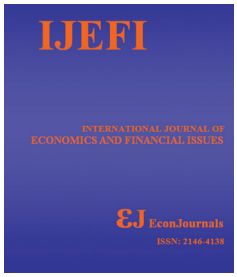

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How People Apply Mental Accounting Philosophy to Investment Risk?

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ABSTRACT

In this article, the authors discuss the theme of mental accounting, which is the combination of psychology and finance. It suggests that the investment portfolio should be determined by the investors risk appetite and profitability preference. Not all investors want to take risks to obtain profits, and not all investors will give up their profits (or for sake their profits) because they are afraid of risks. Investors are different, AS they make decisions according to their own risk and return profiles. Unlike the traditional CAPM theory, we consider that risk and return portfolios have different levels in line with the investors' mental accounts of risk and profits to meet their investment expectations. Investors will carry out investment activities only when their psychological needs are met.

Keywords: Mental Accounting, Investors Risk Appetite, Risk Coefficient β (BETA) , Return Investment Portfolio
JEL Classifications: B26, F39, G02

1. THE CONCEPT OF MENTAL ACCOUNTING

In 1980, Richard Thalar, a famous psychologist at the University of Chicago, mentioned the concept of "Mental Accounting" in his article entitled "Using Mental Accounting in a Theory of Consumer Behavior" (Thalar, 1983) for the first time. In this article, he used mental accounting to analyze consumer behavior. Mental Accounting (Thalar, 1999) is a cognitive operating system of an individual, family or organization related to how important they find economic activities, encode and evaluate them, or it can be considered as a cognitive form of bookkeeping that can be used to track their record of income and cost. The essence of mental accounting is a narrow frame (Barberis and Huang, 2008), which allows people to utilize the limited brain resource to control or manage all transactions more efficiently. When people calculate value, they have to determine a reference point of value, and different decision making trees result in different reference points. At the same time, people evaluate profit and loss with different value curves: The value curve of profit is convex and the value curve of losses is concave, so this forms a S-shaped curve (Boretos, 2012). In summary, mental accounting is a kind of management where people manage their wealth in separate accounts unconsciously and psychologically. Every mental account has its own booking methods and psychological arithmetic rules. Thalar stated that people calculate their gains or losses in each mental account as an evaluation of their decisions and choices. In this process, people do mental accounting arithmetic not to pursue a rational maximized cognition of utility (Mathis and Steffen, 2015), but to pursue maximization of emotional satisfaction. Emotional experience plays an important role in people's decision making process.

2. THE APPLICATION OF PSYCHOLOGICAL ACCOUNT FACTORS IN PERSONAL VENTURE CAPITAL

In this paper, we will discuss the impact of mental accounting on personal investment risk, which plays an important role in personal financial investment. Before examining the correlation between individual mental accounts and their venture capital, we set up a test (Xihua Security, 2013) that is commonly used in financial institutions to assess the client risk appetite (Pareek, 2013),

which evaluates the investor's investment preferences from several perspectives such as age, profession, income, family status, home ownership, investment objective, loss tolerance and profit preference. In order to illustrate that mental accounting really does exist, we found a fund manager, and he helped us to make his customers do an experiment. In order to understand the investors' risk appetite preferences, we asked his clients to do a risk investment test (Appendix), which included eight questions related to the investors personal condition, family status, income, asset status, investment preferences, etc., each question had 4 or 5 options, the options scored 0-10 points, the final score was added as a total score. The investors who had a total score <30 points were classified as conservative investors - Type A, 30-60 points were stable investors - Type B and more than 60 points were aggressive investors - Type C.

We designed two simulated investment environments as a bull market and a bear market and designed three stocks had significant difference in return rate and volatility for each of these two environments.

In the bull market simulated investment environment, we designed a portfolio of low return (RE) and low risk (VAR) for conservative Investor A, and a high return and high risk portfolio for aggressive Investor C. As a comparative sample, we applied the same investment portfolio of Investor C for the stable Investor B to observe the differences between the stable investors and the aggressive investors (Table 1).

In the bear market simulated investment environment, we designed a portfolio of low loss (RE) for conservative Investor A and a high loss portfolio for aggressive Investor C. As a comparative sample, we applied the same investment portfolio of Investor C for the stable/rational Investor B to observe the differences between stable investors and aggressive investors (Table 2). In this process, there is a small difference between the portfolio with a low loss rate (−1.06%) and the portfolio with a high loss rate (−2.00%), but their risk volatility is conservative. It means that in a bear market, the lower the loss is, the higher the risk is.

In the bull market, three types of investors had the same initial capital (10,000 euro). At the beginning, they could allocate the proportion of the fund among the three stocks of their investment portfolio. In the entire 10 day investment period, they could change the allocation of their investment at any time, for example, they were free to change the proportion of their investment funds or to end their investment experiment. At the bear market stage, the investors were told they were in a bear market, and they had the option of choosing whether or not to invest their initial funds. Their initial funds could be 10,000 Euro, plus their earnings at the Bull market stage. The investment process was the same for the bull market. Because of the portfolio design could be personalized, instead of using an average level of sample data as a reference, we only selected three investors of different types to make examples.

2.1. Investors Investment Decision Making in the Bull Market Environment

As the initial decision, Investor A (Table 3) allocated his investment fund of 10,000 Euro in a portfolio of 25% - Stock 1, 50% - Stock 2 and 25% - Stock 3. At the beginning, Investor A tended to allocate his funds to the stock with a higher return (Stock 2). The next day, he thought: "I earned a lot of money by making the right decision." The 4th day, he said "I lost money." Even if his portfolio was still profitable compared to his initial position, because of the stock price, he was sensitive of the loss due to the stock price drop. On the 5th day, he sold 25% of Stock 2 and transferred this part of his funds to invest in Stock 3 which was more stable. On the 8th day, he sold all his Stock 2 and transferred the funds to invest in Stock 1. This behavior showed that after earning a higher profit, Investor A tended to set out the profit and did not want to wait for higher profits of Stock 2, as he expected, the Stock 2 had reached its upper limit at this moment. He believed that there was a possible decrease of Stock 2. On the 10th day, Investor A finished his experiment of investing in the bull market and earned a 27% profit.

As in the initial decision, Investor B (Table 3) allocated his investment fund 10,000 Euro to a portfolio of 35% - Stock 1, 40% - Stock 2 and 25% - Stock 3. The 3rd day, Investor B was glad and said: "I earned a lot of money." On the 5th day, Investor B sold all of Stock 1. Because the price of Stock 1 had increased to the upper limit of his expectations and realized a leap in price at this moment, he believed that its price might fall, so he decided to sell all of Stock 1. On the 6th day, because the price of Stock 1 had increased to the upper limit of his expectations and realized a leap in price at this moment, he believed that its price might fall, so he decided to sell all of Stock 3. On the 7th day, Investor B finished his experiment of investing in the bull market and earned 29.5% in profit. He felt very happy about his earnings. When the portfolio

Table 1: Average return rates and volatilities of six selected stocks in bull market

Bull market	RE equity 1 (%)	VAR equity 1	RE equity 2 (%)	VAR equity 2	RE equity 3 (%)	VAR equity 3	RE portfolio (%)	VAR portfolio
Investor A	2.9	0.0027	1.6	0.0020	0.1	0.0004	0.6	0.0014
Investor B	14.1	0.0760	0.9	0.0020	0.3	<0.0001	5.1	0.0283
Investor C	14.1	0.0760	0.9	0.0020	0.3	<0.0001	5.1	0.0283

Table 2: Average return rates and volatilities of six selected stocks in bear market

Bear market	RE equity 1 (%)	VAR equity 1	RE equity 2 (%)	VAR equity 2	RE equity 3 (%)	VAR equity 3	RE portfolio (%)	VAR portfolio
Investor A	−5.6	0.0598	1.4	0.0011	1.1	0.0002	−1.1	0.0199
Investor B	−5.6	0.0598	1.4	0.0011	1.1	0.0002	−1.1	0.0199
Investor C	−5.6	0.0260	−0.4	0.0030	<0.01	<0.0001	−2.0	0.0096

profit exceeded his expectation, he felt enough psychological satisfaction, and did not want to suffer the risk of future losses, no longer looked forward to more future earnings. Therefore he chose to end his experiment in the simulated bull market before the entire experiment period ended (10 days).

As in the initial decision, Investor C (Table 3) allocated his investment fund of 10,000 Euro to a portfolio of 25% - Stock 1, 25% - Stock 2 and 50% - Stock 3. At the beginning, Investor A tended to allocate his funds to stock with low prices (Stock 3). The 3rd day, he was excited and said: "I earned a lot of money because I never invested in high price stock before." The 4th day, he thought that the price of Stock 2 had high volatility, so he believed that its price would continuously increased. He sold 15% of Stock 3 and invested its income in Stock 2. On the 5th day, the price of Stock 1 increased significantly and Investor C earned a lot of benefits, so he decided to sell all of Stock 1. On the 6th day, he thought the Stock 2 was stable, so he invested all his income from Stock 1 in Stock 2. On the 8th day, he sold all of his Stocks 1 and 2, and only held Stock 3. When the portfolio profit reached his expectations, he preferred to invest his fund in stable stocks to obtain stable future profits. On the 10th day, Investor B finished his experiment of investing in the bull market and earned 116% in profits.

Comparing mental accounts and behaviors among these three investors, during the 10 day experiment period, we noticed that from Investor A to Investor C, conservative Investor A changed his portfolio 3 times. Stable Investor B changed his portfolio 4 times and aggressive Investor C changed his portfolio 5 times. Their frequencies of adjusting investment portfolio increased. This result is in line with the results of their risk appetite test. Investor A, after gaining a certain amount of profits, tended to hold a stable stock. For him, profit is not the main objective, but loss prevention is. Although Investor B adjusted his portfolio several times, he is more prone to stopping investing after obtaining an expected return. He save up from the investment activity to avoid future profits and losses completely. Investor C was the most aggressive investor who had the highest expectation of profits. On one hand, after gaining a higher return, he prefers to continue holding a fraction of the high volatility stock, but did not sell all of them like Investor B. He still expected to continuously get more future returns. On the other hand, Investor C also had a rational behavior. After obtaining higher returns, he focused on his investment funds with stable stock. On one hand, he tried to avoid future risk, while he was greedy for more future profits. He decided a lower risk tolerance limit and modified his portfolio with this new limit.

2.2. Investors Investment Decision Making in the Bear Market Environment

Conservative Investor A (Table 4) decided to save profits that he earned from the bear market and only invested 10,000 Euro in initial funds in the bear market. In the initial decision, Investor A allocated his investment fund of 10,000 Euro in a portfolio of 25% - Stock 1, 25% - Stock 2 and 50% - Stock 3. In the bear market, Investor A took a prudent position, so he separated his previous income and initial fund into different mental accounts. Here we have a real example of the mental accounting application. Due to being afraid of losses, he only used the initial fund that was not his money to invest and he preferred to invest in low price stock (Stock 3). On the 3rd day, Investor A sold all of Stock 1 and used this fund to invest in Stock 3, which indicated that he was inclined to invest in stable stock. On the 4th day, he said to himself "My decision was really good, I only lost a little money." On the 5th day, Investor A sold all of Stock 2 and invested this part of fund to Stock 1, because he believed that Stock 1 still had probability of increasing. On the 6th day, he sold all of Stock 1 and invested its income in Stock 3. After obtaining more profits, he tended to hold more stable stock. On the 7th day, he thought "The price of stock 1 is still rising, but it is wise that I sold Stock 2." On the 9th day, he said "This is really good, because my Stock 3 is earning profits." It is easy to see that Investor A has a strong risk aversion and he is very satisfied with his risk averse behavior. On the 10th day, Investor A finished his experiment of investing in the bear market and earned 13% in profit.

As in the initial decision, Investor B (Table 4) allocated his investment fund of 10,000 euro in a portfolio of 30% - Stock 1, 30% - Stock 2 and 40% - Stock 3. Unlike Investor A, Investor B was willing to reinvest the profits that he earned in the previous period, which showed that he did not separate earnings from the

Table 3: Investors transaction decisions in bull market

Bull market enviornment											
Investor A	**Equity 1**	**Equity 2**	**Equity 3**	**Investor B**	**Equity 1**	**Equity 2**	**Equity 3**	**Investor C**	**Equity 1**	**Equity 2**	**Equity 3**
% investment	25	50	25	% investment	35	40	25	% investment	25	25	50
Day 1	11.5	23.4	11.2	Day 1	306.0	83.2	7.0	Day 1	306.0	83.2	7.0
Day 2	12.6	25.7	11.4	Day 2	309.8	84.0	9.3	Day 2	309.8	84.0	9.3
Day 3	13.6	27.2	11.4	Day 3	320.0	84.1	8.5	Day 3	320.0	84.1	8.5
Day 4	13.4	26.7	11.9	Day 4	334.0	85.1	9.5	Day 4	334.0	85.1	9.5
								% investment	25%	40%	35%
Day 5	12.9	25.7	11.9	Day 5	363.2	85.0	9.5	Day 5	363.2	85.0	9.5
% investment	25	25	50	% investment	0	40	25	% investment	19	30	26
Day 6	12.8	26.0	11.6	Day 6	331.3	85.0	12.8	Day 6	331.3	85.0	12.8
				% investment	0	40	0	% investment	19	55	26
Day 7	12.0	27.3	11.6	Day 7	326.5	88.6	27.5	Day 7	326.5	88.6	27.5
				% investment	0	0	0				
Day 8	12.5	29.7	11.4	Day 8	322.3	89.8	28.3	Day 8	322.3	89.8	28.3
% investment	50	0	50					% investment	0	55	0
Day 9	13.2	30.2	11.4	Day 9	320.5	91.1	25.8	Day 9	320.5	91.1	25.8
Day 10	13.2	30.2	11.3	Day 10	314.8	90.3	25.0	Day 10	314.8	90.3	25.0

Table 4: Investors transaction decisions in bear market

Bear market enviornment											
Investor A	**Equity 1**	**Equity 2**	**Equity 3**	**Investor B**	**Equity 1**	**Equity 2**	**Equity 3**	**Investor C**	**Equity 1**	**Equity 2**	**Equity 3**
% investment	25	25	50	% investment	30	30	40	% investment	25	50	25
Day 1	14.1	19.3	4.7	Day 1	14.1	19.3	4.7	Day 1	71.7	5.8	192.8
Day 2	14.9	20.2	4.9	Day 2	14.9	20.2	4.9	Day 2	71.6	6.1	203.2
Day 3	15.3	20.2	5.0	Day 3	15.3	20.2	5.0	Day 3	71.6	5.8	198.0
% investment	0	25	75	% investment	45	0	55				
Day 4	15.0	19.9	5.0	Day 4	15.0	19.9	5.0	Day 4	71.6	5.7	188.5
								% investment	50	50	0
Day 5	14.8	20.2	5.0	Day 5	14.8	20.2	5.0	Day 5	71.5	3.6	183.3
% investment	25	0	75								
Day 6	16.2	20.1	5.0	Day 6	16.2	20.1	5.0	Day 6	71.6	3.9	203.0
% investment	0	0	75	% investment	0	0	0				
Day 7	16.7	19.7	5.1					Day 7	71.7	3.8	206.8
								% investment	100	0	0
Day 8	16.9	21.5	5.1					Day 8	71.6	3.6	202.7
Day 9	8.4	21.6	5.2					Day 9	71.6	3.3	195.1
								% investment	0	0	100
Day 10	8.5	21.8	5.2					Day 10	71.5	3.5	186.4

initial investment capital. He put them together into the same mental account. The next day, he thought "I know that I am in a bear market. Even if I want to sell the stock, I'd prefer to keep them at this moment." It means that Investor B was not optimistic about the risk in a bear market, but he was still willing to take a certain risk and continued to wait for the stock price changes. On the 3rd day, he sold all of Stock 2, and invested these funds equally in Stocks 1 and 3. The price of Stock 2 did not change, but Stocks 1 and 3 kept increasing, so he decided to pursue higher profits, even if he knew that a risk existed. On the 6th day, he sold all of his stocks, ending the bear market simulated environment investment experiment before the end of the 10 day period and earned 44% in profit.

As in the initial decision, Investor C (Table 4) allocated his investment fund of 10,000 euro in a portfolio of 25% - Stock 1, 55% - Stock 2 and 25% - Stock 3. Unlike Investor A, Investor C was willing to reinvest the profits that he earned in the previous period, which showed that he did not separate earnings from the initial investment capital, and he put them together into the same mental account. The same as in the previous experiment, in the bear market, Investor C still tended to allocate his funds to the low price Stock 2. On the 4th day, he sold all of Stock 3 and invested his income in Stock 1. When he suffered a loss, he immediately sold the declining stock and invested his fund in stable stock. This behavior indicated that Investor C has a keenness for risk aversion. On the 7th day, he sold all of Stock 2 and invested its fund in Stock 1, which demonstrated his attitude of seeking stability. On the 9th day, he sold all of Stock 1 and used all his money to invest in Stock 3. This behavior reflected his strong speculation in Stock 3. Because of the high volatility of Stock 3, he believed that it had a great probability of rebounding, the price of Stock 3 could rise. On the 10th day, Investor C finished his experiment of investing in the bear market and had a 49% loss.

Comparing mental account and behavior among these three investors, during the 10 day experiment period, we noticed that from Investor A to Investor C, conservative Investor A changed his portfolio 3 times, stable Investor B changed 2 times and aggressive Investor C changed 3 times. Their frequencies of adjusting investment portfolio were similar. In the process of investment adjustment, all of them showed risk aversion (Brandouy et al., 2012) behaviors. In the bear market, all of them were cautious and had a prudent attitude. They did not want to trade stock frequently. Only Investor C took a high investment risk. At the final stage of his investment, he took a desperate attitude and hope of reversing the situation in order to obtain profits by using speculative behavior. Regardless of the degree of risk appetite, these three investors had similar behaviors. In the bull market, their trading frequency was more than in the bear market, which indicated that they were risk averse. However, it is worth mentioning that the conservative investor had more risk aversion, and he divided the profit in his mental account and a loss mental account more specifically. Meanwhile, he was less confident with his judgment. When he made wrong decisions, he tended to seek self-comfort. On the contrary, Investor C was willing to take higher risks because he wished to get higher returns, even if he was aware of the high risk of stock price drop. To pursue higher profits, he accepted taking higher risks and used it to validate his investment decisions. At the same time, the aggressive Investor C was overconfident of his ability to predict future stock price. In summary, the stable investor always maintained consistent attitude, as much as possible in order to obtain benefits while avoiding losses. Once profits reached his expectations, he immediately terminated the investment activity. He was not willing to take more risk and did not expect higher future returns. To summarize, when we design investment portfolios, we must take into account the psychological factors on the impact of investment decisions, and design suitable investment portfolios tailored to investors risk appetite and mental accounts.

The example of these three investors illustrated the importance of risks and profits in investors mental accounting. Despite the bull market having an obvious incremental tendency, conservative investors were still reluctant to take risks, even if they would rather not give up high profits. The Bear market has an obvious declining trend, and aggressive investors ignored high risk to pursue more returns. This showed that the investors mental accounts played a decisive role in their decision making, even more significant than the real investment market situation.

2.3. Designing Investment Portfolios Based on Mental Accounting

In the previous phase, we learned that different investors may make different investment decisions, as they have different investment risk preferences, and they may evaluate the same risk or the same profit in different ways. Before designing an investment portfolio, we need to understand our investors risk appetite (Pareek, 2013), and design a suitable portfolio according to their investment profile, which can reduce investors to make irrational decisions. When investors make investment decisions, they always have a future expected return, but a gap exists between their expectations and the real return. The real return could be higher or lower than their expectations, or it could even be a loss. All these possibilities can be considered as the investment risk, in other words, we can call it uncertainty in investment income.

2.3.1. Risk assessment - BETA coefficient

Markowitz, the founder of modern theory, first proposed the mean-variance model of portfolios in 1952, and 12 years later economists put forward the capital asset pricing theory (Steinbach and Markowitz, 2001), which has always improved this theory in the entire economic field. The beta (β) coefficient (Swensen, 2015) is a measure of systemic risk of security investments that measures the volatility of a security portfolio as an investment portfolio and is relative to the overall market. The β coefficient is one of the most important indicators for measuring structural and systemic risk. The real meaning of this factor is for measuring their investment portfolios volatility of individual assets and comparing them with overall market assets. It reflects the performance of an investment which is relative to the broader market level. When people have great confidence (Meier, 2016) to predict in a bull market, or a broader market does not have an increasing trend, they should choose stocks with a high β. Because that will bring higher returns than the average market return. The larger the absolute value has β, the greater the magnitude of the change in returns that is relative to the broader market; the smaller the absolute value has β, the smaller the change in the magnitude of change in returns relative to the broader market is. If β is 1, the market average price rises by 10%, the individual stock price rises by 10%; the market average price drops by 10%, and the individual stock price falls by 10% correspondingly. If β is 1.1, the individual stock price goes up by 11% when the average market price goes up by 10%, and the individual stock price goes down by 11% when the average market price goes down by 10%. If β is 0.9, the individual stock price goes up by 9% when the average market price goes up by 10% and the individual stock price goes down by 9% when the average market price goes down by 10%.

The β factor in the income approach should be the β factor which represents the future price. Havavini and Schatzberg (Corrado and Schztzberg, 2011) have shown that the multiplication method may be invalid if a β is calculated using daily return data, because the yield distribution is broad-tailed with respect to a normal distribution. Here we used the market daily return and individual daily return rate to calculate the risk factor β_i for individual stocks (Formula 1).

$$\beta_i = \frac{Cov(Re_i, Re_M)}{Var(Re_M)} = \frac{\sigma_{iM}}{\sigma_{MM}} \quad (1)$$

Re_i - Daily return of individual stock i
Re_M - Daily return of the market
Cov (Re_i, Re_M) - Covariance of individual daily return and the market return
Var (Re_i, Re_M) - Variance of individual daily return and the market return.

Because of the great impact of the investors risk appetite and expected return, we decided to do a further investigation of the historical return and β factor. The financial crisis of 2007 had done great damage to the global economy, so European stock markets have had high volatility in the past few years (Slimane et al., 2013). To reduce the effect of financial crisis, we chose a data set of all 600 companies of EUROSTAXX 600 index with a period of 2 years (2013-2014) (Figure 1). Figure 1 was the monthly accumulative return of these 600 companies from 1st January 2012 to 31st December 2014. It is easy to see from the figure that the European stock market has presented a stable increasing trend since 2013. The reason why we chose these 2 years as an observed period was that we tried to use a data set which could represent the real situation of listed companies after the financial crisis. Traditional financial investment theory believes that the investment risk and the investment return are positively related, the higher the is, the higher the expected returns or losses will be. And the lower the BETA is, the lower the expected returns or losses will be (Censizoglu and Reeves, 2013). Through the example of our three investors, we discovered that the investors investment profile was not totally related with the investment risk or expected return. Investor A preferred to give up more profits to avoid risk, but Investor C ignored risk to pursue more probable returns. From the perspective of a professional advisor, we hope that conservative investors will not give up profits because of the fact that they are afraid of risk and we also do not want our aggressive investors to take risks of losing more money. So we ask ourselves, is there an optimized portfolio which has both higher returns and lower risk?

In this experiment, we calculated the average daily return rate (Formula 2) of all 600 companies of the EUROSTAXX 600 index during 2013-2014 and we also calculated the BETA factor for each of these 600 companies with their daily return during these 2 years.

$$Re_i = \sum_{1}^{N} \ln\left(\frac{P_t}{P_{t-1}}\right) \quad (2)$$

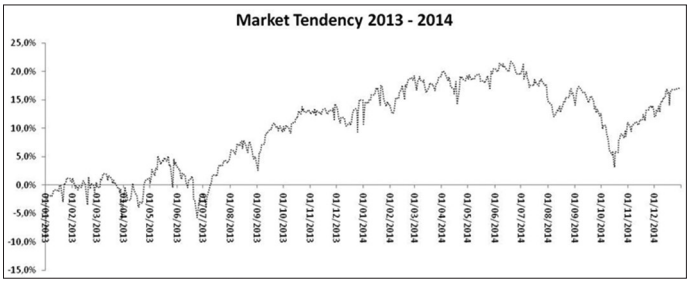
Re_i - Average daily return rate of individual stock
P_{t-1} - Stock price of day t−1
P_{t-1} - Stock price of day t
N - Observed day number.

Here we considered that the market return was the average return of these 600 companies during the same period. We rated the average daily returns and BETA factor in descending order and classified the 600 companies into 10 groups (RE1-RE10), RE1 is

the rating with the highest historical return and RE10 is the rating with the lowest historical return. We also rated the BETA factor with the same idea, BETA1 has the highest risk and BETA10 has the lowest risk (Baker and Wurgler, 2006). To reach a conclusion with more data sets, we defined the RE1, RE2 and RE3 stocks as high return stocks, the RE4, RE5 and RE6 as medium return stocks and the RE7, RE8, RE9 and RE10 as low return stocks; the BETA1, BETA2 and BETA3 stocks as high risk, the BETA4, BETA5 and BETA6 as medium risk and the BETA7, BETA8, BETA9 and BETA10 as low risk. So we had 9 different investment portfolios: High BETA - high RE, high BETA - medium RE, high BETA - low RE, medium BETA - high RE, medium BETA - medium RE, medium BETA - low RE, low BETA - high RE, low BETA - medium RE and low BETA - low RE. To verify the future performance, we calculated the average daily return (Table 5) of these 9 portfolios in 2015. The daily market return of 2015 was −1.3%. From the example of the three investors, we concluded that no matter which type of investors are involved, they may make transaction decisions whenever they obtain profits. These profits should be net profits. When the investment return is higher than the investment cost, investors may sell their portfolios to obtain net profits, especially the conservative investors.

In order to estimate the net future returns, we need to calculate the investment costs (Heaton, 2011) and subtract these costs from earnings to get the net investment return. The costs of the European stock market may include: An administrative fee, for example 25 euro per order/0.5% of trade value. The custody fee depends on the number of holdings for example, 2 euro per holding every quarter. The transferring paper certificate shares into electronic form is usually free. Some costs may exist from a third party such as exchange access fees, stamp duty taxes, settlement fees and cleaning fees. They can be a percentage of trade value or a flat fee. Due to the diversified investment costs of European stock markets, investors can find the lowest cost for their stock investment. The following example is an example of the investment cost on the European stock market: We calculated the cost of the European stock market. Suppose we buy 10 thousand shares of a stock at a price of 10 euro/share and fixed transaction cost of 0.10% and the ladder transaction cost of 0.08%. The fixed cost is 100 euro and the ladder cost is 81.25 euro. At what price can we sell the stock to gain more profits? Transaction fees/number of shares = 100,000*0.08%+29/10,000 = 109/10,000 = 0.11%, so when the expected return is higher than 0.11%, the sale is profitable. In this experiment, we assumed that the cost of the portfolio is 0.11% of the total investment capital. In fact, the investment cost may be lower in today's ECN trading platform (Poser, 2001).

Figure 1: The daily accumulative return of 600 companies of EUROSTAXX 600 index during 2013-2014



The Table 5 concludes three variables, % of market share is the percentage of each portfolio (the amount of stocks) in the total 600 stocks, average daily return rate in 2015 is the average daily return rate of each portfolio in 2015 and % trading opportunity is the percentage of days that each portfolio obtained a return rate higher than its investment cost (0.11%) in 2015 (260 trading day). Most of our 600 stocks were of medium or low risk. In 2015, the portfolio that had the highest average return was the $BETA_H$-RE_L portfolio (0.05%) and the portfolio that had the lowest average return was the $BETA_L$-RE_L portfolio (−0.05%). Because the return rate of these 9 portfolios had small differences in 2015, we could not identify which portfolio was better. But if we consider the probability of earning profits, the $BETA_M$ and the $BETA_L$ portfolios had more transaction points with profits than the $BETA_H$ portfolios which meant that investors would have more possibility of obtaining benefits. We concluded that the stocks with lower risk would have more stable future prices. They may have more probability of earning profits in the future and their future returns may not be lower than the high risk stocks.

3. CONCLUSION

In this paper we analyzed the relationship between investors mental accounting and investment portfolio design from psychological and financial perspectives. The results of our risk and return experiment showed that, despite having the same investment portfolio and the same investment environment (bull market or bear market), and due to the fact that investors investment risk preferences changed, their expected return and investment decision-making could be different. Our conservative Investor A gave up more returns to avoid risks, but our aggressive Investor C

Table 5: BETA and RE rating portfolios

RE-BETA portfolios	% of market share (in EUROSTAXX 600)	Average daily return rate in 2015	% trading opportunity (260 trading days in 2015)
BETAH-REH	4.2	0.01	38.5
BETAH-REM	6.9	−0.11	34.6
BETAH-REL	2.8	−0.16	45.8
BETAM-REH	6.9	−0.29	40.4
BETAM-REM	-	-	-
BETAM-REL	15.3	−0.09	48.5
BETAL-REH	23.6	0.05	41.2
BETAL-REM	8.3	0.03	46.5
BETAL-REL	31.9	−0.50	42.3

ignored risks to pursue probable profits. To satisfy the risk appetite and the expected return of different investors, we designed 9 investment portfolios with different risk and return levels. We calculated the real return of these portfolios in the following year and estimated their possible transaction time points. On one hand, we found that lower risk portfolios could have more probability of getting more profits in the future, and on the other hand, we found that compared with lower risk portfolios, the high risk portfolios did not have significant differences of returns in the future. High risk did not mean high returns and low risk did not mean low returns.

We designed investment portfolios based on investors' risk and return profiles and tried to find out their transaction time points from psychological factors, which was different from traditional methods. The traditional CAPM model emphasizes high return or low risk in order to evaluate portfolios, but it ignores considering the mental factors of investors. Each investor has his own mental accounts of risk and return, they compare these two accounts to satisfy their investment expectation (Cheema and Soman, 2006) instead of calculating just the statistics correlation rationally. It is obvious that mental accounting is useful in investment markets and it is worth undertaking further studies and discussions in the future.

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