TIME-VARYING RELATIONSHIP BETWEEN CORPORATE GOVERNANCE AND EXPECTED STOCK RETURNS

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Abstract

This paper aims to analyze a time-varying relationship between corporate governance and expected stock returns in Thailand. The time variation of corporate governance premium is estimated by macroeconomic determinants using a two-state Markov switching model. The results indicate the presence of asymmetries in the variations of corporate governance premium over the Thai economic cycles. Investors can take advantage of the time-varying characteristics with the adaptation of switching investment strategy. Incorporation of style switching strategy with value premium in recessions and momentum premium in expansions improves expected returns of corporate governance-sorted portfolios.

Keywords: Corporate Governance, Markov Switching Model, Switching Investment Strategy, Value and Momentum Premiums, Thailand

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1. INTRODUCTION

This study analyzes a time-varying relationship between corporate governance and expected stock returns. Based on an assumption that expected returns of portfolios sorted by the corporate governance rating are regime-dependent, my goal is to seek an optimal switching investment strategy that outperforms a simple buy-and-hold investment. The optimal investment strategy is further analyzed whether combing with value and momentum risk factors can improve the returns to investors. The motivation for this research stems from mixed results of the previous researches regarding the influence of the quality of firms' corporate governance on operating performance and valuation. It's intuitive to presume that good governance at a firm positively affects its operating profits and value creation to investors. This theory is in line with the conclusion of Gompers et al. (2003), Drobetz et al. (2004), Bebchuk et al. (2008), Ammann et al. (2011). On the contrary, Core et al. (2006) and Bhagat and Bolton (2008) claim that, while weak shareholder rights lead to a lower operating outcome, they do not cause poor stock returns and governance measures are not correlated with future stock returns. Core et al. (2006) argue that a positive relationship between corporate governance and stock performance is rather period-specific, which hints that expected returns from corporate governance are non-linear and a regime-switching model may be a better fit. The results of Bauer et al. (2003) also indicate that good corporate governance does not necessarily increase firm value, and depending on the tested year, the relationship can be negative.

Time-varying returns are captured by Markov switching model, which the previous researches suggest its capability of fitting well-documented risk premiums such as size, value, and momentum. Markov switching model is hypothesized to be applicable for tracing the relationship between corporate governance and its expected returns. Unstable, or time-varying stock returns can be attributable to a change in a macroeconomic environment. Following Chen et al. (1986) who argue that stock returns are not captured by a standard CAPM but rather by macroeconomic variables, numerous studies attempt to find out whether the excess returns from the size, value, and momentum

are result of variations in economic conditions (Perez-Quiros & Timmermann, 2000; Ammann & Verhofen, 2006; Black & McMillan, 2005; Ozoguz, 2008; Gulen et al., 2011; Kim et al., 2014; Sarwar et al., 2017). What their studies have in common is that the three risk premiums are indeed time-varying, and the stock returns' sensitivity to the macroeconomic variables depends on economic states or regimes which are identified by Markov switching model. Introduced by Hamilton (1988), Markov switching model permits to shift from one regime to another and provides probabilities of such transitions (Sarwar et al., 2017). Advantages of employing Markov switching model are that it provides flexible filter to extract the hidden regimes from observed data as well as characterizes the development of regimes shifts to the economic cycle (Chung et al., 2012).

The previous literature points out that differences in the regimes are remarkably apparent in volatility. One is high variance regime which often overlaps with the period of economic recession announced by public entities such as NBER (the National Bureau of Economic Research) in the U.S.A. while the other is low variance regime which is associated with expansion state. From the previous researches, two findings draw particular interest. The first is that value stocks are counter-cynical (Chen et al., 2008; Gulen et al., 2011) while momentum stocks are pro-cynical (Kim et al., 2014). In other words, value stocks do well during recession whereas momentum stocks excel during expansion. The second is that macroeconomic variables impact on stock returns significantly more during the recession than during expansion, which is to say returns from the size, value, and momentum risk premiums are asymmetric between the two regimes. The coefficients of macroeconomic factors tend to be greater during the recession.

This research provides the following two novel findings to the literature. First, based on the time-varying characteristic of expected returns from the quality of corporate governance, an optimal investment strategy with switching between portfolios of different governance levels and risk-free short-term government bonds is developed. Secondly, incorporating risk factors of value and momentum with the governance ratings when forming portfolios improves expected returns.

The focus of this study is the Thai market. According to the Stock Exchange of Thailand (SET), Thailand houses the second largest trading bourse in the Southeast Asia after Singapore. It also boasts of the highest average daily turnover in the region, representing high liquidity in the market, which is one of the key market developments for both domestic and foreign investors.

2. LITERATURE REVIEW

2.1. Corporate governance

One of the most often cited pieces of literature on a link between corporate governance and stock returns is Gompers et al. (2003). The importance of this paper is that they pioneered a holistic approach by constructing the Governance Index or alternatively called GIM Index after their initials, using 24 unique provisions that restrict or support shareholder rights. The portfolio longing the Democracy (good governance) stocks and shorting Dictatorship (poor governance) stocks still posts a significant return even after controlling industry returns. One result which closely relates to this research is that, when dividing the sample period in half, the returns of the long-short portfolio differ in the first and second half. The returns are still positive, yet they lose the statistical significance for the value-weighted portfolio for both periods and in the second half for the equal-weighted portfolio. This hints a non-linear or time-varying relationship between corporate governance and stock returns.

Scholars do not entirely support the theory of the positive relation between corporate governance and firm value. In fact, some claim an opposing view. While Bhagat and Bolton (2008) affirm that the GIM index is significantly related to the operating performance measured by ROA, the governance indices do not explain abnormal future stock returns. The contrasting result stems from the fact that they also consider the endogeneity of the relationship among corporate governance, performance, capital structure, and ownership structure. Once taking into account of a system of simultaneous relationship of the four variables above, the explanatory power of the governance index for stock return diminishes.

Core et al. (2006) also admit that weak protection of shareholder rights, or high score on the GIM index, lead to lower operating performance. However, they deny a causal relationship between weak shareholder rights and lower stock returns. Negative effects of being the Dictatorship firms are already predicted by analysts as a lower governance quality is associated with lower operating performance. Hence, there is no surprise on earnings announcement. Moreover, the probability of being acquired, usually associated with a high premium, is about the same for the firms with strong and weak shareholder rights. Thus, a take-over probability is not attributed to excess stock returns. Finally, they conclude that the positive relationship between corporate governance and abnormal stock returns of Gompers et al. (2003) is period-specific, which is a promising remark for this study.

Corporate governance may play a more important and crucial role in the emerging markets than in the developed markets. The emerging market is less mature, and thus the legal environment is not as rigid as in the developed countries. In fact, an average level of corporate governance is lower in countries with weaker legal systems. In such a business environment, firm-level corporate governance can partially compensate incompetent laws and enforcement (Klapper & Love, 2004). Moreover, good corporate governance is valued higher in weaker legal states where such practice is rare and it appears to be a precious intangible asset for investors. One explanation for this is because, in countries with less investor protection, controlling shareholders tend to expropriate from minority shareholders (Nenova, 2003). With better governance practices, such expropriation can be prevented in some degree and the market values such as firms more favorably (Klapper & Love, 2004; Durnev & Kim, 2005).

Numerous researches on the relation between corporate governance and firm value in the emerging market are found. This includes Korea (Black et al., 2006), Turkey (Ararat et al., 2017), Russia (Black, 2001; Black et al., 2006), India (Balasubramanian et al., 2010; Saggar & Singh, 2017), Hong Kong (Cheung et al., 2007, 2011; Lei & Song, 2012; Lo & Kwan, 2017), Ukraine (Zheka, 2006), South Africa (Dzingai & Fakoya, 2017) and Thailand (Wiwattanakantang, 2001; Kouwenberg, 2006; Hodgson et al., 2011; Connelly et al., 2012). Although the testing methodologies and the methods of governance index construction differ from one literature to another, the message is essentially alike: A good corporate governance positively impacts firm value and operating performance in the emerging markets. Nevertheless, none of these works point out time-varying characteristics of the relation between corporate governance and its influence on returns for investors. Perhaps due to a lack of sufficient data, most researches in the developing market are based on single-year cross-sectional data, which will not be able to expose any features that change over time. This study analyzes the relationship using time-series data to see how underlying economic states affect expected stock returns.

2.2. Regime switching model

Several academic papers report countercyclical asymmetries of value premiums. Black and McMillan (2004, 2005), Amman and Verhofen (2006), Gulen et al. (2011), Sarwar et al. (2017) state that expected return of value stocks is time-varying, high during a high-volatility state which coincides with economic downturn and low during a low-volatility state occurs concurrent with economic expansion. Their result indicates that the expected return of value stocks is substantially higher than growth stocks during the contraction period. Similar to the small stocks, macroeconomic variables put more significant influence on the value stocks during the recessions. Why are value stocks more likely to perform better during recession? Carlson et al. (2004) reason that value firms have higher operating leverage than growth firms. This implies that value stocks are more prone to negative shocks, which increases risk and expected returns of value stocks during economic downturn. Garcia-Feijoo and Jorgensen (2010) support this theory and identify positive correlation between degree of operating leverage and book-to-market, stock returns, and systematic risk. Zhang (2005) states that costly reversibility, which means that corporations bear a greater cost in reducing than expanding the scale of assets, leads to a higher risk for value firms because of their inflexibility to adjust investment level to extenuate the negative shocks.

On the contrary to value premiums' countercyclical characteristics, expected momentum profits are procyclical (Chordia & Shivakumar, 2002; Cooper et al., 2004; Stivers & Sun, 2010). Kim et al. (2014) fitted a regime-switching model to expected momentum return. Two of their main findings are momentum stocks' asymmetrical reactions to aggregate economic conditions and procyclical time-varying expected returns. During the expansion state identified by Markov switching model, winner stocks tend to have greater loadings on conditioning macroeconomic factors than loser stocks, whereas in the recession states, loser stocks are more affected. This implies riskiness of winner and loser stocks are different across economic states. The riskiness of winner stocks is higher during expansion states because of greater growth options measured by high market-to-book equity and market-to-book asset ratios. Winner stocks are more likely to have higher growth options. On the other hand, the riskiness of loser stocks is greater during the recession due to an increased risk of leverage options proxied by high debt-to-equity and asset-to-equity ratios. Loser stocks tend to have higher leverage options.

3. DATA AND METHODOLOGY

The sample universe of this study is all the stocks listed on the Stock Exchange of Thailand (SET) and the Market for Alternative Investment (MAI). The corporate governance ratings are obtained from the Corporate Governance of Thai Listed Companies, an annual report published by the Thai Institute of Directors (IOD). The IOD examines each listed company on the SET and the MAI according to a predetermined set of governance criteria and scores them 0-100. There are five categories to be assessed: Rights of Shareholders, Equitable Treatment of Shareholders, Role of Stakeholders, Disclosure and Transparency, and Board Responsibilities. Based on the given governance score, corporate governance (CG) star is assigned as shown in Table 1. Only the firms with 5 Stars (EXCELLENT), 4 Stars (VERY GOOD) and 3 CG Star (GOOD) are identified in the report and the other firms with 2 CG Stars (SATISFACTORY), 1 Star (PASS) and no Star are not disclosed. The sample period is from 2008 to 2015 for 8 years.

Table 1. CG (corporate governance) star by the IOD (Thai Institute of Directors)

Score range	*Number of stars*	*Description*
90-100	*****	Excellent
80-90	****	Very good
70-79	***	Good
60-69	**	Satisfactory
50-59	*	Pass
Less than 50	No star given	-

In order to empirically examine the time-varying behavior of relationship between corporate governance and stock return, application of the Markov swathing regression is suitable because it is capable of capturing the time-varying characteristics of stock returns across business cycles. Perez-Quiros and Timmermann (2000) and Kim et al. (2014) framework is employed. Let r_t be the return of an asset at time t and let X_{t-1} be a vector of publically available information up to time $t-1$ used to forecast r_t. In the Markov switching model, all parameters including intercept, regression coefficients, and volatility of excess returns are assumed to be functions of a single latent state variable (S_t). Specifically,

$$r_t = \beta_{0,S_t} + \beta'_{S_t} X_{t-1} + \varepsilon_t,\ \varepsilon_t \sim N(0, \sigma^2{}_{S_t}) \qquad (1)$$

where $N(0, \sigma^2{}_{S_t})$ denotes normal distribution with zero mean and variance $\sigma^2{}_{S_t}$. Supposing there are

two states, or often called regimes in the literature, $S_t = 1$ and $S_t = 2$, then the coefficients and variances are either $(\beta_{0,S_1}, \beta'_{S_1}, \sigma^2{}_{S_1})$ or $(\beta_{0,S_2}, \beta'_{S_2}, \sigma^2{}_{S_2})$.

Markov switching model allows the risk and expected returns to vary across two states. Thus, it is necessary to specify how the underlying states develop over time. The common assumption is made that state transition probabilities follow a first-order Markov chain as follows:

$$p_t = P\,(S_t = 1 | S_{t-1} = 1, y_{t-1}) = p(y_{t-1}) \quad (2)$$

$$1 - p_t = P\,(S_t = 2 | S_{t-1} = 1, y_{t-1}) = 1 - p(y_{t-1}) \quad (3)$$

$$q_t = P\,(S_t = 2 | S_{t-1} = 2, y_{t-1}) = q(y_{t-1}) \quad (4)$$

$$1 - q_t = P\,(S_t = 1 | S_{t-1} = 2, y_{t-1}) = 1 - q(y_{t-1}) \quad (5)$$

where y_{t-1} is a vector of variables which are publicly available at time $t-1$ and influences the state transition probabilities between periods $t-1$ and t.

The two-state Markov switching model is estimated using maximum likelihood methods. Let $\theta = (\theta_1, \theta_2)$ be the vector of parameters that are estimated in the likelihood function. Suppose the probability density function of the return, conditional on being state *j*, is Gaussian:

$$f\,(r_t | \Omega_{t-1}, S_t = j; \theta) = \frac{1}{\sqrt{2\pi\sigma_j^2}} \exp\left(-\frac{(r_t - \beta_{0j} - \beta'_j X_{t-1})^2}{2\sigma_j^2}\right) \quad (6)$$

for $j = 1,2$. The information Ω_{t-1} includes X_{t-1}, r_{t-1}, y_{t-1}, and lagged values of these variables. Then, the log-likelihood function is

$$L\,(r_t | \Omega_{t-1}; \theta) = \sum_{t=1}^{T} \log(\emptyset(r_t | \Omega_{t-1}; \theta)) \quad (7)$$

where the density function $\emptyset(r_t | \Omega_{t-1}; \theta)$ is simply obtained by summing the probability-weighted state probabilities across the two sates:

$$\emptyset(r_t | \Omega_{t-1}; \theta) = \sum_{j=1}^{2} f(r_t | \Omega_{t-1}; S_t = j; \theta)\, Prob(S_t = j | \Omega_{t-1}; \theta), \quad (8)$$

where $Prob(S_t = j | \Omega_{t-1}; \theta)$ is the conditional probability of being in the state *j* at time *t* given information at time $t-1$. The condtional state probabilities can be deprived from the standard probabilities theorem:

$$Prob(S_t = i | \Omega_{t-1}; \theta) = \sum_{j=1}^{2} Prob(S_t = i | S_{t-1} = j, \Omega_{t-1}; \theta)\, Prob(S_{t-1} = j | \Omega_{t-1}; \theta) \quad (9)$$

The conditional state probabilities, by Beyer's rule, can be expressed as:

$$Prob(S_{t-1} = j | \Omega_{t-1}; \theta) = \frac{f(r_{t-1} | S_t = j, X_{t-1}, y_{t-1}, \Omega_{t-2}; \theta) Prob(S_{t-1} = j | X_{t-1}, y_{t-1}, \Omega_{t-2}; \theta)}{\sum_{j=1}^{2} f(r_{t-1} | S_{t-1} = j, X_{t-1}, y_{t-1}, \Omega_{t-2}; \theta)\, Prob(S_{t-1} = j | X_{t-1}, y_{t-1}, \Omega_{t-2}; \theta)} \quad (10)$$

Glay (1996) shows that the Equation (9) and (10) can be iterated recursively to obtain the state probabilities $Prob(S_t = i | \Omega_{t-1}; \theta)$ and the parameters of the likelihood function. The variations in the state probabilities represent the presence of time-varying conditional expected return.

Four portfolios are constructed by pooling the stocks with the same group of the CG stars, namely EXCELLENT, VERY GOOD, GOOD, and POOR. EXCELLENT is 5 stars, VERY GOOD is 4 stars, GOOD is 3 stars, POOR is 2 stars or below. The publication timing of the IOD's reports varies year to year, but the reports are usually available to investors in the 4th quarter of the year. To make sure there is ample time for investors to know the CG star of each company, we rebalance the portfolios at the end of January in the following year. It is assumed that returns from the portfolios are dependent on hidden economic regimes, which are estimated by a Markov switching model. Following Perez-Quiros and Timmermann (2000) and others, the existence of two regimes is assumed. The portfolio returns of four different CG level is modeled as follows:

$$r_{it} = \propto_i + \beta_{i1,st} TERM_{t-1} + \beta_{i2,st} DEF_{t-1} + \beta_{i3,st} \Delta M_{t-2} + \beta_{i4,st} DIV_{t-1} + \varepsilon_{it}; \quad i = (EXCELLENT, VERY\ GOOD, GOOD, POOR) \quad (11)$$

where $r_{it} = (EXCELLENT_t, VERY\ GOOD_t, GOOD_t, POOR_t)$ is the (4 x 1) vector of four different governance level portfolio returns, and $S_t = \{1, 2\}$ represents regime 1 and regime 2. *TERM* is a term spread, difference between 10-year government bond and 1-month government bond. *DEF* is a default spread defined as difference in yield between Baa and Aaa corporate bond. ΔM is a 12-month log difference in money supply. ΔM is lagged by 2 months to allow for delay of availability of such information. *DIV* is a dividend yield of the market index (the SET index). ε is normally distributed error term with $(0, \sigma^2)$. All the data are obtained from Thomson Reuters' Datastream, the Bank of Thailand and the Thai Bond Market Association.

The interest rate is a key economic variable in other studies that employs Markov switching model (Perez-Quiros & Timmermann, 2000 and others), but it is dropped from the Equation (11). This is because of its high correlation with ΔM, with correlation coefficient of 0.73 and VIF (variance inflation factor) of 5.42, which poses a serious threat of multicollinearity. Masih and Masih (1996) points out that money supply predominantly leads rather than lags interest rate in the Thai economy.

Term spread can be considered as an indicator of economic conditions as well as risk premium. During expansions, due to rapid growth of short-term interest, the term spread decreases. On the other hand, it increases during recessions because short-term interest rate drops.

Default spread, or alternately often called credit spread, has been frequently used in the literature as an indicator of credit market conditions as well as a proxy for expected stock returns (Chen et al., 1986; Keim & Stambaugh, 1986; Fama & French, 1988; Kandel & Stambaugh, 1990; Kashyap et al., 1994; Jagannathan & Wang, 1996; Chordia & Shivakumar, 2002). These prior researches suggest that default spread is generally positively correlated with future stock returns. Firms with higher corporate governance tend to have better access to the external financial markets as they are more trustworthy to financial institutions. On the other hand, corporations with poorer governance practice have rather limited access to the financial market.

The dividend yield is a popular vehicle to model expected stock returns (Keim & Stambaugh, 1986; Fama & French, 1988; Kandel & Stambaugh, 1990). Although dividend yield is not directly related to the credit market, it proxies for time-variation in the unobservable risk premium (Kim et al., 2014). High dividend yield, which is low stock prices relative to dividends, indicates high discount rates and higher expected returns.

Summary statistics of monthly returns of portfolios which are sorted by CG stars are presented in Table 2. The medium return of *EXCELLENT* portfolio is the highest and that of other portfolios gets lower monotonically as the corporate governance ratings get lower. In other words, the decrease in CG stars appears to be associated with lower returns. *EXCELLENT* portfolio is the most volatile with the largest standard deviation and the widest range between the maximum and minimum. All the portfolios are negatively skewed with kurtosis higher than 3, which implies non-normal distribution (Sarwar et al., 2017). P-values for Jarque-Bara normality test, which tests for normal distribution, are statistically significant for *EXCELLENT* and *GOOD* portfolios. This means that null hypothesis is rejected and the distribution is non-normal.

Table 2. Summary statistics of monthly return of corporate governance-sorted portfolios

Portfolio	*EXCELLENT* (*5 Stars*)	*VERY GOOD* (*4 Stars*)	*GOOD* (*3 Stars*)	*POOR* (*2 Stars or Below*)
Mean	1.959	2.234	1.892	1.443
Medium	2.447	2.408	2.339	1.724
Maximum	18.538	15.482	10.596	11.459
Minimum	-14.025	-11.550	-13.609	-12.793
Standard Deviation	5.007	4.704	4.544	4.802
Skewness	-0.215	-0.238	-0.696	-0.522
Kurtosis	4.180	3.822	3.932	3.211
P-value of Jarque-Bera Normality Test	0.04*	0.16	0.00**	0.10

*Note: This table reports the mean, medium, maximum, minimum, standard deviation, skewness, and kurtosis of monthly returns of four Corporate Governance-Sorted Portfolios. Stocks are assigned to each portfolio based on the IOD's Corporate Governance Reports from 2008 to 2015. Portfolios are rebalanced in January of the following year after the report is published. The period of monthly portfolio returns is from January 2009 to December 2016. P-value of Jarque-Bera Normality test is also reported in the table. Null hypothesis of Jarque-Bera Normality test is that the data is normally distributed. *, **, and *** indicate significant at 0.05, 0.01, and 0.0001 level respectively.*

4. RESULT

4.1. Corporate governance portfolios by Markov switching regression

Panel A in Table 3 presents the estimation results of the parameters by Markov switching model. Regime 1 is an economic expansion state which is characterized by a higher return and less volatility. On the other hand, Regime 2 is a recession state which has a lower return and higher volatility (Gulen et al., 2011). This contrasting property between the regimes is prominent across all the portfolios.

The asymmetry between the regimes is noticeable in the parameters. Except for *GOOD* portfolio, term spread is positive in the expansion. It is positively significant for *VERY GOOD* portfolio. In contrast, the term spread is negative for *EXCELLENT* and *VERY GOOD* portfolios during the recession. Thus, term structure has a greater impact on stocks with better CG ratings. During expansions, term spread tends to decrease due to increasing short-term interest. In spite of the increasing short-term rate, firms with higher CG ratings have better access for external funds, which enables them to invest in profitable projects. Therefore, the positive relationship between returns from better CG ratings and the term structure exists in the economic expansion.

The relationship between portfolio returns and default spread shows the asymmetry between the regimes as well. The parameters are positive, except *GOOD* portfolio, in the expansion whereas it is negative in the recession. The coefficient of *POOR* portfolio demonstrates that credit spread has a strong negative effect in the recession. Firms with bad CG ratings have limited access to the financial market, particularly during economic downturn. Therefore, an increase in default spread has a significant negative impact on their stock returns.

In the economic upturn, the parameters for growth in money supply are all positive while they are all negative in the downturn. Three out of the four portfolios get statistical significance in both states. When money supply is increased, it generally has a positive impact on stock return. During the recession, the government usually increases the money supply in the market to stimulate the economy, so the change in supply is positive. However, the effect on the stock return can be slow. The negative relationship during the recession indicates that falling stock prices and increasing money supply are occurring at the same time. When the effect from increased money supply gets gradually apparent, the economic state might be already out of recessions.

The parameters for divided yield exhibit distinct contrast between the two regimes too. They are all negative in the expansion whereas they are

positive with strong significance in the recession. This can be explained that during the economic downturn, investors perceive dividends as fixed income so that demand for high dividend-paying stocks increase. On the other hand, during expansions, investors are more likely to pursue capital gains so firms with high dividend payout are seen less attractive.

Overall, the results in Panel A of Table 3 show clear asymmetry between the two economic states. Also, this is evidence that simple linear regression is unable to capture the returns from the CG ratings. Markov switching regression, which allows estimating different parameters across the two regimes, is a better fit because of non-linear, time-varying characteristics of the CG ratings' effect on stock return. An economic argument for such time-varying characteristic is that the market is less efficient in incorporating firm-specific information during recession (Gupta et al., 2013). The mean return of *POOR* portfolio is higher than those of *EXCELLENT* and *VERY GOOD* portfolios during recessions. This suggests that the market fails to incorporate good governance practice into prices in the economic downturns. Arshad and Rizvi (2015) support the idea of the market efficiency being lower during recessions as compared to expansions in the East Asian economies.

Panel B of Table 3 reports transition probabilities of the CG portfolios. All the portfolios show stickiness, meaning that they are more likely to stay in the same regime where they are at present. With a probability between 64 to 81 percent, they remain in the same regime.

Table 3. Markov switching model for returns on the corporate governance-sorted portfolios

Panel A. Parameter estimates of Markov switching model

	Portfolios	***EXCELLENT***	***VERY GOOD***	***GOOD***	***POOR***
Regime 1 (Expansion)	*Constant*	-2.634 (-0.76)	-0.116 (-0.05)	8.095* (2.50)	-4.711 (-0.82)
	$TERM_{t-1}$	1.001 (1.38)	1.439* (2.34)	-0.186 (0.38)	1.054 (1.15)
	DEF_{t-1}	2.263 (1.46)	3.842** (3.00)	-0.625 (-0.38)	1.370 (0.53)
	ΔM_{t-2}	0.591** (2.92)	0.542*** (3.79)	0.136 (0.94)	0.696* (2.10)
	DIV_{t-1}	-0.896 (-1.36)	-2.147*** (-3.87)	-1.301* (-2.49)	-0.698 (-0.49)
	R-Squared	0.252	0.412	0.237	0.219
	Portfolio return mean	3.893	4.412	3.551	2.171
	Standard deviation	2.824	2.661	2.309	3.811
Regime 2 (Recession)	*Constant*	-10.052 (-1.69)	-5.646 (-1.22)	-7.929 (-7.92)	7.49 (0.73)
	$TERM_{t-1}$	-0.726 (-0.85)	-0.211 (-0.250)	1.710 (0.79)	1.301 (0.77)
	DEF_{t-1}	-4.993 (-1.52)	-5.914* (-2.26)	-4.201 (-1.51)	-11.489* (-2.32)
	ΔM_{t-2}	-1.198*** (-4.49)	-0.900*** (-3.533)	-0.616* (-2.07)	-1.161 (-1.71)
	DIV_{t-1}	7.930*** (8.51)	6.590*** (6.94)	4.91*** (3.79)	4.787** (3.18)
	R-Squared	0.720	0.556	0.396	0.535
	Portfolio return mean	-0.746	0.744	-0.152	0.281
	Standard deviation	6.07	5.212	5.687	5.933

Note: The following Markov switching model is estimated for the CG-sorted portfolio returns:

$$r_{it} = \propto_i + \beta_{i1,st} TERM_{t-1} + \beta_{i2,st} DEF_{t-1} + \beta_{i3,st} \Delta M_{t-2} + \beta_{i4,st} DIV_{t-1} + \epsilon_{it};$$
$$i = (EXCELLENT, VERY\ GOOD, GOOD, POOR)$$

*r is a monthly portfolio return, st is the regime indicator, TERM is a term spread defined as difference in interest rate between 10-year government bond and 1-month government bond, DEF is a default spread defined as difference in yield between Baa and Aaa corporate bond. ΔM is a money growth which is 12-month log difference in money supply, and DIV is a dividend yield of the market index (the SET index) The period is from December 2008 to November 2016 for Term, DEF, and Div, and November 2008 to October 2016 for ΔM. T-statistics for the coefficients are in the in the parentheses. *, **, and *** indicate significant at 0.05, 0.01, and 0.0001 level respectively.*

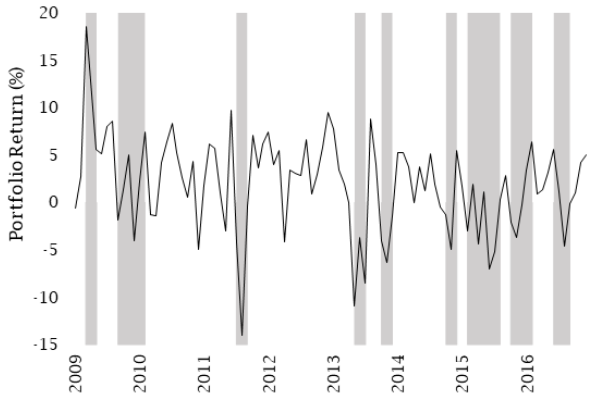
Panel B. Transition probabilities

	EXCELLENT		***VERY GOOD***		***GOOD***		***POOR***	
	Regime 1	Regime 2	Regime 1	Regime 2	Regime 1	Regime 2	Regime 1	Regime 2
Regime 1	0.725	0.357	0.724	0.184	0.724	0.279	0.816	0.277
Regime 2	0.275	0.643	0.276	0.816	0.276	0.721	0.184	0.723

Note: Transition probabilities between the two regimes are reported.

Figure 1 plots the monthly return of the *EXCELLENT* CG portfolios. Due to the limited space, only the one for the *EXCELLENT* portfolio is presented. The shaded areas represent recessions identified by the Markov switching model. The characteristics of the recessions are low returns and high volatilities. The recession periods do capture two major economic downturns in Thailand. The first is caused by massive floods in 2011. The second is political unrest in 2013 which ended up with a military coup. Both period experienced monthly portfolio losses as large as 10%.

Figure 1. Monthly return of EXCELLENT CG portfolio



Note: The data is from January 2009 to December 2016. The shaded area represents recession state.

To statistically examine the asymmetry between the two states, Wald test was conducted. A null hypothesis for the test is that the coefficients of the independent variables are equal across the two states. Table 4 reports the results. The null hypothesis is rejected for all four portfolios. This proves the switching model is statistically significant, implying that returns of the CG portfolios respond differently to the macroeconomic variables in expansions and recessions. These results are in line with Perez-Quiros and Timmermann (2000), Gulen et al. (2011), Kim et al. (2014) and Sarwar et al. (2017).

Table 4. Wald test

Hypothesis	*EXCELLENT*	*VERY GOOD*	*GOOD*	*POOR*
H_0: $\beta_{i,j,(st=1)} = \beta_{i,j,(st=2)}$ *i=(EXCELLENT, VERY GOOD, GOOD, POOR)* *j=1,2,3,4*	160.01*** (0.00)	399.33*** (0.00)	87.624*** (0.00)	127.55*** (0.00)

*Note: This table reports the Wald test values of Chi-squared distribution. The null hypothesis is that the coefficients of the explanatory variable are equal across the two states for the CG-sorted portfolios. P-values for chi-square statistics are in the in the parentheses. *, **, and *** indicate significant at 0.05, 0.01, and 0.0001 level respectively*

$$r_{it} = \propto_i + Dummy \times \beta_{i1} TERM_{t-1} + Dummy \times \beta_{i2} DEF_{t-1} + Dummy \times \beta_{i3} \Delta M_{t-2} + Dummy \times \beta_{i4} DIV_{t-1} + \epsilon_{it}\,; \quad i = (EXCELLENT, VERY\ GOOD, GOOD, POOR) \tag{12}$$

As a robustness test for the switching model, the following OLS regression is tested Equation (12) where *Dummy* represents the state of economy and takes 1 during recessions and 0 during expansions. The other variables are the same as in Equation (11). This is to confirm the validity of the switching model. Instead of letting the model to estimate the regimes, it is manually imposed in the form of the dummy variables and re-run the regression to forecast the parameters. Table 5 reports the result. Most of the coefficients highly resemble the ones in Panel B of Table 4 which is the result of the switching model for the recession state. Moreover, most of the coefficients are exceedingly significant. This suggests that the switching model correctly divides the expansion and recession periods.

Table 5. Robustness test

	Portfolios	*EXCELLENT*	*VERY GOOD*	*GOOD*	*POOR*
Dummy =1 for recession, 0 for expansions	*Constant*	-12.817** (-3.12)	-7.777** (-2.81)	-3.530 (-1.15)	10.443* (2.25)
	$TERM_{t-1}$	-1.006 (-1.47)	-1.680** (-3.183)	-1.416* (-.2.41)	1.410 (1.03)
	DEF_{t-1}	-3.521 (-1.59)	-5.207*** (-3.82)	-5.751*** (-3.80)	-13.637*** (-5.32)
	ΔM_{t-2}	-1.205*** (-6,11)	-0.540*** (-3.71)	-0.503** (-3.11)	-1.364*** (-5.72)
	DIV_{t-1}	8.092*** (9.65)	6.957*** (8.96)	5.652*** (6.56)	5.022*** (4.66)

Note: This table reports the following OLS regression:

$$r_{it} = \propto_i + Dummy \times \beta_{i1} TERM_{t-1} + Dummy \times \beta_{i2} DEF_{t-1} + Dummy \times \beta_{i3} \Delta M_{t-2} + Dummy \times \beta_{i4} DIV_{t-1} + \epsilon_{it}\,; \quad i = (EXCELLENT, VERY\ GOOD, GOOD, POOR)$$

*r is a monthly portfolio return, Dummy represents the state of economy and takes 1 for recessions and 0 for expansions, TERM is a term spread defined as difference in interest rate between 10-year government bond and 1-month government bond, DEF is a default spread defined as difference in yield between Baa and Aaa corporate bond. ΔM is a money growth which is 12-month log difference in money supply, and DIV is a dividend yield of the market index (the SET index) The period is from December 2008 to November 2016 for Term, DEF, and Div, and November 2008 to October 2016 for ΔM. T-statistics for the coefficients are in the in the parentheses. *, **, and *** indicate significant at 0.05, 0.01, and 0.0001 level respectively.*

4.2. Out of sample test

In previous sections, the presence of asymmetries in the CG-sorted portfolios and time-varying effect of the CG ratings on stock returns was identified. By taking advantage of such characteristics, we test an arbitrage investment strategy. The entire data sample is 96 months and this is split into 48 in-sample months and 48 out-of-sample trading months. The in-sample data is from January 2009 to December 2012. Using the in-sample data, the return for January 2013 is forecasted. If the estimated return is positive, the portfolio should be invested in in January 2012. If the estimated return is negative, then funds are invested in 1-month government Treasury bill. This process is repeated until November 2016. Thus, the investment strategy is switching between the portfolios and short-term

government bond, depending upon forecasted returns.

The switching strategy is compared to the corresponding buy-and-hold strategy. The buy-and-hold strategy is holding the CG-sorted portfolios for the entire 96-month period. The risk-adjusted returns are compared between the two strategies by using Sharpe ratios. Transactions are also taken into account. Because there are costs associated with buying and selling stocks for the switching strategy, break-even transaction cost is included. This is the maximum transaction cost per trade that makes the Sharpe ratio of the switching strategy equal to that of the buy-and-hold strategy. The higher break-even transaction cost indicates better feasibility of the switching strategy (Sarwar et al., 2017).

Table 6 reports the result of the out-of-sample test. The result is divided into the full out-of-sample period, which is 48 months from January 2013 to December 2016, and expansion and recession sub-periods. In the full out-of-sample period, except *GOOD* portfolio, switching strategy posts superior return to the buy-and-hold strategy. Sharpe ratios of the switching strategies are higher for *EXCELLENT, VERY GOOD*, and *POOR* portfolios. All three portfolios generate higher returns with lower standard deviations with the switching strategy. Break-even transaction costs 0.376%, 1.549%, and 0.365% respectively. In Thailand, average transactions cost per trade at the most security firms stand at 0.15%. Therefore, the switching strategy is practically feasible. Examination of the sub-period results reveals that it is during recessions that the switching strategy excels. In the recession, all four portfolios get higher Sharpe ratios with the switching strategy, while in the expansion, Sharpe ratios of the switching strategy are lower except *POOR* portfolio. This is due to the switching strategy's ability to shift to government bonds during the recession when lower returns and higher volatilities are expected. Thus, the switching strategy can be a defensive investment during the bear market.

Table 6. Out-of-sample trading results

Portfolios	***EXCELLENT***		***VERY GOOD***		***GOOD***		***POOR***	
Trading Strategy	*Buy-and-Hold*	*Switching*	*Buy-and-Hold*	*Switching*	*Buy-and-Hold*	*Switching*	*Buy-and-Hold*	*Switching*
Full sample								
Mean return	5.479	8.409	12.737	19.772	0.921	0.061	-0.362	6.409
S.D. of return	15.066	11.549	15.331	12.135	16.364	14.075	17.421	13.060
Sharpe ratio	0.238	0.564	0.707	1.473	0.447	0.301	-0.129	0.345
No. of switches		10		6		12		17
Break even TC		0.376		1.549		Negative		0.365
Expansions								
Mean return	44.324	37.147	65.455	61.809	63.101	43.356	5.399	10.115
S.D. of return	8.302	7.585	7.699	8.412	7.388	8.693	14.449	10.097
Sharpe ratio	5.096	4.631	8.240	7.108	8.281	4.767	0.241	0.812
Recessions								
Mean return	-20.951	-12.679	-10.443	-0.000	-29.373	-23.451	-5.808	2.827
S.D. of return	15.265	11.119	14.955	10.956	14.008	12.788	20.167	15.651
Sharpe ratio	-1.489	-1.300	-0.820	-0.167	-2.232	-1.982	-0.380	0.006

Note: The buy-and-hold strategy is investing in the CG-sorted portfolios from January 2009 to December 2016. The switching strategy is switching between the CG-sorted portfolios and 1-month government bond. The in-sample period is from January 2009 to December 2012. From January 2013, a long-position is taken if the forecasted return is positive; otherwise, the funds are invested in 1-month government bond.

The results are for the out-of-sample period from January 2013 to December 2016. Mean returns and standard deviations have been annualized. Break-even transaction costs are maximum costs per switch that an investor would incur that make the Shape ratio of the switching strategy equal to that of the buy-and-hold. Negative break-even transaction costs indicate that the Shape ratio of the switching strategy is lower than that of the buy-and-hold.

4.3. Out of sample test with value and momentum factors

Previous researches suggest that value firms with high Book-to-Market (BM) stocks perform well during recessions (Gulen et al., 2011 and others) and momentum stocks with recent past high returns show better performance during expansions (Kim et al., 2014 and others). Value stocks are countercyclical to the economic conditions whereas momentum stocks are procyclical. This finding is incorporated into the switching strategy of the CG portfolios.

In the out-of-sample period between January 2013 and December 2016, because of the stickiness of the regime, the regime of the following month is assumed to be the same as the current regime. For example, the last month of the in-sample period is December 2012 and its regime is expansion. Then the next month is also assumed to be in the expansion state and 30 momentum stocks with the highest returns from t-12 to t-2 from each CG-sorted portfolio are chosen. If the next month is forecasted as recession, then 30 value stocks with the highest BM are selected. Thus, the switching strategy is switching between the styles of value and momentum within the same CG rating stocks.

The trading results are presented in Table 7. In the entire out-of-sample period, the switching strategy outperforms the buy-and-hold strategy in all the CG classes. The risk-adjusted return of the switching strategy, measured by Sharpe ratio, is higher than that of a buy-and-hold strategy. However, because of the high frequency of switching between the two styles, transaction costs take up the extra returns in *EXCELLENT* and *VERY GOOD* portfolios. Break-even transaction cost for the two portfolios are only 0.097% and 0.001% per trading respectively, which are not feasible in the real investing environment in Thailand. The switching strategy for *GOOD* and *POOR* portfolios also requires frequent switches but the high returns make up for the transaction costs. Looking at the sub-period, the switching strategy beats the buy-and-hold in all the CG classes during recessions with higher Sharpe ratios.

Table 7. Out-of-sample style switching trading results

Portfolios	*EXCELLENT*		*VERY GOOD*		*GOOD*		*POOR*	
Trading Strategy	*Buy-and-Hold*	*Style Switching*	*Buy-and-Hold*	*Style Switching*	*Buy-and-Hold*	*Style Switching*	*Buy-and-Hold*	*Style Switching*
Full sample								
Mean return	5.479	7.321	12.737	16.482	9.215	18.520	-0.362	15.773
S.D. of return	15.066	15.813	15.331	20.270	16.364	18.749	17.421	20.355
Sharpe ratio	0.238	0.343	0.707	0.719	0.447	0.886	-0.129	0.681
No. of switches		17		15		19		21
Break even TC		0.097		0.001		0.433		0.786
Expansions								
Mean return	44.324	46.503	65.455	81.560	63.101	85.538	5.399	32.119
S.D. of return	8.302	8.856	7.699	9.640	7.388	9.562	14.449	14.653
Sharpe ratio	5.096	5.023	8.240	8.251	8.281	8.745	0.241	2.061
Recessions								
Mean return	-20.951	-19.399	-10.443	-10.751	-29.373	-27.451	-5.808	1.449
S.D. of return	15.265	16.493	14.955	21.219	14.008	15.861	20.167	24.603
Sharpe ratio	-1.489	-1.284	-0.820	-0.592	-2.232	-1.832	-0.380	-0.0172

Note: The buy-and-hold strategy is investing in the CG-sorted portfolios from January 2009 to December 2016. The switching strategy is switching between value and momentum stocks within each the CG-sorted portfolio. The in-sample period is from January 2009 to December 2012. From January 2013, 30 value stocks with the highest Book-to-Market are selected if recession is expected in the following month and 30 momentum stocks with the highest returns from t-12 to t-2 are selected if expansion is expected in the following month.

The results are for the out-of-sample period from January 2013 to December 2016. Mean returns and standard deviations have been annualized. Break-even transaction costs are maximum costs per switch that an investor would incur that make the Shape ratio of the switching strategy equal to that of the buy-and-hold. Negative break-even transaction costs indicate that the Shape ratio of the switching strategy is lower than that of the buy-and-hold.

5. CONCLUSION

Since Gompers et al. (2003) pioneered the field of the corporate governance index and its effect on increased firm value, a number of researches followed their suit. In general, the literature backs the notion that better corporate governance places a positive impact on firm value. However, some scholars such as Core et al. (2006) argue that poor corporate governance does not necessarily cause lower stock returns. This research fills the gap and claims that the relationship between corporate governance and its effect on stock returns is non-linear and time-varying.

First, because of the non-linearity nature, the CG-sorted portfolio returns are better fitted with Markov switching model. The CG-sorted portfolio returns respond to the macroeconomic variables differently during economic expansions and recessions. The parameters of the metronomic variables show a clear asymmetry between the two regimes. The Wald test statistically confirms the asymmetry across the economic states. By taking advantage of the time-varying nature of the CG's effect on stock returns, an arbitrage investing strategy is tested. The switching strategy between the CG portfolio and short-term government bond successfully outperforms the buy-and-hold strategy in the out-of-sample period after taking account for the transaction cost.

Second, with an incorporation of counter-cyclical characteristics of value stocks and pro-cyclical characteristics of momentum stocks, another switching strategy with style rotation is tested. From the CG-sorted portfolios, value stocks during recessions and momentum stocks during expansions are selected to form new CG-style portfolios. The out-of-sample sample test confirms that this style switching strategy also rewards investors with superior returns than the buy-and-hold investment especially for the portfolios with lower rated CG firms.

Limitation of this research includes a rather insufficient dataset. Because the IOD started to regularly publish the CG ratings in Thailand only from 2008, this study is based on the sample for the 8 years. As the other researches in this field employ the data for as long as 30 years, the validity of this study would be enhanced if the results were drawn from a wider range of raw data. In addition, the regression and switching model is tested on the Thai market, which is considered small and still immature from a perspective of the international financial market. Thus, there is room for future study to test the same model on more fundamentally advanced markets. Lastly, this study can be extended by combining the CG ratings with the sustainability factor. Starting in 2015, the SET annually announces the Thailand Sustainability Investment list, which includes listed companies which meet environmental, social, and governance criteria. Adding this sustainability factor might improve the returns from the switching strategy.

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