The Credit Risk-Return Puzzle and the Value Premium Puzzle in Thailand

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การศึกษาปริศนาความเสี่ยงกับผลตอบแทนด้านเครดิตและปริศนาค่าชดเชยความเสี่ยงจากมูลค่าในประเทศไทย

น.ส.พิมพ์นารา รัตนแสง

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The objective of this study is to examine the presence of two puzzles in the stock market which are empirically inconsistent with the fundamental principle of risk and return. Theoretically, the assets with higher risk should compensate higher returns. However, when the credit risk is considered, the previous evidences show that the stocks of firms with high credit rating (low risk) generate higher return than the stocks of firms with low credit rating (high risk). Moreover, previous studies find that the firms with high book-to-market (value firm) generates higher return on stock than the firms with low book-to-market (growth firm). This study tests the puzzles in Thailand by using data from 150 firms with credit ratings from 2015 to 2022. The result shows the credit risk-return puzzle does not exist in Thai market, but the value premium puzzle is presented in Thai market.

Field of Study:	Finance	Student's Signature .....
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1. Introduction

The fundamental principle that underlies the investment risk and return in the finance theory is that the asset with higher risk should demand higher return than the asset with lower risk, in other words, investors should be compensated when bearing more risk. However, many empirical studies demonstrate the negative risk-return relationship when the credit risk is taken into consideration. The firm's credit risk is measured by the credit rating assessed by the credit rating agencies, where high rating referred to a good-credit firm or firm that is less likely to default and low rating referred to a poor-credit firm or firm that is more likely to default.

Theoretically, investment in a low credit rating firm is perceived as a risky investment. Thus, investor should expect higher return on investment. Empirically, the high-rated firms, hence, lower risk, generate higher return than the low-rated firms, and vice versa. This is a known puzzle called the credit risk-return puzzle. Avramov et al. (2009) examines the credit-risk return relationship in the US market and finds that low credit risk firms realize higher returns than high credit risk firms. (Avramov et al., 2009) Consistently, Campbell et al. (2008) shows that stocks with high distress risk tend to deliver anomalously low average returns. (Campbell et al., 2008) Besides, Bissoondoyal-Bheenick and Brooks (2015) indicate the existence of the credit risk-return in Japan and Australia market, which also present the similar pattern in the developed market. (Bissoondoyal-Bheenick & Brooks, 2015)

The rating agency is one of the sources of financial information and becomes influential to all the firms listed in the Stock Exchange of Thailand (SET) in the aspects of the firm's cost of capital, the investment decisions, and the sale of securities as it is required the credit rating by the credit rating agency approved by the Securities and Exchange Commission (SEC). Basically, the main role of the credit rating agency is to mitigate the asymmetric information problem between the firm and the investors. The study of Thai market is interesting to analyze the effect of credit rating whether the same situation holds in the emerging market and to revisit the local rating agency information value in a small market.

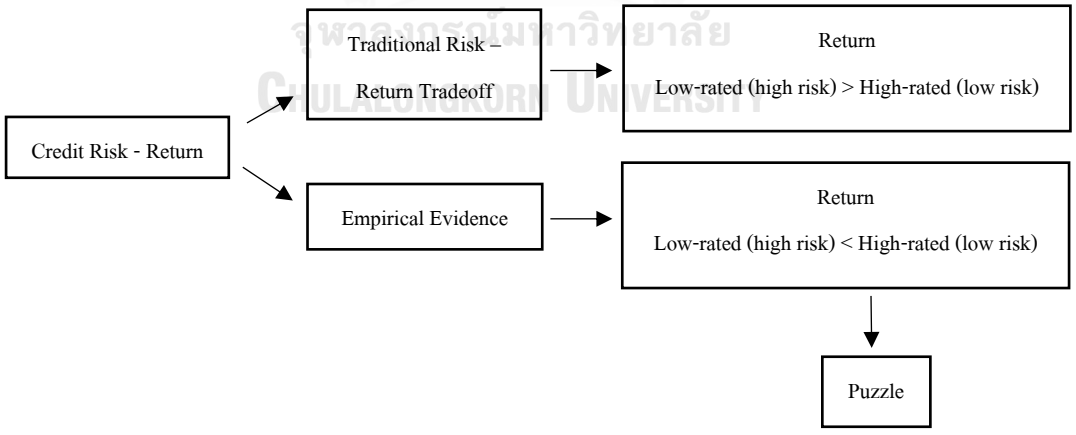
The study uses the credit rating data issued by Tris Rating, a credit rating agency in Thailand, approved by SEC, which has a partnership with S&P Global Ratings. Tris Rating has more than 20 years of experience and has played an important role in Thai debt capital market, where Tris has

rated more than 400 Thai firms. Typically, there are two types of ratings published by Tris including an issuer rating and an issue rating. Particularly, this study employs the issuer rating. The rating scale is as follow:

Table 1 Tris Credit Rating Scale

Grade	Rating	Grade	Rating
Investment Grade	AAA	Non-investment Grade	BB+
	AA+		BB
	AA		BB-
	AA-		B+
	A+		B
	A		B-
	A-		CCC+
	BBB+		CCC
	BBB		CCC-
	BBB-		CC
			C
			D

Figure 1 Credit Risk-Return Puzzle



Hence, this paper aims to study whether the negative credit risk-return relationship exists in Thai market. Since most research focus mainly on the developed market, especially the US, this paper will point out whether the puzzle hold in the small market like Thailand.

In addition, this study examines further by including another known market puzzle called the value premium puzzle, which is conceptually similar to the first puzzle. The value premium is described as firms with high book-to-market ratio (BVMV), known as value firms, tend to generate higher return than firms with low book-to-market ratio, known as growth firms. Fundamentally, the value firm derives market value from the assets in place, whereas the growth firm derives market value from the growth option. Therefore, it is rational to believe that growth firm should yield more. However, several empirical studies report the existence of value premium in which value firms outperform growth firms. For example, in the US market, Lakonishok et al. (1994) and Fama and French (1992) document that value strategy outperforms growth strategy. (Lakonishok et al., 1994) (Fama & French, 1992) Nevertheless, there are two attributes explaining what drives the value premium.

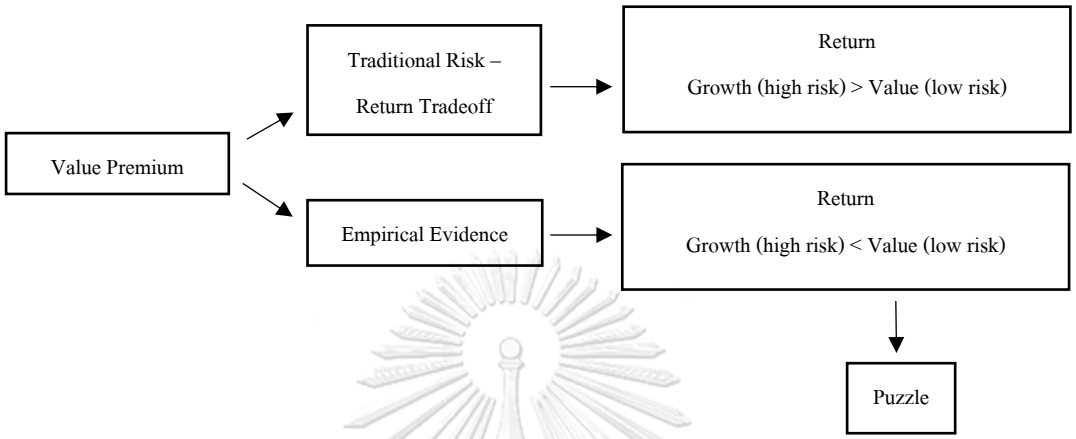
The risk-based explanation behind this is that value firm is exposed to systematic risk and investor is rewarded for bearing the risk. In the economic downturn, growth firm may hoard cash and refrain from exercising risky growth option, and then realize lower return, while value firm which is already in the mature stage has limited growth options and it is difficult to utilize assets in place to generate remarkable earnings. (Fama & French, 1992) In the other hand, the behavioral-based explanation argues that naïve investors overreact to stocks that have done very well in the past, then these glamour stocks become overpriced. Similarly, these investors overreact to stocks that have done very badly in the past, then these value stocks become underpriced. (Lakonishok et al., 1994)

The second puzzle factor is presented to examine further whether the value premium can be exploited in Thai market, which also means that it is systematic across the markets. The test is conducted to see whether the value premium is priced amongst individual stocks.

Unlike the book-to-market ratio, the credit rating is usually for the bond holders to consider whether to invest in a particular firm, or it is the risk perceived by the bond holders rather than the shareholders. Therefore, this study aims to additionally assess both factors together to examine whether they help support the stock returns in the same direction or adding the book-to-market ratio

reduces or offsets the impact of the credit rating factor. This objective could help the investor to exploit the opportunity from these puzzles.

Figure 2 Value Premium Puzzle



Hypothesis 1: The credit risk-return puzzle and the value premium puzzle exist in Thai market (the returns of high-rated firms are higher than the returns of low-rated firm, and the returns of high book-to-market firms are higher than the returns of low book-to-market firms, or vice versa) and the interaction of both credit rating and book-to-market has an impact on the stock returns.

Hypothesis 2: The market risk premium and the credit risk premium of the portfolio have an impact on the stock return.

2. Literature Review

2.1 Credit Risk-Return Puzzle

Number of researchers have assessed the credit risk-return anomaly in the US market. Campbell et al. (2008) exhibits that stocks with high probability of failure or default tend to deliver anomalously lower average return. (Campbell et al., 2008) The question they try to address are how to measure the failure to meet financial obligation, do distressed stocks move together, and does distress risk provide premium. One of the measurements of the financial distress they use is the D (default) rating issued by leading credit rating agency. They form portfolios sorted by failure risk and find that distressed portfolios have low average returns, high standard deviations, high market betas, and high loading on Fama and French's small-size and value risk factors. This evidence opposes the traditional asset pricing that is well-known to the investors. They propose that the cause of this anomaly incurs by behavioral factor, and it is too costly for sophisticated investors to arbitrage. Avramov et al. (2009) concludes that the risk-return anomaly arises from the performance of the low-rated stocks, especially around downgrades. (Avramov et al., 2009) In their analysis, stocks with credit rating of all classes are included and are grouped by 10 deciles portfolios. Consequently, the return differential between the highest-rated and the lowest-rated portfolio is 3.33% over a 1-year period. The negative risk-return effect is robust even when the returns are adjusted by Capital Asset Pricing Model (CAPM) and Fama and French's three-factor model. The explanation behind this is probably due to the mispricing rather than systematic risk. The low-rated firms' poor financial conditions lead to worsen firm fundamentals and then pressure institutional investor to sell stocks, while there are also short-sale constraints which make it difficult to arbitrage. Interestingly, a recent research paper supports the arbitrage limits on distressed stocks. Sha et al. (2022) finds that the negative risk–return relation is stronger for high distress-risk stocks since these stocks are associated with higher arbitrage costs and at the same time happened to be highly illiquid. (Sha et al., 2022)

Dichev (1998) studies whether the bankruptcy risk is systematic. If it is, then high bankruptcy risk should reward higher returns. (Dichev, 1998) However, the study reveals that firms with high bankruptcy risk earn significantly lower average returns. Therefore, the distress risk factor is unlikely to account for the size and book-to-market effects, unlike some studies have suggested. Griffin and Lemmon (2002) examine the relationship between market equity, distress

risk, and stock returns. (Griffin & Lemmon, 2002) They suggest that high credit risk firms are mispriced as they find that high distress risk firms exhibit the largest return reversals around earnings announcement and the book-to-market premium is largest in small firms.

Aside from the US market, there are also documents that the credit-risk return puzzle presents in other markets. For instance, Bissoondoyal-Bheenick and Brooks (2015) investigate on Japan and Australia market whether the credit risk-return puzzle exists in each market in different economic conditions, given that Japan is a bank base system and Australia's experience in the global financial crisis has been different as it has been relatively immune to the financial crisis. (Bissoondoyal-Bheenick & Brooks, 2015) The result shows the credit risk-return anomaly is presented in both countries and the state of economy matters. Moreover, the result indicates that only rating downgrade has a significant impact in both Japan and Australia market. Similarly, Nedumparambil and Bhandari (2020) conduct a test on India market, given it is one of the fastest growing emerging markets and is bank-based system with institutional investors drive the market. (Nedumparambil & Bhandari, 2020) The result validates the presence of the credit risk-return puzzle in India.

2.2 Value Premium Puzzle

The value premium anomaly has been observed for decades. Capaul et al. (1993) demonstrates the existence of significant value-growth factor in the US, the UK, France, Germany, Switzerland, and Japan as the authors form portfolios according to value and growth factor. (Capaul et al., 1993) Then, analyzing portfolio returns of value stocks and growth stocks shows significant difference in returns. Lakonishok et al. (1994) tests the value premium puzzle in the US market and exhibits that the value strategy outperforms the market. (Lakonishok et al., 1994) Particularly, the authors argue that it is because the typical investors misprice the stocks, not because of the fundamental risk factor of the firms. Gharghori et al. (2013) examines the Australia market and finds the strong value-growth effect, where book-to-market is the superior proxy for the negative-earnings firms and cash-flow-to-price is the better proxy for the positive-earnings firms. (Gharghori et al., 2013) Clark and Qiao (2020) show that the value premium exists in the Chinese market with no systematic behavioral factor. (Clark & Qiao, 2020) They rather suggest the strong evidence for

risk-based explanation as for investors bearing more risk for financial inflexibility in China. Fama and French (1992) in their research paper conclude that the relation between average return and beta has become weaker. (Fama & French, 1992) Their test does not support the classic framework that average return is positively related to market beta. In addition, the result shows that size and book-to-market mainly capture the average cross-sectional variation in average stock returns. However, the empirical evidences are still mixed. Some documents do not support that the value stocks beat the growth stocks. For instance, Abhyankar et al. (2009) investigates the value strategy implemented on the G7 countries and supports that in the US, Canada, and Japan market the value stocks dominate the growth stocks. (Abhyankar et al., 2009) While, there is no significant relationship in the UK, France, Germany, and Italy market. Wang and Xu (2004) argue that in Chinese market, the book-to-market do not help explain the cross-sectional differences in returns. (Wang & Xu, 2004)

3. Data and Methodology

This research uses the data of the firms listed on SET that are rated by Tris Rating, including stock return, credit rating, book-to-market ratio (BVMV), size, turnover ratio, cumulative return, and market return (r_m). The period starts from January 2015 to December 2022 (96 periods). If the firm's credit rating data is issued after January 2015, the data set shall be collected from the month that the firm starts receiving the credit rating. All the data including credit ratings are obtained from Refinitiv and Yahoo Finance. The risk-free rates (r_f), which are the 1-month Thailand treasury bills rate, are obtained from the Bank of Thailand database. The total number of firms is 150 and the total number of firm-month is 10,749.

The first objective is to compare the average return of the portfolios to test the existence of the puzzle in Thailand. For the credit risk-return puzzle, 3 portfolios are formed by grouping firms into high-rated portfolio (AAA to AA-), medium-rated portfolio (A+ to BBB-), or low-rated (BB+ to D) portfolio. The performance of each portfolio is measured by the buy-and-hold strategy for a 1-year period starting from 2015 to 2022. The portfolios are equal-weighted portfolios and are rebalanced every year. It is expected that the high-rated (low-rated) portfolio generates higher (lower) average return than low-rated (high-rated) portfolio. Similarly, for the value premium puzzle, 3 portfolios are formed by grouping firms into high-BVMV portfolio (Ratio > 1), medium-BVMV portfolio (Median < Ratio < 1), or low-BVMV portfolio (Ratio < Median). The performance of each portfolio is measured by the buy-and-hold strategy for a 1-year period starting from 2015 to 2022. The portfolios are equal-weighted portfolios and are rebalanced every year. It is expected that the high-BVMV (low-BVMV) portfolio generates higher (lower) average return than the low-BVMV (high-BVMV) portfolio.

The second objective is to do the regression model as it enables to control for other firm-related factors that influence the stock returns.

Hypothesis 1: The credit risk-return puzzle and the value premium puzzle exist in Thai market (the returns of high-rated firms are higher than the returns of low-rated firm, and the returns

of high book-to-market firms are higher than the returns of low book-to-market firms, or vice versa) and the interaction of both credit rating and book-to-market has an impact on the stock returns.

$$r_{i,t} = \alpha + \beta_1 Rating_{i,t} + \beta_2 BVMV_{i,t} + \beta_3 (Rating * BVMV)_{i,t} +$$

$$\beta_4 r_{m,t} + \beta_5 Size_{i,t-1} + \beta_6 Turnover_{i,t-1} + \beta_7 Cumulative_{i,t-1} + \varepsilon_{i,t}$$

To test the hypothesis, the dependent variable is the monthly returns of individual stocks. The first explanatory variable is the long-term issuer ratings by Tris Rating. Tris Rating assigns issuer credit ratings to express forward-looking opinions on an obligor's ability and willingness to meet its financial obligations as they come due. For the long-term issuer rating, Tris Rating uses letter rating symbols to indicate the assessed ability of an obligor to meet its financial obligations over the medium to long term. The symbol AAA represents the highest rating, and D represents the lowest rating. In this study, the alphabetical grades are transposed to numerical grades from 1 to 22. For example, AAA is mapped to grade 22, AA+ is mapped to grade 21, D is mapped to grade 1, so the increase in the numerical grade implies the better rating. The numerical rating scale is shown in the table 2 below, along with the total number of data collected for each rating. The second explanatory variable is the book-to-market ratio (BVMV). The third explanatory variable is the interaction term of the credit rating and BVMV to measure the joint effect.

There are 4 control variables. Firstly, market return, which captures the systematic risk for overall market. The SET index return is a proxy for the market return. Secondly, firm size, which is measured by the market value of equity (share price multiplies by number of shares outstanding). Thirdly, turnover ratio, which is the trading volume (shares) to number of share outstanding, to capture liquidity. Avramov et al. (2009) reports regarding size and liquidity factors that the decreasing in firm size is associated with worsening credit rating and high-rated firms are more liquid than low-rated firms. (Avramov et al., 2009) Fourthly, cumulative return or the return over the last 6 months to capture the momentum factor. Note that, for the newly listed stock, the cumulative number of months could be from 1 month. Jegadeesh and Titman (1993) report regarding the momentum factor that stocks with higher returns in the previous 12 months tend to have higher future returns than stock with lower returns in the previous 12 months. (Jegadeesh & Titman, 1993) All the control variables, except the market return, are lagged by 1 months relative

to the month the dependent variable is measured. For example, when the stock return is collected in January 2015, size, turnover, and cumulative return are collected in December 2014.

Table 2 Numerical Rating Scale

Alphabetical Grade	Numerical Grade	No. of Data	Alphabetical Grade	Numerical Grade	No. of Data
AAA	22	257	BB+	12	529
AA+	21	53	BB	11	281
AA	20	248	BB-	10	55
AA-	19	440	B+	9	75
A+	18	1,069	B	8	0
A	17	1,394	B-	7	0
A-	16	1,563	CCC+	6	0
BBB+	15	1,872	CCC	5	0
BBB	14	1,294	CCC-	4	0
BBB-	13	1,611	CC	3	0
			C	2	0
			D	1	8

Suppose the credit risk-return puzzle exists, the β_1 is expected to be positive, meaning that high-rated firms generate higher returns and low-rated firms generate lower returns as the higher ratings are assigned by the higher number of numerical grades in the model. Suppose the value premium exists, the β_2 is expected to be positive, meaning that high BVMV firms (value firms) generate higher returns than low BVMV firms (growth firms). The beta of the interaction term, β_3, is expected to be positive. The firms with high (low) level of credit rating and BVMV are expected to yield high (low) returns, which means that both factors support the returns in the same direction. The firms with high (low) level of credit rating but having medium or low (high) BVMV are supposed to get positive but smaller beta, which means that the credit risk-return puzzle influences more and the value premium puzzle can only reduce the effect of the credit risk-return puzzle.

Otherwise, if the beta of the interaction term is negative, it implies that the joint effect could diminish the influence of the puzzles.

Hypothesis 2: The market risk premium and the credit risk premium of the portfolio have an impact on the stock returns.

$$r_{i,t} - r_{f,t} = \alpha + \beta_1(r_m - r_f)_t + \beta_2 HML_t + \varepsilon_{i,t}$$

The model is adjusted from the capital asset pricing model (CAPM), which describes the relationship between risk and expected return, and the Fama-French three-factor model, which additionally describes the outperformance tendency. To test the hypothesis, the dependent variable is the monthly returns of individual stocks, adjusted by the risk-free rate. The first independent variable is the market return, adjusted by the risk-free rate, or called the market risk premium. The SET index return is a proxy for the market return. The second independent variable is the credit risk-return premium of the portfolio which is the return of the high-rated portfolio less the return of the low-rated portfolio (HML) to measure the outperformance tendency. Since the high-rated portfolio tends to generate higher return than the low-rated portfolio, according to the credit risk-return puzzle, there may be premium which may affect the stock return.

This is an additional contribution to the first objective and to reconfirm the presence of the credit risk-return puzzle whether there actually exists or not. After the portfolios of high-rating and low-rating are formed and hold for a year, in each period (month) the return of each portfolio is calculated. Next, the HML factor is to subtract the return of the low-rated portfolio from the return of the high-rated portfolio. Then, repeat the same step for 8 years (96 periods), and run the regression. The β_1 captures the market risk premium. Suppose the credit risk-return puzzle exists, the β_2 is expected to be positive which means there is credit risk premium that positively affects the stock return. If the results from both models show negative beta (for credit factor) or insignificant effect, it can eventually be concluded that no puzzle exists in Thai market.

4. Results and Discussion

4.1 Data Analysis

The table 3 below shows the descriptive statistics for 150 firms with credit rating in 8 years period (2015-2022). The total observation is 10,749 data points. The means are higher than the median for all variables except the market return, suggesting the positively skewed distribution. The return ranges from the minimum of -65.22% to the maximum of 125.46%. The standard deviation of return is 10.88%. The credit rating has the mean and median around 15 or interpreted as BBB+. The credit rating ranges from the minimum of 1 or D and the maximum of 22 or AAA. The standard deviation of rating is around 2 notches. The BVMV has the mean of 0.84, suggesting the data is toward the growth stock. The BVMV ranges from the minimum of -20.48, which indicates there is a default firm, to the maximum of 5.67. The mean and median of the market return are very close at 0.20% and 0.22%, respectively, suggesting almost a symmetrical distribution. The market return ranges from the minimum of -16.01% to the maximum of 17.86%. The standard deviation for market return is 4.54%. There is a wide range of firm size from 227 million baht to 790 billion baht. Also, there is a wide range of turnover from 0 to 308.62. For the cumulative return, it ranges from -79.70% to 367.39% and the standard deviation is 25.83%, indicating a wide spread of data around the cumulative return.

Table 3 Descriptive Statistics of the data set

	Mean	Median	Max	Min	Stdev.	Obs.
Return	0.46%	-0.50%	125.46%	-65.22%	10.88%	10,749
Credit Rating	15.43	15.00	22.00	1.00	2.46	10,749
BVMV	0.84	0.73	5.67	-20.48	0.81	10,749
Rating*BVMV	12.78	11.23	73.71	-307.57	10.10	10,749
Market Return	0.20%	0.22%	17.86%	-16.01%	4.54%	10,749
Size	51,203	17,776	790,512	227	91,109	10,749
Turnover	3.82	1.87	308.62	0.00	8.56	10,749
Cumulative Return	1.92%	-1.57%	367.39%	-79.70%	25.83%	10,749

The correlation matrix is also presented in table 4 below. It shows none of the correlation among the control variables is high. Therefore, these set of control variables could be used properly in the regression model.

Table 4 Correlation Matrix between Variables

	Return	Credit Rating	BVMV	Rating * BVMV	Marlet Return	Size	Turnover	Cumulative Return
Return	1							
Credit Rating	0.0065	1						
BVMV	-0.0448	-0.1096	1					
Rating * BVMV	-0.0683	-0.0023	0.8456	1				
Marlet Return	0.4863	-0.0032	-0.0216	-0.0297	1			
Size	-0.0086	0.5723	-0.2256	-0.1901	-0.0137	1		
Turnover	0.0010	-0.0468	-0.0553	-0.0725	0.0045	-0.0103	1	
Cumulative Return	0.0173	-0.0012	-0.0934	-0.1228	-0.0048	0.0573	0.2369	1

Since there are some firms whose BVMV is negative (outlier), this study will run the regression for the hypothesis 1 twice by including the outlier and excluding the outlier. The table 5 below shows the descriptive statistics for 148 firms with credit rating in 8 years period (2015-2022). The data excludes the negative-BVMV firms. The total observation is 10,726 data points. The means are higher than the median for all variables except the market return, suggesting the positively skewed distribution. The return ranges from the minimum of -65.22% to the maximum of 120.00%. The standard deviation of return is 10.88%. The credit rating has the mean and median around 15 or interpreted as BBB+. The credit rating ranges from the minimum of 1 or D and the maximum of 22 or AAA. The standard deviation of rating is around 2 notches. The BVMV has the mean of 0.86, suggesting the data is toward the growth stock. The BVMV ranges from the minimum of 0 to the maximum of 5.67. The mean and median of the market return are very close at 0.20% and 0.22%, respectively, suggesting almost the symmetrical distribution. The market return ranges from the minimum of -16.01% to the maximum of 17.86%. The standard deviation for market return is 4.54%. There is a wide range of firm size from 227 million Baht to 790 billion Baht. Also,

there is a wide range of turnover from 0 to 308.62. For the cumulative return, it ranges from -79.70% to 367.39% and the standard deviation is 25.82%, indicating a wide spread of data around the cumulative return.

Table 5 Descriptive Statistics of the data set excluding the outlier

	Mean	Median	Max	Min	Stdev.	Obs.
Return	0.47%	-0.50%	120.00%	-65.22%	10.80%	10,726
Credit Rating	15.44	15.00	22.00	1.00	2.44	10,726
BVMV	0.86	0.73	5.67	0.00	0.63	10,726
Rating*BVMV	12.90	11.25	73.71	0.00	8.93	10,726
Market Return	0.20%	0.22%	17.86%	-16.01%	4.54%	10,726
Size	51,240	17,769	790,512	227	91,197	10,726
Turnover	3.82	1.87	308.62	0.00	8.57	10,726
Cumulative Return	1.96%	-1.57%	367.39%	-79.70%	25.82%	10,726

The correlation matrix is also presented in table 6 below. It shows none of the correlation among the control variables that is high. Therefore, these set of control variables could be used properly in the regression model.

Table 6 Correlation Matrix between Variables excluding the outlier

	Return	Credit Rating	BVMV	Rating * BVMV	Marlet Return	Size	Turnover	Cumulative Return
Return	1							
Credit Rating	0.0023	1						
BVMV	-0.0773	-0.2376	1					
Rating * BVMV	-0.0797	-0.0080	0.9573	1				
Marlet Return	0.4864	-0.0042	-0.0480	-0.0501	1			
Size	-0.0086	0.5766	-0.3054	-0.2203	-0.0139	1		
Turnover	0.0015	-0.0470	-0.0747	-0.0851	0.0044	-0.0104	1	
Cumulative Return	0.0182	-0.0042	-0.1560	-0.1604	-0.0057	0.0568	0.2370	1

4.2 Empirical Results

This research works on 2 objectives. Firstly, the analysis of the return on portfolio classified by credit rating and BVMV, calculated on a yearly basis. Secondly, to analyze more deeply on the return and to control for other firm-related factors that influence the return, the regression method which regress the monthly return on stock on credit rating, BVMV, and the interaction term is applied. Moreover, another regression model, in relation to the portfolio analysis in the first objective, tests the credit risk-return puzzle based on the concept of the CAPM and the adjusted concept of Fama-French's HML factor.

4.2.1 Analysis of Portfolio Return

To test for the credit risk-return puzzle, in each year from 2015 to 2022, the stocks from the group of (1) High-rated firms (2) Medium-rated firm (3) Low-rated firm are chosen to form a portfolio based on their type. The holding period return (HPR) of each stock is calculated based on the price of the first trading and the last trading day of that year. The portfolios are equal-weighted. The average returns are shown in the table 7 below. Noted that the study focuses mainly on the comparison between the high-rated portfolio and the low-rated portfolio as the medium-rated portfolio is formed to help clarify the analysis between high-rated firm and the low-rated firm.

Table 7 Holding Period Return of Portfolios Classified by Credit Rating

	2015	2016	2017	2018	2019	2020	2021	2022
High	-20.86%	22.56%	21.67%	-1.89%	-1.74%	-13.69%	8.26%	-2.54%
Medium	-3.03%	38.49%	14.78%	-22.56%	3.09%	5.23%	30.09%	-4.54%
Low	-31.31%	30.52%	-11.43%	-26.85%	-23.16%	-14.82%	71.47%	-11.99%

For the high-rated firms, the HPR ranges from -20.86% to 22.56%. For the low-rated firms, the HPR ranges from -31.31% to 71.47%, showing the higher volatility. There are 3 years (5 years) of positive return (negative return) for the high-rated portfolio and there are 2 years (6 years) of positive return (negative return) for the low-rated portfolio. The HPR of the high-rated portfolio beats that of the low-rated portfolio for 6 years (2015, 2017, 2018, 2019, 2020, 2022). On the other hand, The HPR of the low-rated portfolio could beat that of the high-rated portfolio for only 2 years

(2016 and 2021). It can be concluded from the buy-and-hold strategy analysis that the results are quite consistent with the credit risk-return puzzle, which the return on stock of the high-rated firm is higher than the return on stock of the low-rated firm.

Next is the analysis of portfolio based on the BVMV to test for the value premium puzzle. Similarly, in each year from 2015 to 2022, the stocks from the group of (1) High-BVMV firms or value firms (2) Medium-BVMV firms (3) Low-BVMV firms or growth firms are chosen to form a portfolio based on their type. The holding period return (HPR) of each stock is calculated based on the price of the first trading day and the last trading day of that year. The average returns are shown in the table 8 below. Noted that the study focuses mainly on the comparison between the high-BVMV portfolio and the low-BVMV portfolio as the medium-BVMV portfolio is formed to help clarify the analysis between the high-BVMV firm and the low-BVMV firm.

Table 8 Holding Period Return of portfolios classified by BVMV

	2015	2016	2017	2018	2019	2020	2021	2022
High	-8.80%	36.75%	33.09%	-11.95%	-8.60%	11.27%	37.54%	-2.63%
Medium	-8.96%	34.26%	5.97%	-23.47%	0.88%	1.42%	11.30%	3.13%
Low	-1.56%	16.87%	10.43%	-21.25%	5.96%	-5.17%	34.51%	-7.84%

For the high-BVMV firms, the HPR ranges from -11.95% to 37.54%. For the low-BVMV firms, the HPR ranges from -21.25% to 34.51%%, showing the higher volatility. There are 4 years (4 years) of positive return (negative return) for the high-BVMV portfolio and there are also 4 years (4 years) of positive return (negative return) for the low-BVMV portfolio. The HPR of the high-BVMV portfolio beats that of the low-BVMV portfolio for 6 years (2016, 2017, 2018, 2020, 2021, 2022). On the other hand, The HPR of the low-BVMV portfolio could beat that of the high-BVMV portfolio for only 2 years (2015 and 2019). It can be concluded from the buy-and-hold strategy analysis that the results are quite consistent with the value premium puzzle, which the return on stock of the high-BVMV firm is higher than the return on stock of the low-BVMV firm.

4.2.2 Analysis of Regression Model

4.2.2.1 The Regression of Credit Rating, BVMV, and the Interaction Term on the Return

The result of the regression analysis is exhibited in table 9 below, where monthly return is regressed on credit rating, BVMV, interaction term, and other control variables, namely market return, size, turnover, and cumulative return, across the distinct periods of the return from January 2015 to December 2022. There are 2 regression results which show the results both when including the outlier and excluding the outlier. (Outlier is the firm with negative BVMV)

$$r_{i,t} = \alpha + \beta_1 Rating_{i,t} + \beta_2 BVMV_{i,t} + \beta_3 (Rating * BVMV)_{i,t} + \beta_4 r_{m,t} + \beta_5 Size_{i,t-1} + \beta_6 Turnover_{i,t-1} + \beta_7 Cumulative_{i,t-1} + \varepsilon_{i,t}$$

Table 9 Regression of Credit Rating, BVMV, and the Interaction Term on Monthly Return

	Return with Rating, BVMV, and Interaction Term	
	(1) Include Outlier	(2) Exclude Outlier
Credit Rating	-0.0051***	-0.0058***
	(0.0016)	(0.0019)
BVMV	0.0119***	0.0213
	(0.0027)	(0.0162)
Credit Rating * BVMV	-0.0021***	-0.0038***
	(0.0002)	(0.0011)
Market Return	1.1462***	1.1225***
	(0.0201)	(0.0200)
Size	-0.0003***	-0.0004***
	(0.0000)	(0.0000)
Turnover	-0.0002	-0.0002
	(0.0001)	(0.0001)
Cumulative Return	-0.0023	-0.0068*
	(0.0038)	(0.0038)
Observations	10,749	10,726
R^2	0.2506	0.2542
Adjusted R^2	0.2396	0.2432

Standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.

According to the regression result, for (1), holding other variables constant, the credit rating has statistically significant effect on the monthly return on stock at 1% significance level, indicating the credit rating has marginally negative impact on the return whereas the higher credit rating is not associated with the higher return but lower return. Therefore, there is no credit risk-return puzzle in Thai market, according to this model. While, BVMV has statistically significant effect at 1% significance level on the monthly return, indicating that BVMV has marginally positive impact on the return whereas the higher BVMV firms are associated with the higher returns. This is consistent with the value premium puzzle globally. The interaction term of credit rating and BVMV has a statistically significant effect on the monthly return at 1% significance level, indicating the interaction term has marginally negative impact on the return. This could imply that there is a significant joint effect in which the credit rating factor diminishes the effect of the value premium puzzle.

For the control variables, the market return has a statistically significant effect on the stock return at 1% significance level, indicating the market return has significantly positive impact on the individual stock return. For instance, if the market return increases by 1%, the stock return will increase by 1.1462%. The firm size also has a statistically significant effect on the monthly return at 1% significance level, indicating the size has marginally negative impact on the return. While, the turnover and the cumulative return over the past 6 months have no statistically significant effect on the monthly return, meaning the liquidity factor and momentum factor play no important roles here. The R^2 reports that the model could explain 25.06% of the variation in the monthly return and the adjusted R^2 is relatively lower at 23.96%.

According to the regression result, for (2), the interpretation of the result is almost likely the same as (1) except for the BVMV and cumulative return. The BVMV has marginally positive impact on the return but not statistically significant. Thus, the outlier does have a significant meaning in the calculation. The cumulative return over the past 6 months has a statistically significant effect on the monthly return at 10% significance level, indicating the cumulative return

has marginally negative impact on the return. The R^2 reports that the model could explain 25.42% of the variation in the monthly return and the adjusted R^2 is relatively lower at 24.32%.

The results of the model with both including and excluding the outlier are quite consistent. So, this provides further confirmation of the model.

Furthermore, the study also considers the fixed effects in term of firm factor and period (month) factor to treat each different period as a separate category and to treat each different firm as having its own unique effect on the return. The results of the regression analysis where the monthly stock return is regressed on credit rating, BVMV, interaction term, and control variables together with the fixed effects across the distinct periods of the return from January 2015 to December 2022 are shown in the table 10 below.

According to the regression result, for (1), holding other variables constant, the credit rating has statistically significant effect on the monthly return on stock at 1% significance level, indicating the credit rating has marginally negative impact on the return whereas the higher credit rating is not associated with the higher return but lower return. Therefore, it shows no credit risk-return puzzle in Thai market. While, BVMV has statistically significant effect at 1% significance level on the monthly return, indicating that BVMV has marginally positive impact on the return whereas the higher BVMV firms are associated with the higher returns. Therefore, there exists the value premium puzzle in Thai market like other markets globally. The interaction term of credit rating and BVMV has a statistically significant effect on the monthly return at 1% significance level, indicating the interaction term has marginally negative impact on the return. This could imply that there is a significant joint effect in which the credit rating factor diminishes the effect of the value premium puzzle.

For the control variables, the market return has a statistically significant effect on the stock return at 1% significance level, indicating the market return has significantly positive impact on the individual stock return. The firm size and turnover ratio also have a statistically significant effect on the monthly return at 1% and 5% significance level, respectively. While, the cumulative return over the past 6 months have no statistically significant effect on the monthly return, indicating there

is no significant impact from the momentum factor. The R^2 reports that the model could explain 27.95% of the variation in the monthly return and the adjusted R^2 is relatively lower at 26.23%.

Table 10 Regression of Credit Rating, BVMV, and the Interaction Term on Monthly Return (with Fixed Effect)

	Return with Rating, BVMV, and Interaction Term (with Fixed Effect)	
	(1) Include Outlier	(2) Exclude Outlier
Credit Rating	-0.0042***	-0.0044***
	(0.0016)	(0.0019)
BVMV	0.0125***	0.0241
	(0.0027)	(0.0162)
Credit Rating * BVMV	-0.0023***	-0.0049***
	(0.0002)	(0.0011)
Market Return	1.1920***	1.1640***
	(0.0270)	(0.0268)
Size	-0.0003***	-0.0004***
	(0.0000)	(0.0000)
Turnover	-0.0002**	-0.0003***
	(0.0001)	(0.0001)
Cumulative Return	-0.0050	-0.0122***
	(0.0040)	(0.0040)
Fixed Effect	YES	YES
Observations	10,749	10,726
R^2	0.2795	0.2861
Adjusted R^2	0.2623	0.2690

Standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.

According to the regression result, for (2), the interpretation of the result is almost likely the same as (1) except for the BVMV and cumulative return. The BVMV has marginally positive impact on the return but not statistically significant. The cumulative return over the past 6 months has a statistically significant effect on the monthly return at 1% significance level, indicating the cumulative return has marginally negative impact on the return. The R^2 reports that the model could explain 28.61% of the variation in the monthly return and the adjusted R^2 is relatively lower at

26.90%. The R^2 of the model incorporated the fixed effects is little higher than the first one, providing a further confirmation of the model's explanatory power.

As the fixed-effect factors are taken into consideration, the relationship between the return and the credit rating and BVMV is still consistent across the models.

4.2.2.2 The Regression of Market Return and HML on the Return

To find more clues about the credit risk-return puzzle, the study performs another regression by examining the impact of the market risk premium and the portfolios' credit risk premium on the monthly stock return across the distinct periods of the return from January 2015 to December 2022. The result is exhibited in the table 11 below.

$$r_{i,t} - r_{f,t} = \alpha + \beta_1(r_m - r_f)_t + \beta_2 HML_t + \varepsilon_{i,t}$$

Table 11 Regression of Market Risk Factor and HML on Monthly Return

	Return with Market Risk Premium and Credit Risk Premium
$(r_m - r_f)$	1.1725***
	(0.0143)
HML	0.1529
	(0.2188)
Observations	10,749
R^2	0.3997
Adjusted R^2	0.3911

Standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.

According to the regression result, holding other variables constant, the market risk factor has a statistically significant effect on the monthly stock return at 1% significance level, indicating the market return has marginally positive impact on the stock return whereas the higher market return is associated with the higher individual stock return. While, the HML factor, or the premium of the high-rated portfolio over the low-rated portfolio, has no statistically significant effect on the individual stock return, indicating the credit risk-return premium does not exist in Thai market. The second regression result is consistent with the first regression result.

To conclude from all tests, for the portfolio's holding-period return, the returns of the high-rated portfolio outperform the low-rated portfolio in most years and the returns of the high-BVMV portfolio outperform the low-BVMV portfolio in most years. These performances seem to relate to the 2 puzzles. However, this method does not provide the detail in what drives the stock return and it is tested on a yearly basis. Hence, the regression method which controls for other factors that might influence the stock return could be more reliable. The regression result shows that the credit risk-return puzzle does not exist in Thai market as the beta of the credit rating factor is negative and significant from zero, meaning that the high-rated firms generate lower return than the low-rated firms. Nevertheless, the result shows that the value premium puzzle does exist in Thai market as the beta of the BVMV factor is positive and significant from zero, meaning that the high-BVMV firms, or value firms, generate higher return than the low-BVMV firms, or growth firms. Holding other variables constant, each puzzle factor moves in a different direction. The result shows that the joint of the credit rating and the BVMV has an influence on the stock return in a sense that the credit rating reduces the impact of the BVMV on the return. From this result, holding the stock of firm with low rating and holding stock of firm with high BVMV tend to get better returns. The results are consistent even when the outlier is excluded and even when the fixed effects are considered. Additionally, another regression model which applies the concept of the risk premium tests whether the credit risk premium influences the stock return or not, using the portfolios created in the first part to calculate the premium of the high-rated portfolio over the low-rated portfolio on monthly basis. The result shows that the credit risk premium does not have a significant impact on the stock return. Therefore, it is concluded from this study that the credit risk-return puzzle does not exist in Thai market.

5. Conclusions

Several studies exhibit that in some markets there are puzzles which are inconsistent with the fundamental principal of finance. Theoretically, the asset with higher risk should generate higher return to compensate for risk. However, in empirical study, when the credit risk is incorporated, the firm with higher credit rating (lower risk) generates higher stock return than the firm with lower credit rating (higher risk). This results in the credit risk-return puzzle that continues to occur in the markets. Therefore, this study aims to examine the credit risk-return puzzle whether it exists in the small and developing market like Thailand. Moreover, another well-known puzzle called the value premium puzzle is also considered in this study. It describes when the stock return of the value firm or firm with higher book-to-market ratio (lower risk) is higher than the stock return of the growth firm or firm with lower book-to-market ratio (higher risk).

The study takes into account the stock of firm with credit rating which is listed on the Stock Exchange of Thailand. The total number of stocks is 150. The period of study is 8 years from 2015 to 2022. There are 2 objectives. Firstly, the portfolios are formed based on type of credit rating and based on type of book-to-market ratio and calculates the 1-year-holding-period return to test which portfolio generates highest and lowest return. The portfolio is rebalanced every year. Secondly, the analysis of the regression models. The data used in the first model are the return on stock, the firm's credit rating, the firm's book-to-market ratio, and the interaction term of the credit rating and the book-to-market ratio, controlled by market return, firm size, stock turnover ratio (liquidity factor), and the cumulative stock return over the last 6 months (momentum factor) together with the firm fixed effect and the period fixed effect to test the existence of the credit risk-return puzzle and the value premium puzzle. Furthermore, the second model is tested based-on the risk premium concept. The data used are the return on stock, the market return, the risk-free rate, and the difference of the return of high-rated portfolio over the low-rated portfolio (use the same portfolio as in the first objective) to test whether there is a market risk premium and/or credit risk premium that significantly impact the return. The regression data are in a monthly basis. The total period is 96.

The results from the portfolio formation primarily shows that the return of the high-rated firms mainly outperforms that of the low-rated firms, which is consistent with the credit risk-return puzzle. Also, the return of the high-book-to-market-ratio firms mainly outperforms that of the low-book-to-market-ratio firms, which is consistent with the value premium puzzle. However, to analyze the relationship more deeply, the regression method is more considerable.

The result from the first regression model shows that the firm with high rating (low risk) significantly tends to generate lower return on stock and vice versa, meaning that the credit risk-return puzzle plays no important role in Thai market. While, the firm with high-BVMV significantly tends to generate higher return on stock and vice versa, meaning that the value premium puzzle plays an important role in Thai market. There is also a significant joint effect of the credit rating puzzle and the value premium puzzle in which the credit rating factor reduces the presence of the value premium puzzle. The result also shows that the stock return is driven by the whole market movement and the firm size matters. The relationships are quite consistent even when the fixed effects are considered. The result from the second regression model shows that the market risk premium has a significant impact on the stock return, but the credit risk premium does not have a significant impact on the stock return. Likewise, this means the credit risk-return puzzle plays no important role in Thailand.

When considering a credit risk, the risk-return trade-off theory still works in the stock market here. In another aspect, the investors may view the credit rating as a risk specifically for the bondholders, unlike the book-to-market ratio which provides a more direct information of the stock for the shareholders. On the contrary, the value premium puzzle could be exploited here, which means that it tends to be systematic across the markets.

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