

# “The vitality of beta in the Asean stock markets”

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## The vitality of beta in the ASEAN stock markets

### Abstract

This research investigates the role of beta in estimating the stock returns in the six ASEAN markets (Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam) based on 12 years of daily data from December 2001 to December 2013. The asymmetric impact of beta on stock returns in the up and down market is analyzed through the conditional capital asset pricing model and cross-sectional regression analysis. In all markets, the impact of beta on realized returns is a flat unconditional relationship. However, when using the conditional capital asset pricing model and cross-sectional regression analysis, the evidence shows that beta and returns have negative (positive) significant relationship during the down (up) periods in Thailand, Singapore and Malaysia. The findings indicate that beta is still a useful risk measure for portfolio managers in these markets. In addition, in all markets, the role of beta is significantly asymmetric in up and down periods.

**Keywords:** asymmetry, conditional capital asset pricing model, stock investment, ASEAN markets.

**JEL Classification:** G10, G11, G12.

### Introduction

Since Black (1972), Lintner (1965) and Sharpe (1964) have given birth to the capital asset pricing model (CAPM), which expresses the returns for any asset as a positive function of a single variable, its market beta, or systematic risk, CAPM has gained popularity and has become one of the main tools in the analysis of the risk-return tradeoff of assets. After a critique by Roll (1977) came out, followed by some evidence against the validity of beta and CAPM (Lakonishok & Shapiro, 1984; Shanken, 1985), researchers in the field switched their attentions from beta to other explanatory factors, such as firm size (Banz, 1981; Reinganum, 1981; Fama & French, 1992) and bid-ask spread (Amihud & Mendelson, 1986). However, evidence supporting the role of beta is presented in the later works of Tinic and West (1986) and Black (1998). Black argued that beta is alive and well. Moreover, Black pointed out that most of the evidence against beta suffers from the data-mining problem, and that in order to minimize this problem, a simple portfolio strategy should be employed by using historical estimates of beta and using many securities to diversify out the factors not related to beta.

Although the past research studies confirm the poor performance and validity of the capital asset pricing model, recent studies show that conditional capital asset pricing is useful and is able to explain the stock returns very well in several markets. The (unconditional) CAPM was criticized heavily in the past and was said to be dead; however, recent empirical studies reveal that the modification form of CAPM (also known as the conditional CAPM) performs significantly well in several markets. The conditional CAPM perfectly holds, thus, in contrast to the widely-held belief that CAPM cannot be

empirically rejected (Levy & Roll, 2012). Since most recent empirical studies have been conducted in developed stock markets, more empirical studies on the performance of conditional CAPM are needed in order to confirm whether the conditional CAPM also performs well in developing markets, especially the stock markets in ASEAN, which have been growing and becoming more popular for international investors.

In order to develop more empirical evidence on this topic, this research aims to investigate the role of conditional CAPM in explaining the cross-sectional differences in the stock returns of the ASEAN stock markets. The main purpose of this paper is to examine whether the conditional relationship between beta and returns, which has been shown to exist in several markets, for example in the USA (Pettengill et al., 1995), UK (Fletcher, 1997), Brussels (Crombez and Vennet, 2000), Japan (Hodoshima et al., 2000), Germany (Elsas et al., 2003), Greece (Theriou et al., 2010), Turkey (Bilgin and Basti, 2014), and Switzerland (Isakov, 1999), holds for the stock markets in ASEAN as well. The asymmetric impact of beta on stock returns in up and down markets is analyzed through cross-sectional regression analysis and the conditional capital asset pricing model.

The review of related literature is presented in the next section, followed by a discussion of the data and methodology, analysis of results, and conclusion.

### 1. Literature review

Following the study of Fama and French (1992), which stated that there was a flat relationship between beta and returns, most of the recent studies have tended to counter their findings. One of the prominent studies was carried out by Pettengill et al. (1995), who developed a conditional relationship between returns and beta that depends on whether

the excess returns on the market index is positive or negative. When the excess returns on the market index is positive (negative), there should be a positive (negative) relationship between beta and returns. Later, numerous researchers applied this technique and found empirical evidence that gave rise to beta once again. Some examples of recent research are presented in the following paragraphs.

Fletcher (1997) examined the conditional relationship between beta and returns with the UK stock returns and found that there was no evidence of a significant risk premium on beta when the unconditional relationship between beta and returns was considered. On the contrary, when the sample is split into periods according to whether the excess market returns is positive or negative, there is a significant relationship between beta and returns. This relationship is stronger in months when the excess market returns is negative than when it is positive.

Fletcher (2000) studied international stock returns between January 1970 and July 1998 by using the same procedure on the monthly returns of the MSCI equity indices of 18 developed markets. Consistent with the previous research, there was a flat unconditional relationship between beta and returns. However, when the sample was split into up market and down market months, there was a significant positive relationship between beta and returns in the up market months and a significant negative relationship between beta and returns in the down market months.

Hodoshima et al. (2000) analyzed the stock market in Japan from July 1960 to December 1995. The findings showed that the regression of returns on beta without differentiating positive and negative market excess returns produced a flat relationship between returns and beta. However, when considering the difference between positive and negative market excess returns, there were significant conditional relationships between returns and beta, which was found to be in general a better fit when the market excess returns was negative than positive in terms of the goodness of fit measures.

Lam (2001) studied the Hong Kong stock market and found a strong conditional positive and negative relationship between beta and returns. The estimated risk premiums of the up and down markets were asymmetrical with the magnitude of the down market premium greater than that of the up market. Thus, under the conditional CAPM, the estimated security market line (SML) in the down market is negatively steeper than is the positively-sloped estimated SML in the up market. In general, the test results suggested that the conditional CAPM was still practically a useful equilibrium pricing model in the Hong Kong stock market.

Karacabey (2001) applied the conditional test of beta and returns to the Istanbul Stock Exchange (ISE) using data over the period of 1990-2000. The results showed that there was a conditional relationship between beta and returns, and thus beta is still valid and useful for portfolio managers and investors that want to invest in emerging markets.

Tang and Shum (2003) examined the conditional relationship between beta and returns in the international stock markets for the period from January 1991 to December 2000. Based on the returns of 13 countries, namely France, Germany, the Netherlands, the UK, Japan, Canada, and the US (the G7), Belgium, Denmark and Switzerland (three European countries), and Hong Kong, Singapore and Taiwan (three Asian countries with open stock markets) during the period from January 1991 to December 2000, the findings showed a significant positive relationship between beta and returns in up market periods (positive market excess returns) but a significant negative relationship in down market periods (negative market excess returns). These findings indicate that beta is still a useful risk measure for portfolio managers in making optimal investment decisions.

Elsas et al. (2003) conducted a study of the German stock market during the period of 1960-1995 and also found a significant relation between beta and returns. It was stated in their explanation that previous studies failed to identify this relationship probably because the average market risk premium in the sample period was close to zero. Specifically, the results showed that the portfolios with higher betas had higher returns when the market risk premium was positive and lower returns when the market risk premium was negative. The results of the conditional test thus support the conclusion that betas are related to returns in the way predicted by the theory. These results provide another justification for the use of betas estimated from historical returns data by portfolio managers.

Al Refai (2009) tested the unconditional and conditional CAPM in the Amman Stock Exchange of Jordan using portfolios which were formed based on industries. It was found that there existed a significant risk-return relationship in up markets but no significant relationship in down markets.

Theriou et al. (2010) examined the conditional relationship between beta and returns in the Greek market during 1991-2002. Similar to previous studies, the results indicated that the estimation of returns and beta without differentiating positive and negative market excess returns produced a flat unconditional relationship between returns and beta. However, when using the conditional capital asset

pricing model (CAPM) and cross-sectional regression analysis, the evidence tended to support the significant positive relationship in the up market and a significant negative relationship in the down market.

Verma (2011) also investigated the explanatory power of the conditional model using international stock returns from 18 countries for the period of 1970-1998. However, his findings were not supportive of the conditional CAPM. The results of the full sample and two subperiods were all insignificant.

Bilgin and Basti (2014) studied both the unconditional and conditional versions of CAPM in the Istanbul Stock Exchange (ISE) for the period of nine years from 2003 to 2011. The test period was divided into four sub-periods. The unconditional CAPM was rejected for the sample period. The results of the conditional test showed that there was a statistically-significant conditional relationship during some sub-periods. However, since the risk-return relationship in the up and down markets was not symmetrical, this conditional relationship did not indicate a positive risk-return tradeoff.

It can be seen from the previous research that has been conducted on numerous markets such as the UK, Japan, Istanbul, Germany, France, Germany, Greece, the Netherlands, Canada, the US, Belgium, Denmark and Switzerland, Hong Kong, Singapore and Taiwan, that most of the results consistently show that beta is still a useful risk measure for portfolio managers, and that the role of beta is asymmetric in up and down markets. However, there are still limited studies on the ASEAN stock markets, so this study aims to fill the gap by providing additional evidence of the beta-return relationship in these markets. The stock markets in ASEAN have been growing and developing in the past decades and therefore have gained more attention from both local and international investors. Investigating the role of beta on the stock returns in these markets would benefit investors in terms of understanding the factors determining the stock returns and understanding the role that the market risk plays during the up and down markets.

## 2. Data and methodology

This research focuses on the stock markets in the ASEAN community. The period under study is a twelve-year range from December 2001 to December 2013. The data contain monthly closing prices of the listed common stocks and the daily closing index of each market. Data were obtained from the Datastream database. The countries in ASEAN that had sufficient data include Indonesia, Malaysia, the Philippines, Singapore, Thailand and

Vietnam. The log returns of stock  $i$  and time  $t$  was computed based on equation (1):

$$R_{i,t} = \ln P_{i,t} - \ln P_{i,t-1} \quad (1)$$

The market returns for each stock market was also computed in the same manner. The beta of each stock was obtained from estimated regression equation (2):

$$R_{i,t} - R_{f,t} = (R_{m,t} - R_{f,t})\beta_i + \varepsilon_{i,t}. \quad (2)$$

According to equation (2), the left hand side is the excess stock returns and the right hand side is the excess market returns multiplied by beta.

Table 1. The Illustration of Beta Estimations

Sub period	Estimation period	Beta
1	Jan 2002 – Dec 2004	Jan 2005
2	Feb 2002 – Jan 2005	Feb 2005
...	...	...
108	Dec 2009 – Nov 2012	Dec 2013

Based on table 1, for each subperiod, the monthly excess stock returns and market returns in each estimation period were used to compute the beta of each stock based on equation (2).

Finally, the cross-sectional regression was estimated for each subperiod based on equation (3) and equation (4).

$$R_{p,t} = \alpha_{0,t} + \alpha_{1,t}\beta_{p,t} + \varepsilon_{p,t}. \quad (3)$$

$$R_{p,t} = \alpha_{0,t} + \alpha_{2,t}D_t\beta_{p,t} + \alpha_{3,t}(1-D_t)\beta_{p,t} + \varepsilon_{p,t}. \quad (4)$$

The number of cross-sectional regressions was equal to the number of sub periods (108), and the number of observations in each regression was equal to the number of stocks. Equation (3) is the traditional approach, which does not take into account the asymmetric impact of beta on returns during the up and down market. Equation (4) is the conditional approach, with dummy variable  $D_t$  equal to 1 when the market risk premium in the month is positive, and 0 otherwise so  $\alpha_{2,t}$  and  $\alpha_{3,t}$  are the coefficients that represent the impact of beta during the up and down market, respectively.

The significance of each coefficient was tested using  $t$ -statistics based on the Fama-Macbeth approach following equation (5).

$$t(\alpha_i) = \text{mean}(\alpha_i) / [\sqrt{n} \times \text{sd}(\alpha_i)], \quad (5)$$

where  $n$  is the number of cross-sectional regressions. Then, in each subperiod and each stock market, the following hypotheses were tested.

$H_0: \alpha_1 = 0$  against  $\alpha_1 \neq 0$ ;

$H_0: \alpha_2 = 0$  against  $\alpha_2 > 0$ ;



$H_0: \alpha_3 = 0$  against  $\alpha_3 < 0$ ;

$H_0: \alpha_2 - \alpha_3 = 0$  against  $\alpha_2 - \alpha_3 \neq 0$ .

For the last  $H_0$ , the sign of  $\alpha_3$  needs to be reversed and the average value recalculated in order to test the symmetry (Fletcher, 1997).

### 3. Analysis of results

Table 2 shows the average monthly market returns in each market during the 108-month test period from January 2005 to December 2013. It also shows the comparison between the average returns during the down markets and up markets. In most markets, there existed a greater number of positive market returns periods, suggesting that the unconditional correlation between beta and realized returns would produce bias in finding a systematic relationship, and that the segmentation of the period into 'up' and 'down' periods should be employed. According to Table 2, the average monthly returns during up markets was between 2.73% (Malaysia) to 8.28% (Vietnam). The average monthly returns during down markets are between -7.39% (Vietnam) to -3.08% (Malaysia). It can be seen that Malaysia had the lowest absolute average monthly returns in both up and down markets, whereas Vietnam exhibited the highest absolute average monthly returns in both cases.

Table 2. Average monthly stock returns

		All months	Down markets	Up markets
Thailand	N	108	42	66
	Average return	1.1328%	-5.2642%	5.2037%
Singapore	N	108	40	68
	Average return	0.4548%	-4.7528%	3.5181%
Indonesia	N	108	35	73
	Average return	1.3620%	-6.0499%	4.9156%
Malaysia	N	108	39	69
	Average return	0.6308 %	-3.0756%	2.7257%
Philippines	N	108	38	70
	Average return	1.1307%	-5.1337%	4.5313%
Vietnam	N	108	52	56
	Average return	0.7351%	-7.3867%	8.2767%

Table 3 shows the results of regressing the unconditional model in equation (3). The 108 coefficients estimated in the 108 monthly cross-sectional regressions were averaged and used to compute the  $t$ -test in order to test the first hypothesis ( $\alpha_1 = 0$  against  $\alpha_1 \neq 0$ ). The beta coefficients were positive in Thailand and the Philippines but they are negative in Singapore, Indonesia, Malaysia and Vietnam. The results for the unconditional relationship between beta and realized returns were insignificant in all markets. If the conditional model performs well, it implies that the positive and negative beta coefficients during the up markets and

down markets cancel each other out, resulting in an insignificant beta coefficient in the unconditional model. This is consistent with previous studies in the stock markets in other regions of the world.

Table 3. The statistics from the unconditional model (all periods)

	Coefficient	$t$ -statistics	$p$ -value
Thailand	0.0008	0.0635	0.4748
Singapore	-0.0042	-0.4272	0.3351
Indonesia	-0.0111	-0.2936	0.3848
Malaysia	-0.0032	-0.5440	0.2938
Philippines	0.0034	0.1932	0.4236
Vietnam	-0.0024	-0.1906	0.4246

Table 4 illustrates the results of the conditional model in equation (4). All of the months in the entire sample period were classified into up and down periods according to Table 2 in order to test the second and third hypotheses ( $\alpha_2 = 0$  against  $\alpha_2 > 0$  and ( $\alpha_3 = 0$  against  $\alpha_3 < 0$ ).

The results regarding the conditional relationship between beta and realized returns were significant in the stock markets in Thailand, Singapore and Malaysia. This is consistent with previous research conducted in the UK, Japan, Istanbul, Germany, France, Germany, Greece, the Netherlands, Canada, the US, Belgium, Denmark and Switzerland, Hong Kong, Singapore and Taiwan (as mentioned in the literature review). On the other hand, the relationship between beta and realized returns was insignificant in Indonesia, the Philippines and Vietnam.

Table 4. The statistics from the conditional model (down periods and up periods)

	Down periods	Up periods
Thailand	-3.4372 (0.0007)**	2.2713 (0.0132)*
Singapore	-3.2662 (0.0011)**	1.2429 (0.1091)
Indonesia	-1.0990 (0.1396)	0.0983 (0.4610)
Malaysia	-2.7275 (0.0048)**	0.6920 (0.2456)
Philippines	-1.0345 (0.1537)	0.8686 (0.1940)
Vietnam	-0.8848 (0.1902)	0.4102 (0.3416)

Note: the table shows the  $t$ -value with the  $p$ -value in parenthesis. \*\* denotes a 1% significance level and \* denotes a 5% significance level.

Table 5 presents the results of the two sample  $t$ -tests for the last hypothesis ( $\alpha_2 - \alpha_3 = 0$  against  $\alpha_2 - \alpha_3 \neq 0$ ). The statistics revealed that the mean value of coefficients during the down periods was significantly different from the mean value of coefficients during the up periods. These results indicated that there was a significant asymmetric effect of beta on the realized returns during the up and down periods in all markets.

Table 5. The statistics from the two sample *t*-tests

	Mean (down)	Mean (up)	<i>t</i> -value	<i>p</i> -value
Thailand	-0.0415	0.0275	7.5986 **	1.75e-10
Singapore	-0.0543	0.0252	7.1025 **	3.42e-10
Indonesia	-0.0396	0.0026	3.7080 **	0.0005
Malaysia	-0.0225	0.0078	6.6964 **	1.25e-09
Philippines	-0.0193	0.0159	-4.7042 **	1.15e-05
Vietnam	-0.0479	0.0299	-3.4702 **	0.0008

Note: \*\* denotes a 1% significance level.

According to Table 5, the coefficient means during both up and down periods had the expected signs in all markets. Stocks with higher betas had higher returns during the up markets but lower returns during the down markets.

## Conclusion

The results from the unconditional model show a flat relationship between the beta and realized returns in all markets. This is consistent with the previous literatures that tested this hypothesis in other stock markets. Moreover, most markets exist more number of positive market returns periods

suggest that the unconditional correlation between beta and realized returns would produce bias in finding a systematic relationship, and that the segmentation of the period into 'up' and 'down' periods should be employed. Therefore, the conditional model would be more appropriate than the unconditional model. The results from the conditional model that separated the down and up periods showed that the beta-realized returns relationship was significantly positive during up markets and negative during down markets in Thailand. This is consistent with previous studies by Pettengill et al. (1995), Fletcher (2000), Hodoshima et al. (2000), Lam (2001), Karacabey (2001), Tang and Shum (2003), and Elsas et al. (2003), which have been conducted in other stock markets. The results from the conditional model in Singapore and Malaysia showed that the relationship between beta and realized returns was significant only in the down periods. This is consistent with the evidence from the Greek market by Theriou et al. (2010). However, the relationship between beta and realized returns was insignificant in both up and down periods in Indonesia, the Philippines and Vietnam.

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