Return Predictability of CAPE versus PE, A Case of Thai Stock Exchange Market

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ความสามารถในการพยากรณ์ผลตอบแทนจากหุ้นของอัตราส่วนราคาต่อกำไรแบบปรับตามรอบเทียบกับแบบปกติ: กรณีศึกษาจากตลาดหุ้นไทย

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Theerapat Muenpakdee

TABLE OF CONTENTS

Page

LIST OF TABLES

Page

LIST OF FIGURES

Page

1. Abstract

The cyclically adjusted price-earnings ratio (CAPE) is proved to have better predictability than traditional PE in the US market, S&P index, and robust through inflationary changes. This paper finds the result is similar in Thailand and consistent in the scale of stock level, but the performance is different in different periods. The performance of CAPE is significantly better than PE when the stock is in the group of stocks that has a high market-to-book value with low dividend yield, a high inflation period, and the period that has more amount of positive earnings-per-share. The study also shows that CAPE could be adapted with a shorter investment period than 10-years. The forecasting period of 3-years also shows the better predictability performance of CAPE comparing to PE.

2. Introduction

The primary purpose of this paper is to study the difference in predictability on stock excess return of listed companies in Thailand between using the CAPE and PE ratio, which may be affected by the stock's volatility of earning per share growth, characteristic of the stock and the level of inflation inside the country.

PE ratio is one of the most popular financial ratios used to predict the return from the stock price. Campbell and Shiller (1998) also find that the PE ratio is probably the most special significant used financial ratio to predict the risk premium of stock return.

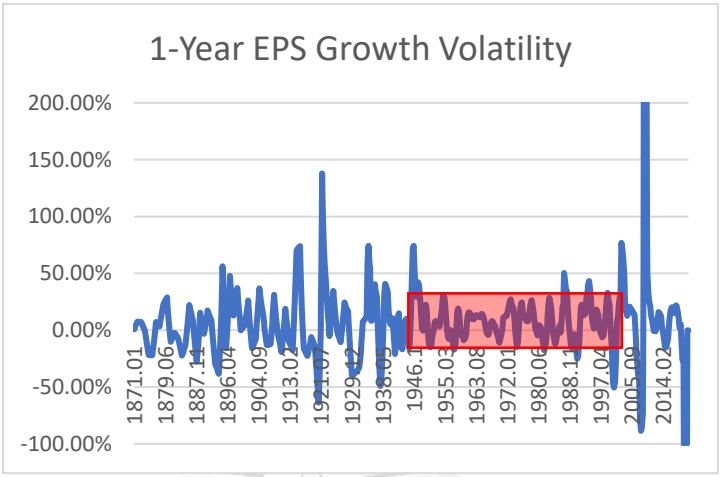
Table 1: Market Multiples Approach for Stock Returns Forecasting

	Global	Americas	Asia Pacific	EMEA
P/E	88%	87%	94%	89%
EV multiple	77%	76%	72%	83%
P/B	59%	54%	72%	66%
P/CF	57%	65%	34%	46%
P/S	40%	46%	19%	36%
D/P	36%	31%	42%	57%
Other	12%	12%	8%	11%

Source: Pinto, Jerald E., R. Robinson, and John D. Stowe, "Equity Valuation: A Survey of Professional Practice", Working Paper, September 2015, CFA Institute.

Welch and Goyal (2008) found that earning price ratio is one of the most prominent financial ratios to forecast US market excess return. Their study shows earning price ratio has an excellent annual predictability performance from World War II to the beginning of the 20th century. They also found that in 2003 and 2004, the predictability performance turned to be very poor, but they did not give more explanation about this phenomenon. According to Figure 1, the data show that between 1943 - 2002, the annual earnings growth volatility was very small compared to the period before and after that, which coincides with the period of low predictability. Hence, it is interesting to investigate whether the predictability of PE is affected by earning growth volatility or not.

Figure 1: Volatility of EPS annual growth (Low during 1943 – 2002)

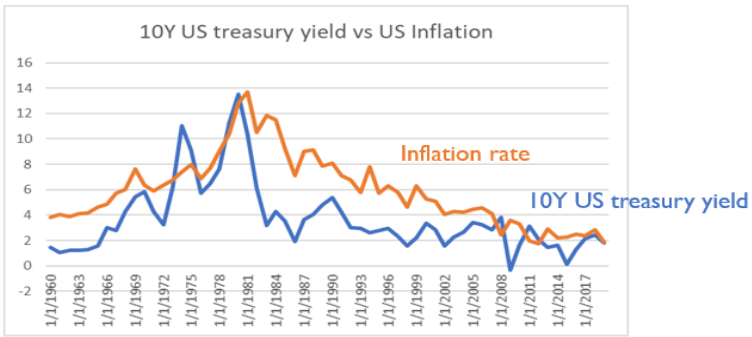


Source: Raw data from Shiller's ie_data.xls

According to the decreasing predictability performance of earning price ratio from Welch and Goyal (2008), this paper tries to find the reasons behind its different performance. In the first case, this paper assumes that it was the effect of annual earnings growth volatility.

Since the stock price is equal to PE multiplied by EPS, the stock price performance is driven by two main components: EPS and PE ratio. In Thailand, the data in 2020 found that the SET index's 12 months forward EPS changed by an average of 0% per year (Covid19 impact included) while the forward PE ratio increased by an average of 5% per year last ten years. In the previous five years, the trailing was -5% and 9% respectively. Many papers found that inflation correlates with stock prices and the required rate of return, Boucher (2005), Shiller (2007), Sharpe (2002), Campbell and Vuolteenaho (2004). The decreasing inflation rate led to decreasing interest rates and bond yield or risk-free rate, leading to a decrease in the required return rate. These mispricing events could affect the volatility in the PE ratio leading to poor predictability performance.

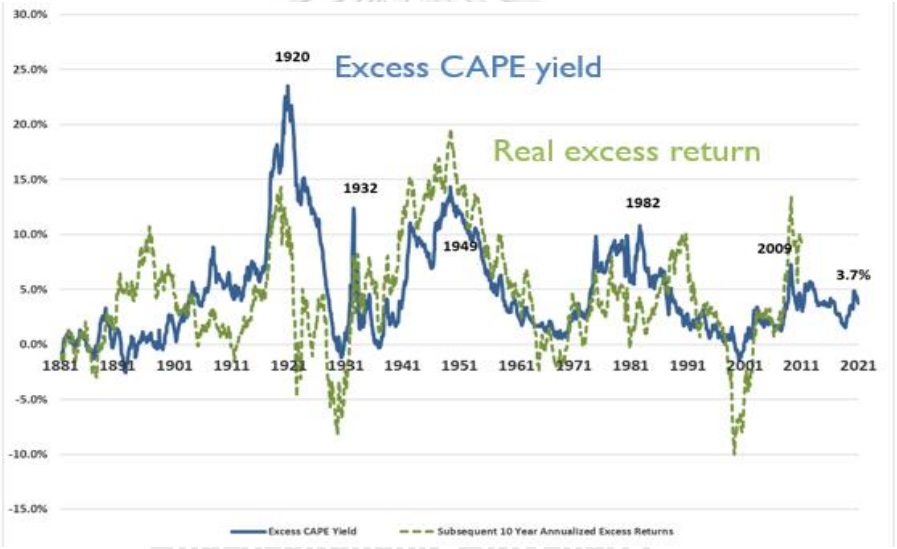
Figure 2: Correlation between 10Y US treasury yield and US core inflation rate



Source: Raw data from www.investing.com

Campbell and Shiller (1988, 1998, 2001) and Shiller (2005) have come up with a cyclically adjusted price-earnings ratio (CAPE) to predict the overall excess return of the US stock market. The results are promising; the study proved that CAPE is robust to changes in inflation level. The CAPE is different from PE in terms of the earning that must be 10-years of average earning adjusted by inflation. The price components are also adjusted with inflation into the real price. By using CAPE, the price-earning ratio's fluctuation from earnings volatility during different business cycles would be controlled. The PE ratio has higher volatility than CAPE because when the economy is good, the company has higher earnings which tend to keep the PE ratio at a low level. On the other hand, the PE ratio is maintained at a high level because of lower earnings during the bad economic condition. Jeremy Siegel (2016) also studied CAPE, which he suggested that CAPE could be used to predict the US market return. The study found that the variation of long-term equity return could significantly be explained by using

Figure 3: Correlation between Subsequent 10Y annualized excess return and Excess CAPE yield



Source: Shiller's ie_data.xls

Contribution:

For the literature, prior research has proved that inflation affects the required rate of return, which could lead to mispricing. There is also the research on forecasting ability on the market return by using a financial ratio like price to earnings ratio, which could be inverted into earning yield. The study found that the performance of forecasting varies between different periods. The CAPE, the adjusted PE ratio, has been created to forecast the return of the market, which has been proved that the performance is more promising compared to PE. All those studies are mainly based on the US stock market, which has a history of more than 100 years. This paper wants to extend those outcomes with the Thailand stock market to see whether the conclusion is the same in another market where the foundation is different so that the theory could be said consistently through these two markets. Right now, the CAPE is studied on the market and sector scale. This study also wants to try to adapt this ratio to the scale of stock level.

For the practical, PE ratio has been used as a tool for both analysts and investors to forecast the market return for so long. It is also used as a tool to say whether the stock is cheap or expensive. The prior research shows that the performance of using this ratio to forecast varying between different periods, so it may be good if the users know which period the ratio should be used. Or if they have other tools that consistently over time, like the CAPE ratio, this could benefit them a lot in terms of practical investment.

3. Literature review

PE ratio is a significance ratio used to forecast stock price, especially for predicting changes in future stock prices, Campbell, and Shiller (1998). This is sound with the current practical use of PE ratio for forecasting and implicitly telling the expensiveness of stocks. Welch and Goyal (2008) studied the empirical performance of early 2006 of equity premium prediction. The study evaluated many forecasts of financial variables, including earning-price ratio, using linear and non-linear models, times-periods, and estimation frequencies. For in sample, the outcome showed the coefficients were mostly significant at the level of 95% and the model's goodness of fit ($\bar{R}^2$) were different in which depending on the observed times-periods. The results also show that PE with more extended averaged earnings has better predictability performance. The performance of PE is also better with long-term prediction.

Another factor that could affect the PE ratio is inflation. Boucher (2005) showed a strong relationship between the earning-price ratio and the inflation level. Most of the rise in equity ratios witnessed since 1982 can be explained by the decrease in inflation since the early 1980s. The calculated cointegrating coefficients imply that a one percentage point reduction in real inflation is correlated with a 10 percent drop in the earnings-price ratio and thus in real stock prices. The data collection consists of findings on a quarterly basis from the fourth quarter of 1951 to the second quarter of 2003 and based on the US market. Shiller (2007) found that lower nominal interest rates were also a factor in the comparatively higher asset prices because of the effect of money illusion. In the time of declining inflation, people would predict that nominal interest rates will fall and use this rate to discount the dividend into a higher price which is the action that does not sound with economic theory. Sharpe (2002) found that one percentage point increasing of expected inflation also led to an increasing approximately one percentage point of required real stock return, which would affect stock prices to decline around 20%. The expected inflation does not seem to have a significant effect on the long-run equity premium since long-term Treasury yields are already included in the inflation factor in expected real stock returns. Campbell and Vuolteenaho (2004) also found that almost 80% of the time-series variation in stock market mispricing can be explained by the level of inflation, which consistent with the hypothesis of Franco Modigliani and Richard A. Cohn, 1979 that without considering the effects of time-varying inflation, the stock market improperly anticipates past nominal growth rates.

Does this mean if PE is controlled for the earnings volatility and effect from inflation, is performance better? Campbell and Shiller (1988) found that the CAPE ratio was very effective in forecasting US stock market return. The ratio was also used in

Campbell and Shiller (1998, 2001) and Shiller (2005) as a tool to study the dynamic of the US stock market, and the ratio has been proved that it is robust to inflationary changes. Furthermore, Bunn and Shiller (2014) have improved this methodology to not robust only to inflationary changes but also to changes in corporate payout policy. In this paper, they have extended the predictability performance to the US stock sector level. The CAPE ratio's predictability performance was proved to be effective not only in each sector but also has the potential to forecast relative return across the sector by using the relative CAPE indicator. Siegel (2016) studied the predictability power of CAPE ratio on US market return which varied with different US accounting standards. The outcome was promising, indicating that 35% of the variation of 10-years real equity returns can be explained by using the CAPE ratio. The result could be better if the observed earning were consistent and uniform conventions across time, which was not because of the regularly changing US accounting standard.

Hypothesis

Hypothesis 1

The predictability of CAPE is better than the PE ratio since CAPE already covers the earnings volatility factor by using more extended averaged earnings. In the short period, earnings volatility could be very high, causing the PE to fluctuate. For example, companies have high profit margins and earnings during economic expansions, causing the PE to decrease to a low level. On the other hand, during recessions, the earnings are low. Thus, the PE ratio becomes higher. CAPE use more extended period averaged earning to make sure that it has covered earnings in a different economic situation that the volatility of earnings could not affect the value of CAPE. CAPE is also adjusted with inflation. Campbell and Shiller (1998, 2001) and Shiller (2005) state that CAPE is robust through inflationary changes.

Hypothesis 2

The increasing earnings growth volatility affects the increase of the difference in the predictability of CAPE and PE since CAPE has controlled earnings volatility by using averaged earnings in a longer period, making its performance more consistent through the business cycle. Welch and Goyal (2008) found that the predictability of PE was good during 1943 – 2002, which according to Figure 1, shows that the annual earnings growth volatility is lower than in another period with low predictability.

Hypothesis 3

Growth stocks affect the difference in the predictability of CAPE and PE due to the more uncertainty of expected cash flow, leading to an error during valuation. Growth stock has a characteristic of very low cash flow today but is expected to have a high cash flow growth in the future. Thus, the mispricing of growth stock could be more significant if comparing to the value stock.

Hypothesis 4

In the period of low inflation, have less difference in the predictability of CAPE and PE. To follow the first hypothesis, since CAPE is PE that is already adjusted by

inflation, the lower the inflation rate means, the smaller CAPE adjusted with inflation from traditional PE.

Hypothesis 5

The level of earnings-per-share data perfection has an effect on the predictability of CAPE and PE. The higher the integrity of earning-per-share data should provide better predictability for CAPE. So, as imperfect data of CAPE increase, the difference in predictability performance between CAPE and PE should decrease because it makes the value of CAPE more approaching to PE.

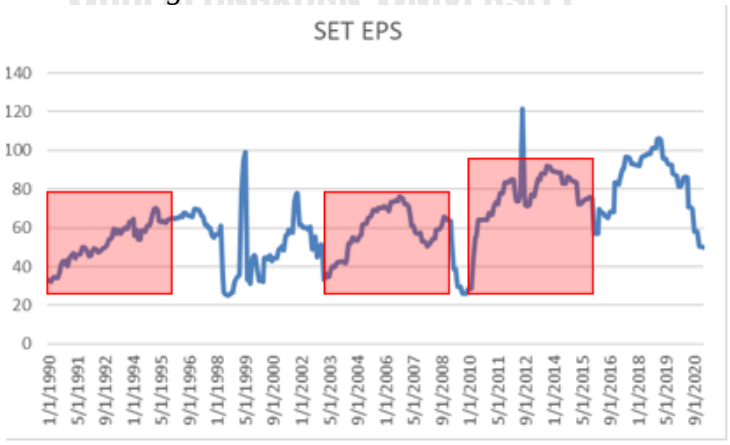
4. Data

The data required is all stocks in Thailand under the SET index since 1994-2020 with monthly frequency. The paper covers only the stocks with available data since 1994. The stocks that get in SET after 1994 are not included in this paper. From this constraint, 223 stocks in SET are observed in this study.

$$CAPE_t = \frac{P_t\left(\frac{CPI\ based\ month}{CPI_t}\right)}{\left(EPS_t\left(\frac{CPI\ based\ month}{CPI_t}\right)+EPS_{t-1}\left(\frac{CPI\ based\ month}{CPI_{t-1}}\right)+\cdots+EPS_{t-60}\left(\frac{CPI\ based\ month}{CPI_{t-60}}\right)\right)/60} \quad (1)$$

Normally CAPE used ten years of averaged earnings to predict ten years market return. But due to data limitations here in Thailand, in this paper, the earnings will be five years averaged earnings and will be used to predict three years stock return. The paper uses averaged earnings as five years because, from the data of SET earnings, the business cycle in Thailand seems to be around five months, as in Figure 4. The reason for predicting a return in the next three years is because the predicting period of Thai analysts is usually between 3-5 years. Since risk–free rate data or 10-years government bond interest rate had been recorded for the first time in September 1999. Therefore, the rate from January to August 1999 are calculated by a rolling method.

Figure 4: SET EPS Historical Data



Source: Datastream

Figure 5: All required data

DATA	Notation	Description	Unit	Source of data
PE ratio	PE	Stock price over trailing 12 months earnings per share	-	Datastream
Earnings per share	EPS	Earnings per share of each stock	Baht/Share	Datastream
Risk-free rate	rf	The 10-Year yield on Thai government bond	% pa	Thaibma
Stock price	P	Price of each stock	Baht/Share	Datastream
Market to book ratio	M/BV	Value of market cap over book value	-	Datastream
Dividend yield	DIV	Value of dividend yield	%	Datastream
Thailand core inflation	inf	Inflation level in Thailand excluding raw food and fuel	% pa	Datastream
Thailand consumer price index	CPI	The consumer price level in Thailand	points	Datastream
Cyclically adjusted price to earnings ratio	CAPE	PE ratio adjusted by inflation	-	Data Construction
Real stock excess return	SER	Real stock price return minus risk-free rate (risk premium)	% pa	Data Construction
Excess CAPE yield	ECAY	Inverted CAPE minus risk-free rate	% pa	Data Construction
Excess PE yield	EPEY	Inverted PE ratio minus the risk-free rate	% pa	Data Construction
Earnings growth volatility	egv	A variance of annual earnings growth in each period	% pa	Data Construction
The dummy of perfect data for calculating earnings growth volatility	full	The dummy has a value equal to 1 if there is no defect in the data to calculate earnings growth volatility	-	Data Construction
Growth stock dummy	growth	If stock is defined as growth stock more than 50% of the period, growth will equal 1. The characteristic of growth is defined as 30% top M/BV and 30% bottom dividend yield.	-	Data Construction
Low core inflation level dummy	lowinfla	Define as low when the annualized core inflation in the studied period less than the average annualized inflation during Jan 1999 – Dec 2017.	-	Data Construction
Imperfect data of earnings-per-share	imperfect	is equal to a sum of undefined earnings-per-share divided by the total amount of earnings-per-share required to calculate CAPE from each CAPE calculation	-	Data Construction

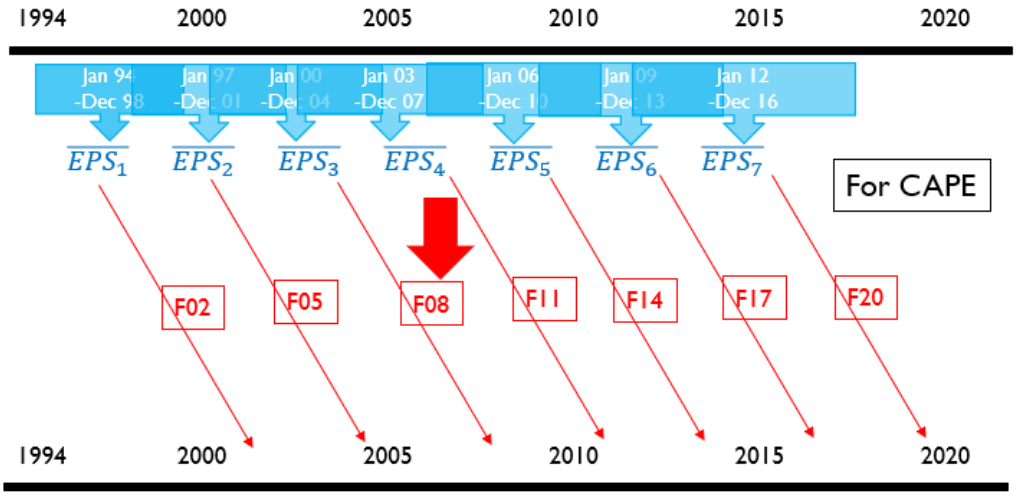
5. Methodology

The first step of this study is to see the predictability or performance of PE ratio and CAPE. An independent lagged is regressed on each stock's excess rate of return. This model is also used to study predictability on risk premium in Welch and Goyal (2008).

$$SER_t^i = \gamma_0 + \gamma_1\left(ECAY_{t-36}^i\right) + \varepsilon_t \qquad (2)$$

$$SER_t^i = \gamma_0 + \gamma_1\left(EPEY_{t-36}^i\right) + \varepsilon_t \qquad (3)$$

Figure 6: Predictability regression infographic (Equation (2))



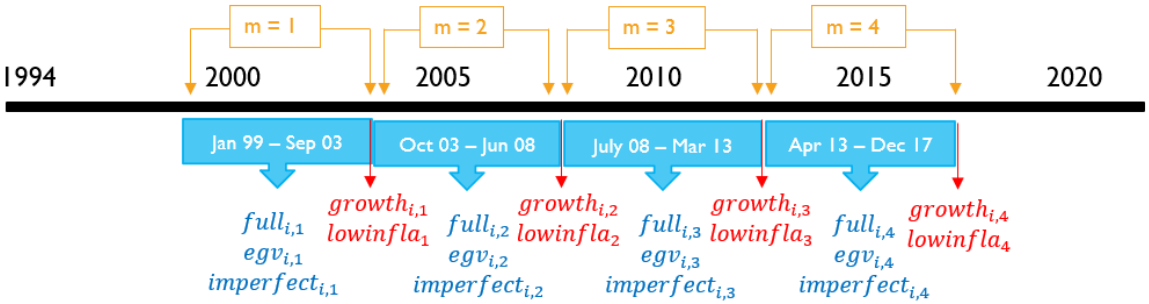
SER is defined as a stock excess return, while ECAY and EPEY are excess CAPE yield and excess PE yield, respectively. By regressing equation (2) and (3), the predictability of each one will be presented in the term of $\bar{R}^2_{PE}$ and $\bar{R}^2_{CAPE}$. Next step, the paper will study the factor that could affect the predictability performance of PE and CAPE by looking at $\bar{R}^2_{PE}$ and $\bar{R}^2_{CAPE}$.

The second step, to study the factor that affects the predictability between both ratios, the difference in the outcome from the first step will be regressed with factors hypothesized to create volatility in predictability performance.

$$(\bar{R}^2_{CAPE} - \bar{R}^2_{PE})_{i,m} = \beta_1(full)_{i,m} + \beta_2(egv * full)_{i,m} + \delta(growth)_{i,m} + \emptyset(lowinfla)_m + \gamma(imperfect)_{i,m} + \alpha_i + U_{i,m} \qquad (4)$$

The regression is set as in Figure 7, where each factor is observed through a different window of the study.

Figure 7: Panel regression infographic (Equation (4))



The difference in the predictability of CAPE and PE are regressed on a dummy of perfect earnings for ***egv*** calculation called ***full***, annual earnings growth volatility interact with ***full*** dummy, dummy of a growth stock, dummy of low inflation, and the portion of imperfect earnings to calculate CAPE to study the impact of each factor. The studied period is separated into four windows with an equally distributed adjusted R-squared of 57. Since this paper starts to gather the data from Jan 1994, the total CAPE and PE used to predict the next three years' real return are 228 for each CAPE and PE in each stock (Jan 1999 – Dec 2017). The number 57 comes from equally separate the CAPE and PE into four windows which are 228 divided by 4.

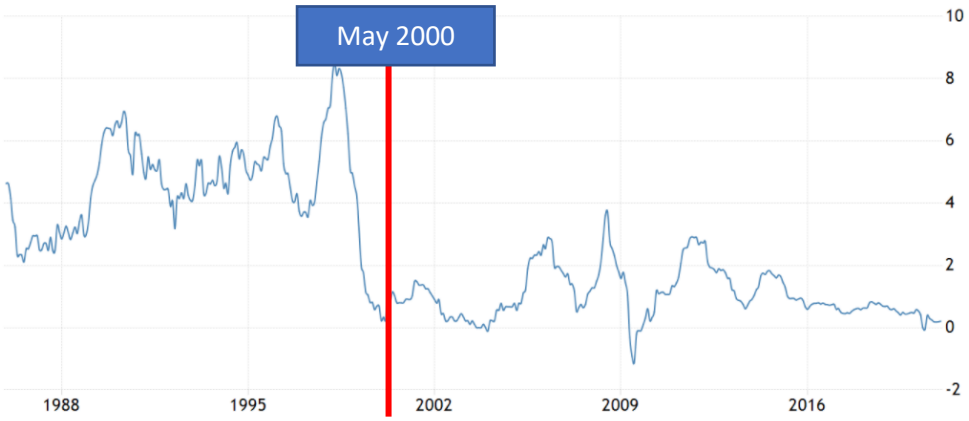
From Fama and French (1996), the characteristics of stocks are observed by size and book to market value. Harris and Marston (1994) also used the same method to define the characteristic of growth or value stock. The 30% of stocks with the highest M/BV were defined as growth stocks. The 30% of stocks with the lowest M/BV were defined as value stocks. This study also adds more sources of data to determine the growth characteristic. Typically growth stocks tend to provide no dividend or very low dividend because they must use their profit to reinvest in growth opportunities. So, the 30% of stocks with the lowest dividend yield are assumed to potentially has growth characteristic. If the stock is in the 30% with the highest M/BV and the 30% with the lowest dividend yield more than 50% in window m, the stock is defined as growth, and the value of growth will be equal to 1.

Figure 8: Fama French's definition for growth and value stocks

	Size		
Market to Book Ratio	Small	Medium	Big
High (Growth stocks)	S/H	M/H	B/H
Medium	S/M	M/M	B/M
Low (Value stocks)	S/L	M/L	B/L

The ***lowinfla*** is equal to 1 if the annualized inflation in the window m is below average annualized inflation during January 1999 – December 2017. According to the data from DataStream, the annualized inflation rate in the first and fourth windows are below average, which will give the value of ***lowinfla*** to be 1. The ***lowinfla*** of the second and third windows will be 0 since the annualized inflation rate is higher than the average. Noted that in May 2000, Thailand changed its monetary policy to control the level of inflation within the country.

Figure 9: Thailand core inflation rate



Source: Tradingeconomics.com / Bureau of Trade and Economic Indices, Thailand

The ***imperfect*** is equal to a sum of undefined earnings-per-share divided by the total amount of earnings-per-share required to calculate CAPE from each CAPE calculation. For a clearer picture, in one window, there is 57 CAPE. For each CAPE, there are 60 earnings-per-share required; if there is only 50 earnings-per-share available for CAPE of Jan 1999, the portion of this month's imperfect data will be (60-50)/60 = 0.167. The paper does this with 57 CAPE in each window and then sums them up to get the value of ***imperfect***.

After every model is regressed, the discussion must take place to see which factors impact the predictability performance. In this study, five main hypotheses are observed and could be explained by these coefficients.

Hypothesis 1: $\mu_{\bar{R}^2_{CAPE}}$ is more than $\mu_{\bar{R}^2_{PE}}$, from equation (2) and (3)

Hypothesis 2: the $\beta 1$ and $\beta 2$ in the equation (4) regression is more than 0.

Hypothesis 3: the δ in the equation (4) regression is more than 0.

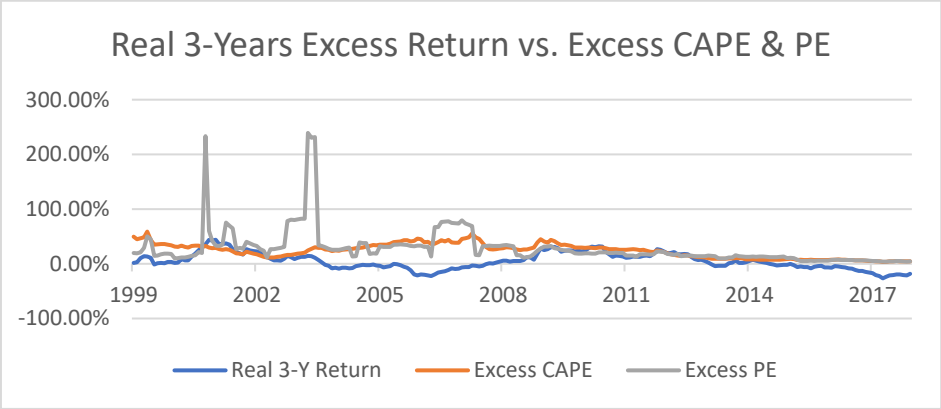
Hypothesis 4: the $\emptyset$ in the equation (4) regression is less than 0.

Hypothesis 5: the γ in the equation (4) regression is less than 0.

6. Empirical Results

From equations (2) and (3), the regression found that the predictability of CAPE is better than PE for stocks in Thailand both on average and throughout the four periods of study. Noted that stocks' earnings-per-share used in the calculation may not be equally balanced through every stock due to data limitation, but this concern is already controlled by the factor ***imperfect*** in equation (4).

Figure 10: Relation between the real 3-years excess return versus the excess CAPE and PE



The figure above shows the relation between the real 3-years averaged Thai stock return with the averaged excess return of CAPE and PE. The predictability of CAPE seems to be a lot better during 2000 – 2003 (after the financial crisis). On the other hand, the difference in predictability between CAPE and PE has decreased after 2003.

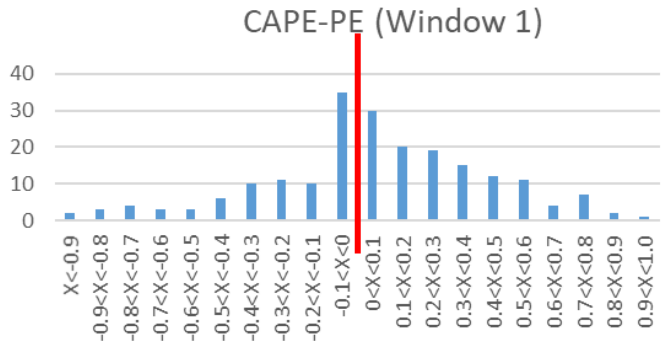
Table 2: Difference of Adjusted R-squared Between CAPE and PE

Adjusted R-squared (CAPE - PE)					
	MAX	MIN	AVG	SD	P-value
Window 1	0.9804	-0.9635	0.0593**	0.3694	0.0107
Window 2	0.9012	-0.8690	0.1244***	0.3241	0.0000
Window 3	0.9549	-0.8591	0.1641***	0.3225	0.0000
Window 4	1.2828	-0.8786	0.1148***	0.3689	0.0000
Overall	0.6619	-0.8467	0.0229*	0.2151	0.0569

Significance levels at 10%, 5%, and 1% are denoted by one, two, and three stars, respectively

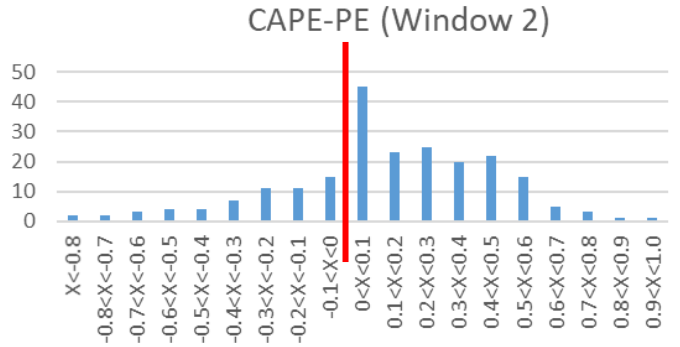
On average, the adjusted R-squared of CAPE is 0.0229 higher than PE at a significance level of 10%. The predictability of CAPE is also better through every window, but only the significance level that different. In the first window, the predictability of CAPE is better off PE by 0.0593 with a significance level of 5%. The second, third and fourth are better off by 0.1244, 0.1641, and 0.1148, respectively, with all, have a significance level of 1%.

Figure 11: Difference in adjusted R-squared from the first regression between CAPE and PE (Jan 1999 – Sep 2003)



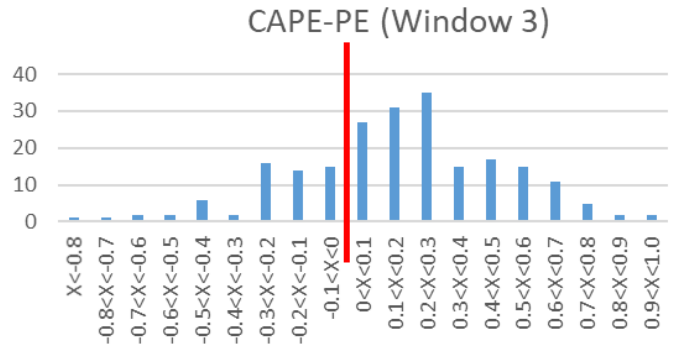
Window 1	
Max	0.980391
Min	-0.96347
AVG	0.059347
SD	0.369407

Figure 12: Difference in adjusted R-squared from the first regression between CAPE and PE (Oct 2003 – Jun 2008)



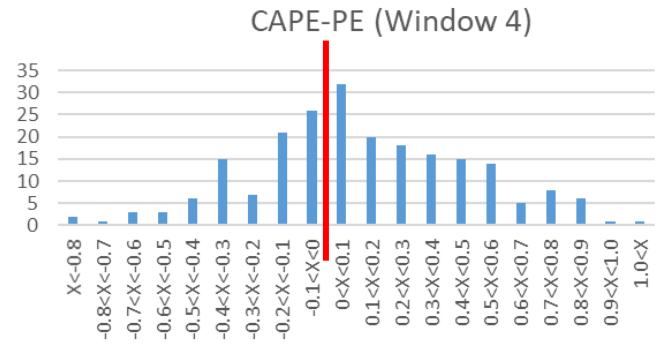
Window 2	
Max	0.901208
Min	-0.86903
AVG	0.1244
SD	0.32407

Figure 13: Difference in adjusted R-squared from the first regression between CAPE and PE (Jul 2008 – Mar 2013)



Window 3	
Max	0.954944
Min	-0.85909
AVG	0.164104
SD	0.322496

Figure 14: Difference in adjusted R-squared from the first regression between CAPE and PE (Apr 2013 – Dec 2017)



Window 4	
Max	1.282833
Min	-0.87862
AVG	0.114826
SD	0.36893

The figures above show distributions of an adjusted R-squared spread between CAPE and PE in 4 different windows of study. The values are denser on the positive side of distribution throughout all different periods, which mean CAPE outperforms PE through all different periods of study, but the performance of CAPE is much better in the second and third period during October 2003 – March 2013 with the lower average and standard deviation.

For equation (4), the result found that ***full*** and ***egv*full*** have an insignificant negative effect on the predictability performance. The ***growth*** has the highest impact on predictability with the coefficient of 0.1197 and significance level at 5%, while ***lowinfla*** has a coefficient of -0.0566 with the same significance level. The ***imperfect*** has the lowest impact on predictability; its coefficient is -0.0057 but has the highest significance level at 1%.

Table 3: The panel regression result for Equation (4)

Variable	Standard model	Model with Only egv	Model with growth separated to div & mktbv	Model with inflation in value instead of dummy
full	-0.0523 (-1.43)		-0.0504 (-1.36)	-0.0590 (-1.59)
full x earning growth volatility	-0.0003 (-0.22)		-0.0003 (-0.21)	-0.0003 (-0.27)
earnings growth volatility		-0.0000 (-0.12)		
growth	0.1010** (2.06)	0.1056** (2.15)		0.0987** (2.00)
market to book			0.0047 (0.14)	
dividend yield			0.0592 (1.31)	
low inflation	-0.0561** (-2.43)	-0.0555** (-2.40)	-0.0532** (-2.28)	
inflation in full value				4.7588** (2.02)
imperfect	-0.0052*** (-3.76)	-0.0042*** (-3.45)	-0.0056*** (-3.53)	-0.0054*** (-3.91)
No. of Observations	857	857	857	857
No. of Groups	223	223	223	223
F-Value	4.54***	5.11***	3.36***	4.17***

Significance levels at 10%, 5%, and 1% are denoted by one, two, and three stars, respectively

7. Discussion

CAPE has better excess return predictability than PE for Thai stocks that are existing since 1999 – 2017. Even though the outcome is consistent through different periods, some factors affect the difference in the predictability of CAPE and PE.

From the result, ***full*** and ***egv********full*** seem to have an insignificant effect on the predictability. The paper also does another regression using only the ***egv*** variable to replace ***full*** and ***egv********full,*** which also provides the same result (Table 3). This may be because the data of ***egv*** are pretty similar throughout the different periods of the study. No matter the number of required EPS to calculate ***egv*** is complete or not, the volatility is usually within the range of 0 – 5 for all the windows (Appendix A, B, C, D). Therefore, the 57 months per window of study may not cover the entire business cycle, which could not provide enough different earnings growth volatility in different study windows. This rationale could be supported by the data in Figure 2 that the annual earnings growth volatility was possible to maintain at the same level for more than 30 years.

The factor growth shows a significant positive effect on the predictability performance, which agrees with the second hypothesis. The study uses two data sources to determine the growth characteristic of stock, which are 30% with the highest market to book ratio and 30% with the lowest dividend yield. The study also did a separate regression by separating growth into div and M/BV to see which factors have more effect on the predictability performance (Table 3). The outcome shows that div and M/BV are not significantly affecting the predictability performance while they are separated. They only have a significant effect when they are combined into growth factors only.

The result also shows that inflation has a significant negative effect on predictability performance, which agrees with the third hypothesis. Since CAPE is the multiple ratios adjusted with inflation while PE is not, according to the first hypothesis that the predictability of CAPE is better than PE, the difference in predictability must decrease while the inflation decreases because CAPE would have a smaller adjustment comparing to higher inflation. The study also does another regression by replacing ***lowinfla*** with the full value of inflation in that study period (Table 3). The result is robust that low inflation significantly negatively affects the difference in predictability between CAPE and PE.

The last observed factor is ***imperfect,*** which shows a significant negative effect on the predictability performance. This is also agreeable with the last hypothesis because the study expects CAPE to be better than PE. The higher integrity of CAPE data should give better predictability performance compared with CAPE with incomplete earnings-per-share data. So, the difference in predictability should be lower if ***imperfect*** increases. Since the study only covers firms that are still operating (only strong companies), the value of ***imperfect*** could also be a proxy for a time of company's difficulty because it is a time firm would have negative earnings, leading to incomplete

data to calculate CAPE. The Datastream only provides positive earnings; the negatives are replaced with zero values.

8. Conclusion

Robert J. Shiller (2005) suggests CAPE has better real excess return predictability for the US S&P index than the traditional PE ratio. This study tries to extend the research and find that the result is also consistent with Thai data, in the level of stocks, not only in the index level. But due to Thai data limitation, it could not be said the result is entirely the same because this study uses only 60 months of EPS to calculate CAPE and the forecasting period is only 3-years. In comparison, the original CAPE in Robert J. Shiller (2005) uses typically 120 months of EPS to forecast the 10-years excess return.

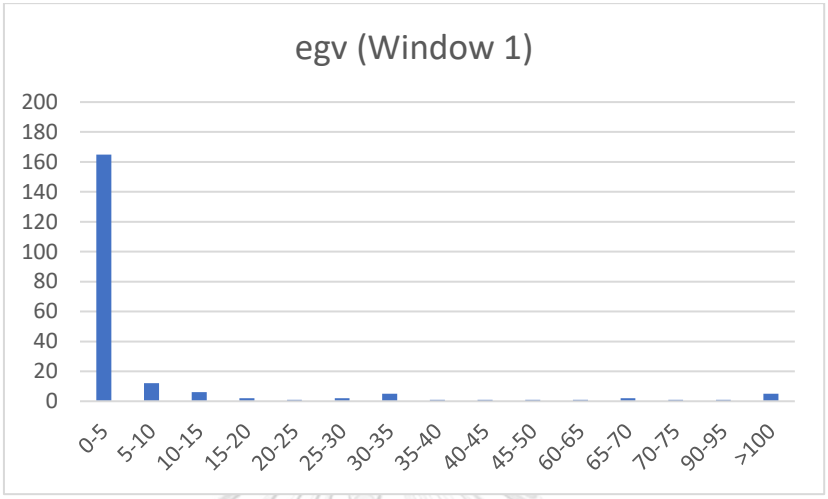
This research also studies the factors that could affect the predictability performance of CAPE by using the traditional PE ratio as the benchmark. The results find that the growth characteristic of stocks, the level of inflation, and the completeness of EPS data to calculate CAPE significantly affect the difference in predictability performance between CAPE and PE.

The contribution of this paper is to show that CAPE could be used to make excess return predictability at the stocks level and in the different market environments from the US like Thailand, which is more like an emerging market than the developed market. This also could lead to a new way of making multiple ratio valuation by using CAPE instead of PE, which is not so popular yet in Thailand, maybe because of the data limitation. But this research also shows that CAPE could be adapted to match a shorter investment period in Thailand, which could benefit investors in similar emerging markets environment who consider CAPE as their tool for making valuation in their practical investment.

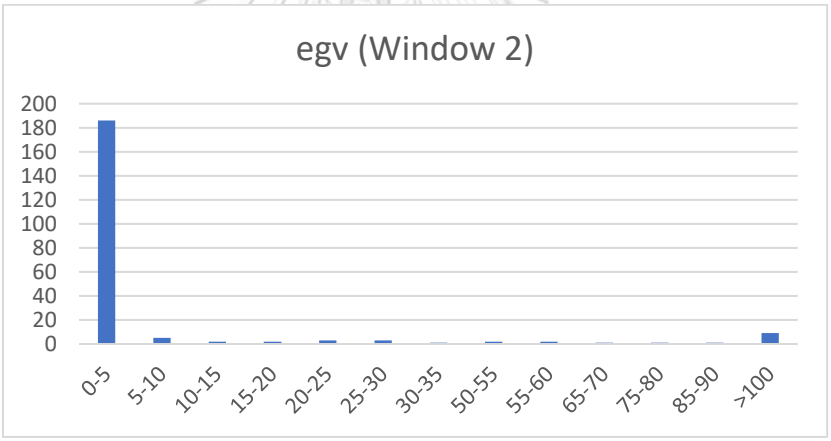
This paper only studies how well the excess CAPE and PE predict the real 3-years excess return by looking at the goodness of fit. This paper does not examine if investors who use CAPE to form their portfolio will gain a better return than PE. Further research needs to be made before trying to use CAPE in a practical investment. However, there exists a prior study by Bunn & Shiller (2014) suggesting that at the industry level, CAPE-based sector rotation portfolio yields a higher return and information ratio comparing to equally weighted strategy and the market benchmark.

Appendix

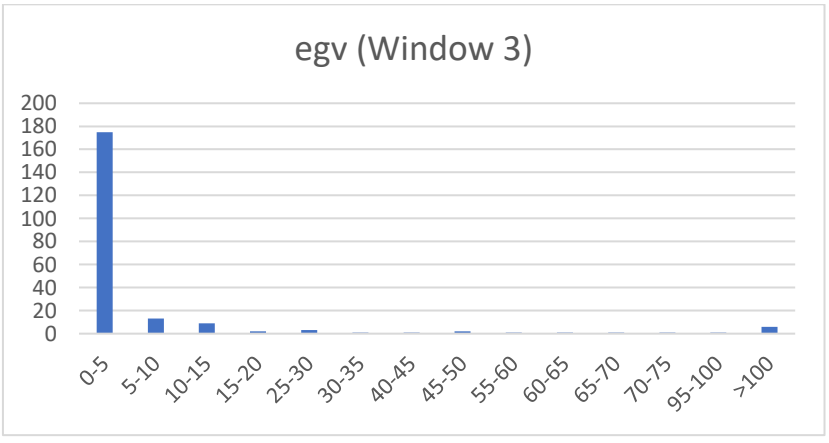
Appendix A: Earnings Growth Volatility Distribution (Jan 1999 – Sep 2003)



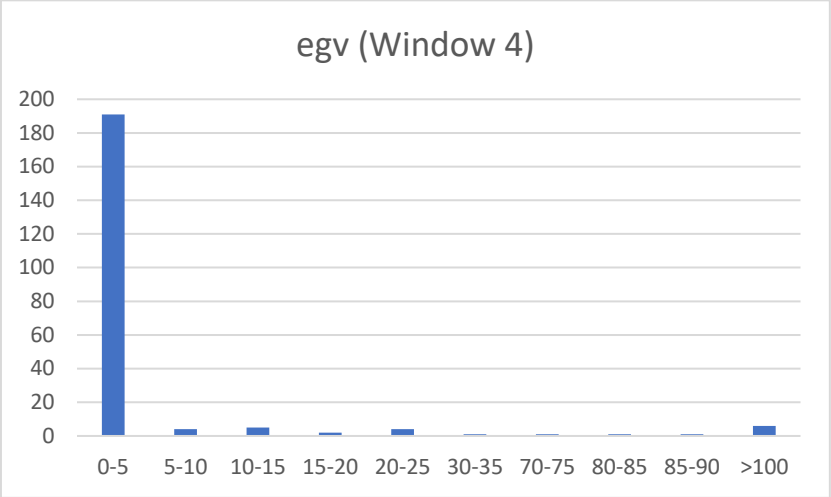
Appendix B: Earnings Growth Volatility Distribution (Oct 2003 – Jun 2008)



Appendix C: Earnings Growth Volatility Distribution (Jul 2008 – Mar 2013)



Appendix D: Earnings Growth Volatility Distribution (Apr 2013 – Dec 2017)



Appendix E: Adjusted R-squared Between Excess CAPE return and Real stock excess return

Adjusted R-squared (ECAY vs. SER)				
	MAX	MIN	AVG	SD
Window 1	0.944063	-0.0381	0.304774	0.283641
Window 2	0.912418	-0.03211	0.318266	0.244636
Window 3	0.950721	-0.01812	0.424072	0.304025
Window 4	0.973877	-0.01814	0.320753	0.296487
Overall	0.755997	-0.0045	0.169004	0.169349

Appendix F: Adjusted R-squared Between Excess PE return and Real stock excess return

Adjusted R-squared (EPEY vs. SER)				
	MAX	MIN	AVG	SD
Window 1	0.999035	-0.33327	0.249388	0.285788
Window 2	0.933301	-0.10924	0.191976	0.219417
Window 3	0.940909	-0.80449	0.261312	0.277966
Window 4	0.99616	-0.77482	0.209567	0.272544
Overall	0.944682	-0.01743	0.146137	0.181081

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