3] Refers to Tvede, L. (2002). *The Psychology of Finance* (Revised ver.). John Wiley and Son for full explanation of the cognition process

and is based on emotions or feelings, which is how the temperature or the full moon might influence our behavior.

Affect Infusion Model – This model was proposed by Forgas (1995). It explains how the affection variables, such as a moon-induced mood or temperature-induced mood, affect (infuse) the decision making of an individual. For example, the full moon affects investors by gravity (direct access process). Then, the full moon generates biological disturbances in the human body (motivational process). The disturbances in the human physiological system lead to irrationality, which causes a heuristic bias (the heuristic process). Finally, the infusion inside the human being leads to a biased decision (the substantive process). In our results, a full moon influenced the investors' moods and cognitive disarray (direct access and motivational). Their mood and cognitive disarray influenced their aggressiveness, risk behavior, and decision making style (heuristic process). Eventually, it affected their stock trading performance (a proof of the substantive process). This AIM is one of the best models to explain how temperature or a full moon affects stock trading performance.

Psychologically Biased Decision Making/ABC Model – the psychology literature already shows how decision making is influenced by psychological factors (i.e. Janis and Mann 1977; Cunningham 1979; Daniel et al. 1998; Warneryd 2001; Slovic et al. 2004). This is what is called psychologically biased decision making. The best model to explain the relationship is Ellis' ABC Model. This model surmises the activating event (in our case a full moon and high temperature), influences core beliefs in decision making, and as a consequence, causes decision making to be biased. The easy way to understand Ellis' ABC model is by looking back at the prospect theory of Kahneman and Tversky (1979). The screening and evaluation process before making a decision are interrupted by an activating event such as a full moon or high temperature. Because of those two factors, the screening and evaluation process (the core belief) are influenced by these factors. As a result (the consequences), decision making is psychologically biased and results in irrational behavior. Forgas (1989), Forgas (1994), Kahneman et al. (1999), and Slovic et al. (2004) addressed the hedonic utility as the outcome of this psychologically biased decision making. Instead of being rational and maximizing the utility, the investors tend to use their feelings, sentiments, or moods when they are making a judgment or a decision. On a day when there is a full moon and/or a high temperature, the investors tend to be more aggressive, sentimental, or suffer from mood disorders. This eventually affects their stock trading performance through irrational judgments and decision making.

Conclusion

A lot of research on MI has suggested trading behavior as the explanation for this phenomenon. However, it has rarely been empirically investigated. Motivated by behavioral psychology, this paper has aimed to explore what determines MI. The examination was performed using the retroductive approach, while the method was a time series quasi experiment.

The investors were tested four times using the adopted psychometric test, and were assessed for their mood state, cognitive disarray, aggressiveness, risk behavior, decision making style, and stock trading performance. Before running the data, its reliability and validity were tested. It showed a satisfactory value of reliability and validity and

indirectly illustrated that the experimental study was good enough.

The results support our hypotheses. A full moon and a high temperature are the factors that can cause investor irrationality. On a day when there is only a full moon, it was only the investors' moods that influenced their stock trading through their decision making style. On a day when there was a high temperature, it was again only the investors' moods which influenced their stock trading performance through the decision making style. These two results demonstrate that if there is an external affection, investors might experience irrationality via mood disturbances.

Interestingly, when a full moon and high temperature co-existed, the mood disturbances and cognitive disarray influenced the stock trading performance through aggressiveness, risk behavior, and decision making style. In other words, the existence of two external factors can cause a bigger degree of irrationality. Investors might have mood disturbances and cognitive disarray, and these two variables encourage investors to be more aggressive, engage in high risk behavior, and deviant decision making. As a consequence, the stock trading performance was negative. When there was no moon or a normal temperature, the market was normal. There is no bias because of the mood state or cognitive disarray. The result concludes that without any external affection, the market might be normal.

In summary, a full moon phase and high temperature usually occur on Mondays. Those two variables are the drivers in making investors act irrationally; as without those variables, the market tends to be normal and the investors are more likely to be quasi rational. If there is no full moon or high temperature

(a normal day), investors make rational decisions in terms of their evaluation of information. However, if there is a full moon or a high temperature, or some other psychological biases, investors are irrational in their decision making. As a full moon occurs more often on Mondays, and the temperature is higher on average on Mondays, these two factors cause the MI. It infers that these two psychological biases are the determinants for MI. These results also show that the assumption of rational behavior can no longer be held as investors tend to have a quasi hedonic utility. External factors of human affections affect the rationality of investors on Mondays or whenever there is a high temperature or a full moon. Chugh and Bazerman (2007) addressed this bounded awareness as the cognitive deficiency. Investors are influenced by the psychological biases of the gravity of the moon and high temperatures.

The study gives an insight to investors of the drivers of MI, so this can be used as an early warning signal to beat the market by riding the seasonality. For example, investors or fund managers can beat the market by following the cycle of calendar anomalies. With regards to mastering the seasonality on Mondays, investors or fund managers need to refer to the stimuli of psychological biases, such as the moon's phase, temperature level, sentiments, and bad news. Having sophisticated investors aware of those stimuli, investors or fund managers can form their strategies accordingly. Additionally, the study reveals that in the equity analyst report, the report can include the moon's phase and current temperature on that day. Further study can be done by examining other psychological factors or other market anomalies using secondary data or experiments.

References

Abraham, A., and D. L. Ikenberry. 1994. The individual investor and the weekend effect. *The Journal of Financial and Quantitative Analysis* 29 (2): 263-277.

Angel, J. J., S.E. Christophe, and M. G. Ferri. 2003. A close look at short selling on Nasdaq. *Financial Analysts Journal* 59 (6): 66-74.

Allison, C. W., and J. Hayes. 1996. The cognitive style index: A measure of intuition-analysis for organizational research. *Journal of Management Studies* 33 (1): 119-135.

Barclay D. W., R. Thompson, and C. Higgins. 1995. The Partial Least Squares (PLS) approach to causal modeling: Personal computer adoption and use an illustration. *Technology Studies* 2 (2): 285–309.

Barr, W. 2000. Lunar revisited: The influence of the moon on mental health and quality of life. *Journal Psychosocial Nurse Mental Health Serice* 38 (5): 28-35

Basu, R., and J. M. Samet. 2002. Relation between elevated ambient temperature and mortality: A review of the epidemiologic evidence. *Epidemiologic Reviews* 24: 190-202.

Bell, D., and E. Levin. 1998. What causes intra-week regularities in stock returns? Some evidence from the UK. *Applied financial economics* 8 (4): 353-357.

Berument, H., and H. Kiymaz. 2001. The day of the week effect on stock market volatility. *Journal of Economics and Finance* 25 (2): 181-193.

Brahmana, R., C. W. Hooy, and Z. Ahmad. 2012a. Psychological factors on irrational financial decision making: The case of day-of-the week anomaly. *Humanomics* 28 (4): 236-257.

Brahmana, R., C. W. Hooy, and Z. Ahmad. 2012b. Weather, investor irrationality and day-of-the-week anomaly: case of Indonesia. *Journal of Bioeconomics* 14 (2): 129-146.

Brahmana, R., C. W. Hooy, and Z. Ahmad. 2014a. The role of weather on investors' monday irrationality: Insights from Malaysia. *Contemporary Economics* 8 (2): 175-190.

Brahmana, R., C. W. Hooy, and Z. Ahmad. 2014b. Moon phase effect on investor psychology and stock trading performance. *International Journal of Social Economics* 41 (3): 182-200.

Brahmana, R., C. W. Hooy, and Z. Ahmad. 2014c. Moon Phase as the cause of Monday irrationality: Case of Asean day of the week anomaly. *The International Journal of Economic Behavior-IJEB* 4 (1): 51-65.

Brahmana, R., C. W. Hooy, and Z. Ahmad. 2015. Does tropical weather condition affect investor behaviour? Case of the Indonesian stock market. *Global Business and Economics Review* 17 (2): 188-202.

Buss, A. H., and M. P. Perry. 1992. The aggression questionnaire. *Journal of Personality and Social Psychology* 63: 452-459.

Butler, D., and G. Loomes. 2002. Quasi rational search under incomplete information: Some evidence from experiments. *Manchester School* 65 (2): 127-144

Card, D., and B. P. McCall. 1996. Is workers' compensation covering uninsured medical cost? Evidence from the Monday effect. *Industrial and Labour Relation Review* 49 (4): 690-706.

Cella, D. F., P. B. Jacobsen, E. J. Orav, J. C. Holland, P. M. Silberfarb, and S. Rafla. 1987. A brief POMS measure of distress for cancer patients. *Journal of Chronic Diseases* 40 (10): 939-942.

Chen, H., and V. Singal. 2003. Role of speculative short sales in price formation: The case of the weekend effect. *The Journal of Finance* 58 (2): 685-706.

Chugh, D., and M. X. Bazerman. 2007. Bounded awareness: What you fail to see can hurt you. *Mind and Society* 6: 1-18

Clare, A. D., Z. Psaradakis, and S. H. Thomas. 1995. An analysis of seasonality in the U.K. equity market. *The Economic Journal* 105 (429): p. 398-409.

Compeau D. R., C. A. Higgins, S. Huff. 1999. Social cognitive theory and individual reactions to computing technology: A longitudinal-study. *MIS Quaterly* 23 (2):145–158.

Cunningham, M. R. 1979. Weather, mood and helping behaviour: Quasi-experiment with the sunshine samaritan. *Journal of Personality and Social Psychology* 37: 1947–1956.

Daniel, K., D. Hirshleifer, and A. Subrahmanyam. 1998. Investor psychology and security market under and over reaction. *Journal of Finance* 53 (6): 1839-1885.

Dewey, E. R. 1971. *Cycles: The Mysterious Forces that Trigger Events*. Foundation for the Study of Cycles, New York

Dichev, I. D., and T. D. Janes. 2003. Lunar cycle effects in stock returns. *Journal of Private Equity* 6 (Fall): 8–29.

Dobbins, J. G. 1982. A menstrual anomaly: Calendar cycling in a Malays population. *Medical Journal of Malaysia* 37 (3): 253-256.

Forgas, J. P. 1989. Moods effect on decision making strategies. *Australia Journal of Psychology* 41: 197-214.

Forgas, J. P. 1994. The role of emotion in social judgement: An introductory review and an affect infusion model. *European Journal of Social Psychology* 24: 1-24.

Forgas, J. P. 1995. Mood and judgment: The affect intrusion model. *Psychology Bulletin* 117: 39-66.

Fornell C., and D. F. Larcker. 1981. Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research* 18 (1): 39-50.

Forster, P. M. D. F., and S. Solomon. 2003. Observations of a "weekend effect" in diurnal temperature range. *Proceedings of the National Academy of Sciences* 100 (20): 11225-11230.

French, K. R. 1980. Stock returns and the weekend effect. *Journal of Financial Economics* 8: 55-69.

Gao, Q. 2009. *Lunar Phases Effect in Chinese Stock Returns. International Conference on Business Intelligence and Financial Engineering*. Beijing, China July 24-July 26

Gill, C. H. and P. L. Scharer. 1996. Why do they get it on Friday but misspell it on Monday? *Language Arts* 73 (2): 89-96

Goh, S. K., and K. N. Wong. 2011. Malaysia's outward FDI: The effects of market size and government policy. *Journal of Policy Modelling* 33:497–510.

Hair J. F., W. C. Black, B. J. Babin, and R. E. Anderson. 2010. *Multivariate Data Analysis*. Upper Saddle River: Prentice-Hall.

Hansen, A., P. Bi, M. Nitschke, P. Ryan. D. Pisaniello, and G. Tucker. 2008. The effect of heat waves on mental health in a temperate Australian city. *Environmental Health Perspective* 116 (10): 1369-1375.

Herbst, A. 2007. Lunacy in the stock market—What is the evidence? *Journal of Bioeconomics* 9: 1-18.

Hirshleifer, D., and T. Shumway. 2003. Good day sunshine: Stock returns and the weather. *The Journal of Finance* 58 (3): 1009-1032.

Hockey, G. R. J., A. John Maule, P. J. Clough, and L. Bdzola. 2000. Effects of negative mood states on risk in everyday decision making. *Cognition and Emotion* 14 (6): 823-855.

Howarth, E., and M. S. Hoffman. 1984. A multidimensional approach to the relationship between mood and weather. *British Journal of Psychology* 75 (1): 15-23.

Isen, A. M., and N. Geva. 1987. The influence of positive effects on acceptable levels of risk: The person with a large canoe has a large worry. *Organization Behaviour and Human Decision Process* 39: 145-154

Isen, A. M., T. E. Shalker, M. Clark, and L. Karp. 1978. Affect, accessibility of material in memory and behavior: A cognitive loop? *Journal of Personality and Social Psychology* 36: 1-12.

Janis, I. L., and L. Mann. 1977. *Decision Making: A Psychological Analysis of Conflict, Choice, and Commitment*. New York: Free Press

Kahneman, D., and A. Tversky. 1979. Prospect theory: An analysis of decision under risk. *Econometrica* 47: 263-292.

Kahneman, D., E. Diener, and N. Schwartz. 1999. *Well Being: The Foundation of Hedonic Psychology*. New York: Russel Sage Foundation

Kamstra, M. J., A. K. Lisa, and D. L. Maurice. 2000. Winter blues: Seasonal affective disorder (SAD): The January effect, and stock market returns. *Working Paper*.

Kane, F. J., R. J. Daly, J. A. Ewing, and M. H. Keeler. 1967. Mood and behavioural changes with progestational agents. *The British Journal of Psychiatry* 113 (496): 265-268.

Koeske, G. F., S. A. Kirk, R. D. Koeske, and M. B. Rauktis. 1994. Measuring the Monday blues: Validation of the job satisfaction scale for the human services. *Social Work Research* 18 (1): 27-35

Kovats, R. S., and L. K. Ebie. 2006. Heatwaves and public health in Europe. *The European Journal of Public Health* 16 (6): 592-599.

Krämer, W., and R. Runde. 1997. Stocks and the weather: An exercise in data mining or yet another capital market anomaly? *Empirical Economics* 22: 637-641.

Krebs, D., and R. Blackman. 1999. *Psychology: A First Encounter*. New Jersey: Harcourt College Pub.

Lai, M. M., K. L. T. Low, and M-L. Lai. 2010. Are Malaysian investors rational? *Journal of Psychology and Financial Market* 2 (4): 210-215

.Lieber, A. L., 1978. *The Lunar Effect*. Garden City, NY: Doubleday

Lim, S. Y., and R. C. J. Chia. 2010. Stock market calendar anomalies: Evidence from ASEAN-5 stock markets. *Economics Bulletin* 30: 996-1005.

Lim, S. Y., C. M. Ho, and B. E. Dollery. 2010. An empirical analysis of calendar anomalies in the Malaysian stock market. *Applied Financial Economics* 20: 255-264.

Lucey, B. M., and M. Dowling. 2005. The role of feelings in decision making. *Journal of Economics Survey* 19 (2): 211-231.

McNair, D., M. Lorr, and L. Droppleman. 1989. *Profile of Mood States*.

Muhammad. N. M. N., and N. Ismail. 2008. Investment decision behaviour: Are investors rational or irrational. *Proceeding of East Coast Economic Region Development Conference* (15-17 December 2008), Kota Bharu, Kelantan.

Muvakami, S., K. Otsuka, Y. Kubo, M. Shinagawa, T. Yamanaka, S. Ohkawa, and Y. Kitaura. 2004. Repeated ambulatory monitoring reveals a Monday morning surge in blood pressure in a communally-dwelling population. *American Journal of Hypertension* 17: 1179-1183

Nelson, R. G., and D. A. Bessler. 2006. Quasi rational: Experimental evidence. *Journal of Forecasting* 11 (2): 141-156.

Nunnally J., and I. Berstein. 1994. *Psychometric Theory*. New York: McGraw-Hill.

Pardo, A., and E. Valor. 2003. Spanish stock returns: Where is the weather effect? *European Financial Management* 9 (1): 117-126.

Saunders, Jr, E. M. 1993. Stock prices and Wall Street weather. *The American Economic Review* 83 (5) (Dec): 1337-1345.

Schwarz, N., and G. L. Clore. 1983. Mood, misattribution, and judgment of well-being: Informative and directive function of affective States. *Journal of Personality and Social Psychology* 45 (3): 513-523.

Sekaran, U., and R. Bougie. 2010. Research methods for business: A skill building approach. Wiley, UK.

Shefrin, H. and M. Statman. 1985. The disposition to sell winners too early and ride losers too long: Theory and evidence. *The Journal of Finance* 40 (3): 777-790.

Slovic, P. 1999. Perceived risk, trust, and democracy. In G. Cvetkovich and R. E. Lofstedt (Eds). *Social Trust and Management of Risk* (pp.42-52). London: Earthscan

Slovic, P., M. L. Finucane, E. Peters, and D. MacGregor. 2004. Risk as analysis and risk as feelings: some thoughts about affect, reason, risk, and rationality. *Risk Analysis* 24: 311-322.

Thaler, R. 1994. *Quasi Rational Economics*. Russel Sage Foundation.

Trombley, M. A. 1997. Stock prices and Wall Street weather: Additional evidence. *Quarterly Journal of Business and Economics* 36: 11–21.

Tvede, L. 2002. *The Psychology of Finance* (Revised ed.). John Wiley and Son.

Tversky, A., and D. Kahneman. 1992. Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and uncertainty* 5 (4): 297-323.

Viale, R. 2008. Cognitive constraints of economic rationality. In Simon, H. A., M. Egidi, R. Viale, and R. L. Marris (Eds.), *Economics, Bounded Rationality, and the Cognitive Revolution* (pp. 174-181). Cheltenham: Edward Elgar Publishing

Warneryd, K. E. 2001. *Stock Market Psychology: How People Value and Trade Stock*. Edward Elgar Publishing.

Wilkinson, G. 1997. Lunar cycle and consultation for anxiety and depression in general practice. *International Journal of Social Psychiatry* 43 (1): 29-34.

Willich, S. N., H. Lowel, M. Lewis, A. Hormann, H. R. Arntz, and U. Keil. 1994. Weekly variation of acute myocardial infarction, increased Monday risk in the working population. *Journal of America Heart Association*, 90, 87-93

Wong, K. A., T. H. Hui, and C. Y. Chan. 1992. Day of the week effects: Evidence from developing stock markets. *Applied Financial Economics* 2 (1): 49-56.

Wong, W-C., and M-M. Lai. 2009. Investor behaviour and decision making style: A Malaysian perspective. *Bankers Journal Malaysia* 133: 3-13.

Yuan, K., L. Zheng, and Q. Zhu. 2006. Are investor moonstruck? Lunar phases and stock returns. *Journal of Empirical Finance* 1 (3): 1-23.
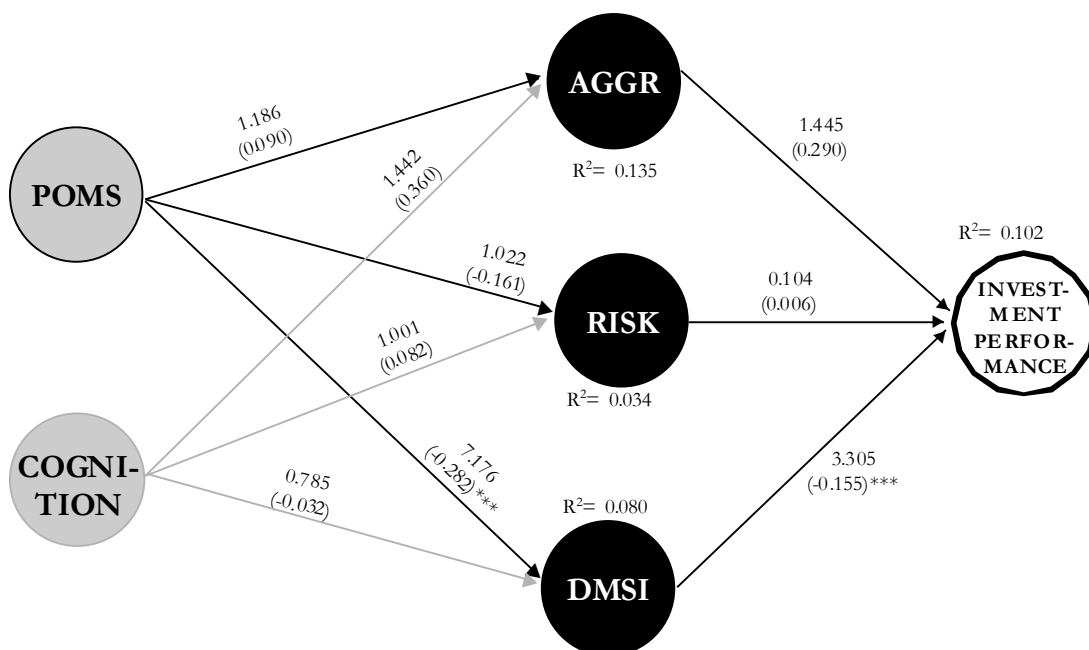
Appendix 1

1. The moon's phase cannot be seen during the day, it is not because there is no moon during the day, it is because sunlight is much brighter than the moon's reflected light, so it cannot be seen by the naked eye.

Phase	Visibility	Standard Time of Culmination (Mid-Phase)
New moon	after sunset	12 Noon
Waxing crescent moon	afternoon and post-dusk	3 PM
First quarter moon	afternoon and early night	6 PM
Waxing gibbous moon	late afternoon and most of night	9 PM
Full moon	sunset to sunrise (all night)	12 midnight
Waning gibbous moon	most of night and early morning	3 AM
Third (last) quarter moon	late night and morning	6 AM
Waning crescent moon	pre-dawn and morning	9 AM
Dark moon	before sunrise	12 noon

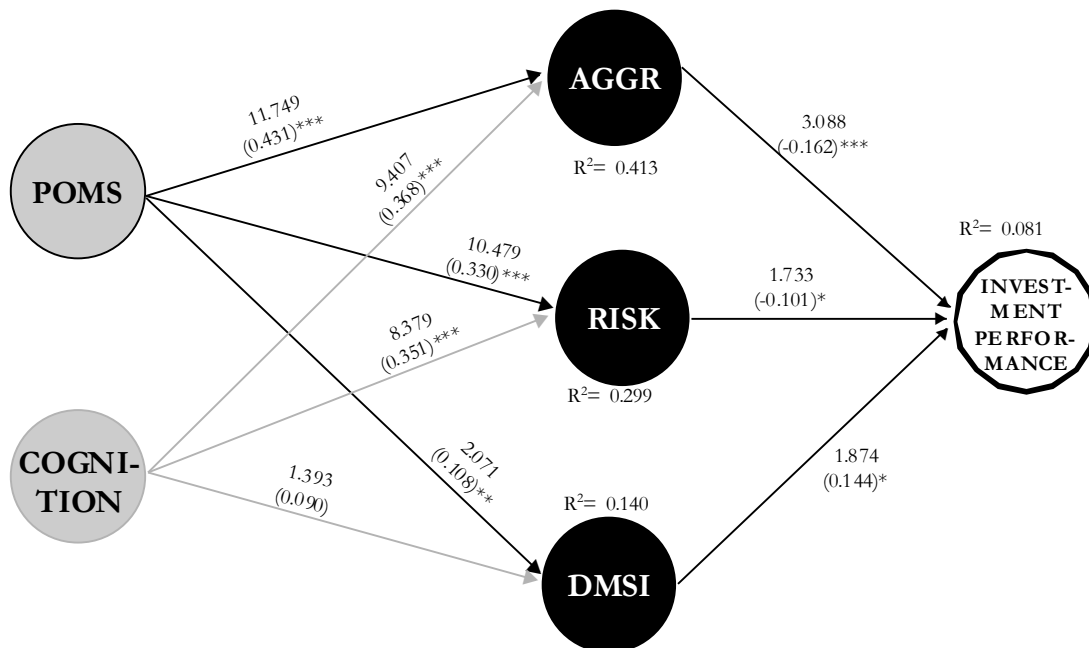2. The psychometric test is available upon request

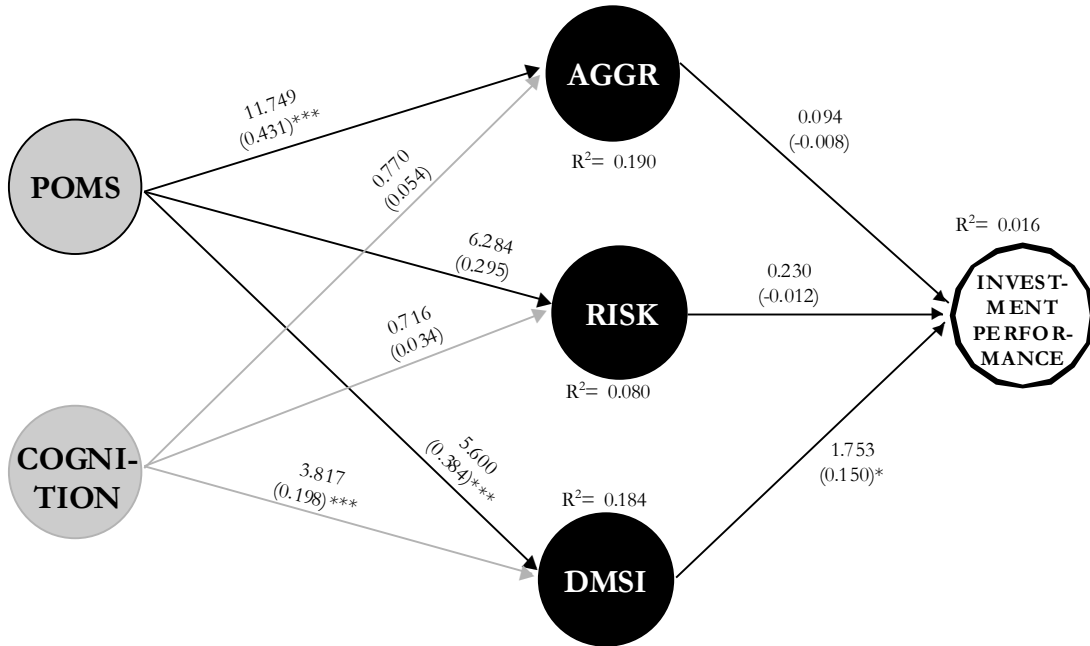### Appendix 2. The Results of Experimental Study 1

Appendix 3. The Results of Experimental Study 2
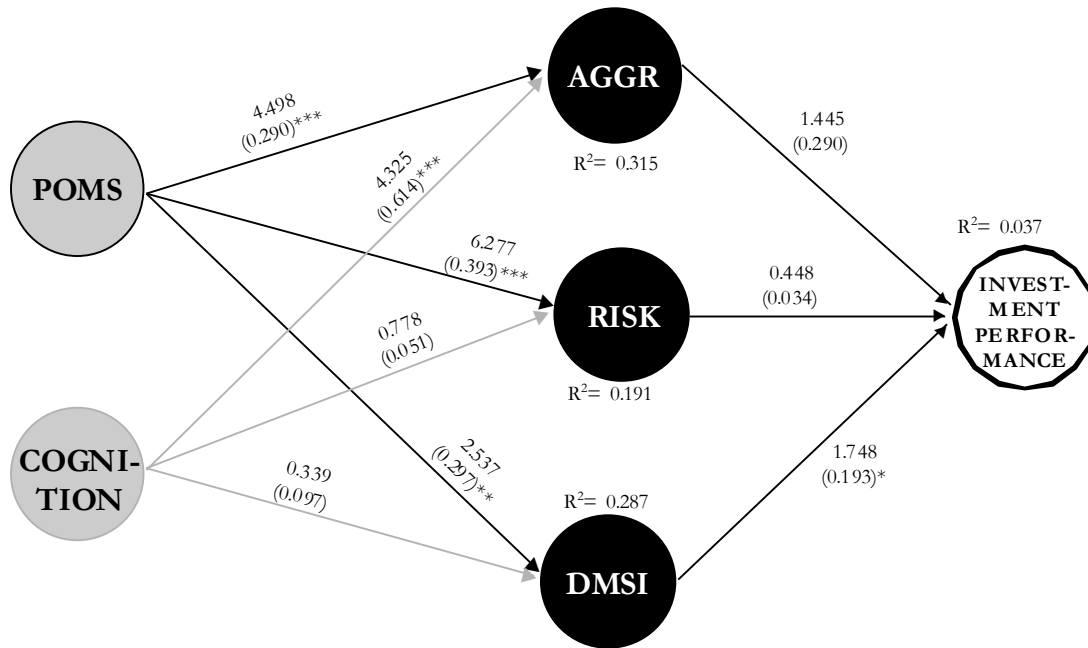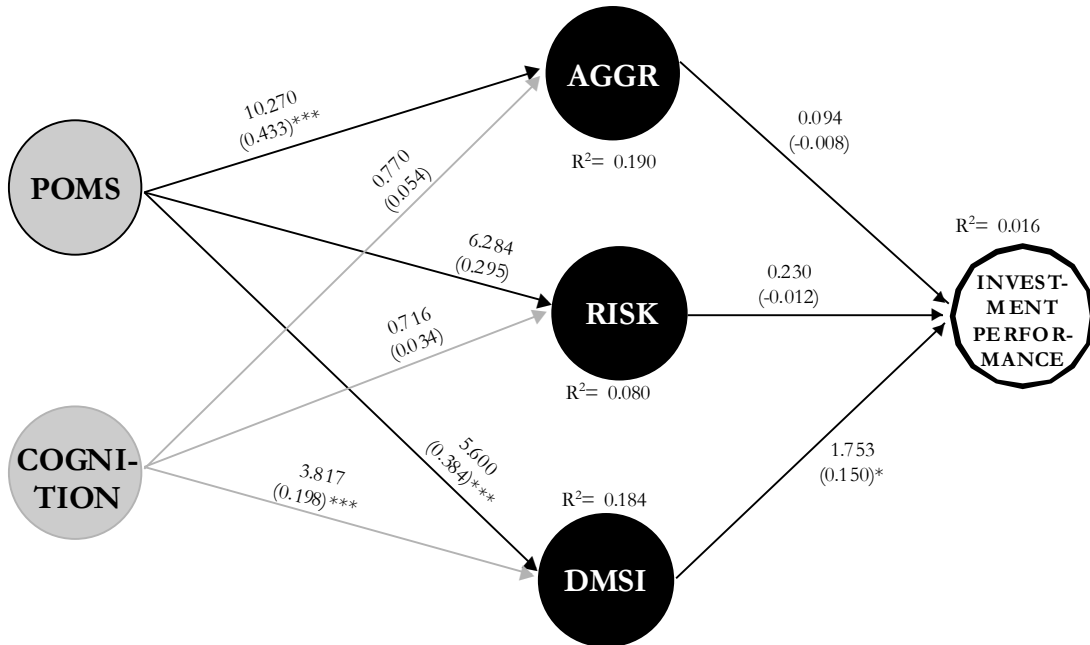

Appendix 4. The Results of Experimental Study 3

Appendix 5. The Results of Experimental Study 4

Appendix 6. The Results of Experimental Study 5

Note: POMS is Profile of Mood State, Cognition is Cognition Disarray. AGGR is Aggresiveness, Risk is Risk behaviour, DMSI is the decision making style, and investment performance is the stock trading performance. Value without parenthesis is the T-Statistic value. Value inside the parenthesis is the beta value. *, **, *** means it is significant at a 1%, 5%, and 10% level, respectively