Senior Research

Equity Market Condition and Monetary Policy Stance in a Markov-switching Model

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Abstract

Using Chen (2005) a modified version of the Markov-switching model developed by Hamilton (1989), this paper investigates how the US monetary policy influences equity markets condition in both domestic and international level, specifically on emerging-Asian equity performance. The main analysis can be interpreted from the empirical findings in this study. First, the results suggest the potential and negative relationship between a contractionary monetary policy and the stock returns regardless of equity market regimes. Second, there exists the asymmetric effects of monetary policy on equity markets across the regimes where monetary policy has greater impacts in volatile states of stock returns; bear market regimes. Ultimately, the discussion of "the risk-taking channel" of monetary policy in equity markets provides the comprehensive interpretations of the empirical findings where monetary policy affects the risk-perception and risk-appetite in the equity markets. Additionally, the expansionary monetary policy environment affects the equity markets positively by enhancing the risk-appetite and increasing the risk-taking behavior in the equity markets.

1 Introduction

Does monetary policy affect stock market asymmetrically across its regimes?

The on-going debate about how monetary policy affects financial markets has been a great interest for both financial economists and monetary economists. It is undeniable that the most direct and immediate influence of monetary policy is found in the equity market, Bernanke and Kuttner (2005). Given the significant influence of monetary policy on stock market, however, the question still persists: Does monetary policy affect stock market asymmetrically across its regimes? This paper aims to, first focuses in the US stock market, identify the stock market regimes using the fixed-transition-probability Markov-switching model. The results show that the Markov-switching models successfully captures all stock market regimes; bull and bear regimes, in the sample. Next, the multivariate Markov-switching models is applied to address whether there exist unsymmetrical effects of monetary policy on stock returns across the regimes. In addition, different measures of monetary policy stance are adopted, including two interest instruments of monetary policy: the discount rates, and the Federal funds rates. Note that the sub-samples concept is applied in order to compare the results before and after the financial crisis, where the interest instruments of monetary policy are at zero-lower bound level. The empirical evidence shows the negative relationship between monetary policy and stock returns where an increase in the interest instruments lowers the stock returns regardless of the regimes. However, the results also show that there exist the asymmetrical effects of monetary policy across different stock market regimes, in which the impacts of changes in interest instruments on equity markets are stronger and more effective during bear market regimes.

How does the US monetary policy influence Asian equity performance across its regimes?

Despite several empirical works focusing on the US stock markets, there is no extant research discussing the global influences of the US monetary policy on other regions, specifically in Asia region. Hence, the paper attempts to shed some light on the global influences of monetary policy on Asian equity markets. Using the MSCI AC ex Japan index as a measure of Asian equity returns or equity market performance, the paper develops the empirical results associated with impacts of the US monetary policy on Asian stock returns across different regimes. The results show that a contractionary (expansionary) US monetary policy affects Asian equity market condition by lowering (increasing) the stock returns in both regimes. In addition, there exist similar asymmetric effects of monetary policy across bull and bear markets as in the local US stock market, where the impacts are stronger during volatile states of stock market.

What are the reasons behind the empirical findings: the negative influences of monetary policy stance on equity markets condition?

After addressing the influences of monetary policy stance on equity markets condition, the paper also provides comprehensive discussions about the "risk-taking channel" in order to deliberate the interpretation of the empirical findings. Hence, the analysis and literature reviews of on-going debates surrounding the new channel of monetary policy in the equity markets are provided in the last section of the paper.

The research is structured as follow: First, the literature reviews of previous studies are provided in Section 2. Next, focusing on the US stock markets, the paper begins with the identification of the stock market regimes, the models and empirical studies of the linkages between monetary policy stance and equity markets, are in Section 3 and Section 4, respectively. In Section 5, the focus is turned to address the global influences of the US monetary policy on Asian equity market performance. The discussions about the "risk-taking channel" of monetary policy in equity markets are raised in Section 6. Finally, the conclusion remarks are summarized in Section 7.

2 Literature Review

2.1 Literatures on the identification of stock regimes

It is undeniable that the financial markets are responsive to changes in economic surroundings. While some changes are perceived to be transitory, for instance, the expected returns and volatility, some are seen to be persistent over periods of time, such as financial crisis, Ang and Timmermann (2011). The regime-switching models, developed by Hamilton (1989), provide the new approach to capture both abrupt and persisted changes in financial markets. Several studies apply the Markov-switching model to identify regimes in the equity markets, such as Maheu and McCurdy (2000), Edwards, Biscarri, and Gracia (2003), Pagan and Sossounov (2003), Lunde and Timmermann (2004), and Chen (2007). Conventionally, equity markets are classified into two main regimes, namely bull and bear markets. A regime with a higher returns and lower variance in a stock market is called bull market regime; whereas, a low-return and volatile state in stock returns is identified as bear market regime. However, there is still no extant definition or common criteria for bull and bear markets in both finance and economics fields.

2.2 Literatures on the relationship between monetary policy and stock returns

One of the main concerns in both finance and economics literatures is how stock markets response to monetary policy. Several empirical studies ratify the potential and positive relationship between expansionary monetary policy and stock returns, including Thorbecke (1997) and Patelis (1997). Moreover, Conover, Jensen, and Johnson (1999) document that the US monetary policy has influences over stock markets in both local and international level. Moreover, the foreign stock markets also response to both local and the US monetary policy. Commonly, the expansionary (contractionary) affects the stock markets by increasing (lowering) stock returns[1].

2.3 Literatures on the asymmetric returns of monetary policy over stock market regimes

According to Chen (2007), there exists the asymmetric effects of monetary policy on the US stock return where a tightening monetary policy has stronger effects during weakened states of stock markets; bear market regimes. Similarly, Jiang (2013) also finds that monetary policy target by the Federal Reserve has larger effects on stock returns during bear market regimes. He also suggests that the expansionary monetary policy indicated by the Federal funds rates can improve the stock market performance during bear markets.

3 The Markov-Switching Model of Stock Returns

In this section, a modified version of the Markov-switching model developed by Hamilton (1989) is used to examine a regime-switching in the U.S. stock market.

Following Chen (2007), the function of stock returns is represented as $R_t = 100 \cdot \Delta\, p_t$, where p_t is the logarithm function of nominal stock prices. The stock returns interpretation is acquired by using the monthly data of S&P 500 price index from January 1965 to August 2014. The research investigates both nominal and real stock returns where the CPI inflation rate is deducted from nominal returns.[2]

Consider a Markov-switching model of stock returns:

$$\varphi(L)R_t = \mu_{s_t} + \epsilon_t, \quad \epsilon_t \sim i.i.d.N(0, \sigma_{s_t}^2) \tag{1}$$

[1]For further explanations and reasoning, please see Section 6 of this paper.
[2]The data is retrieved from Federal Reserve Economic Data. The S&P 500 price index data is from Bloomberg.

where $\varphi(L) = 1 - L - L^2 - \cdots - L^k$ with L as the lag operator. The state-dependent mean and variance of stock returns are represented respectively as μ_{s_t} and $\sigma_{s_t}^2$. The term S_t is an underlying dummy variable equaling 0 or 1, which indicates the equity market conditions with $S_t = 0$ being bull market regime and $S_t = 1$ representing bear market regime. In a fixed transition probability Markov-switching model, the stock returns are allowed to switch between regimes with the fixed transition probability of switching over-time.

A two-state fixed transition probability Markov process matrix is represented as followed.

$$P = \begin{bmatrix} P^{00} & 1 - P^{11} \\ 1 - P^{00} & P^{11} \end{bmatrix} \quad (2)$$

where

$$P^{00} = P(S_t = 0 | S_{t-1} = 0) \quad (3)$$

$$P^{11} = P(S_t = 1 | S_{t-1} = 1) \quad (4)$$

The transition probabilities functions are represented as:

$$P^{00} = \frac{\exp\{\theta_0\}}{1 + \exp\{\theta_0\}}$$

and

$$P^{11} = \frac{\exp\{\gamma_0\}}{1 + \exp\{\gamma_0\}}$$

3.1 Identification of bull and bear markets in stock returns

In accordance with the unit root test by both Akaike's information criteria (AIC) and Schwarz's criterion (SC), there is no AR lag in R_t. Therefore, the MS-AR (0) model is a simple mean and variance Markov-switching model. The estimation results for linear and Markov-switching models of both nominal and real stock returns are shown in table 1.

TABLE 1

LINEAR AND FTP MARKOV-SWITCHING MODELS OF STOCK RETURNS

	Nominal Returns		Real Returns	
	Linear	Markov-switching	Linear	Markov-switching
μ	0.53		-1.50	
	(0.18)		(0.18)	
μ_0		1.06		-0.97
		(0.20)		(0.19)
μ_1		-1.52		-3.68
		(1.15)		(1.16)
σ^2	19.18		19.17	
σ_0^2		1.22		1.22
		(0.07)		(0.06)
σ_1^2		1.89		1.91
		(0.11)		(0.10)
p^{00}-c		2.97		3.04
		(0.54)		(0.51)
p^{10}-c		-1.45		-1.43
		(0.60)		(0.59)
p^{00}		0.952		0.954
p^{11}		0.811		0.806
LogLik	-1722.734	-1687.694	-1722.327	-1685.733

NOTE: The standard errors are entries in parentheses. The dependent variable in this model is the nominal or real stock returns. The linear model is $R_t = \mu + \varepsilon_t$ with mean μ and variance σ^2. The Markov-switching model is $R_t = \mu_{st} + \varepsilon_t$ with mean and regime specific error variance (μ_0, σ_0^2) in regime 0 or bull market and (μ_1, σ_1^2) in regime 1 or bear market. The transition matrix parameters are specified as p^{00}-c and p^{10}-c. LogLik represents the log likelihood value of the models.

Apparently, the Markov-switching models generate higher value of the likelihood function than the linear models for both nominal and real returns. This may suggest that the Markov-switching model is better-performed than the linear regression model.

According to the findings from Maheu and McCurdy (2000) and Shiu-Sheng (2007) who use Markov-switching model to identify bull and bear markets in the stock returns, the market condition is defined by its mean and variance. This finding is in accordance with the previous studies where the stable higher-return and volatile lower-return states in stock returns are conventionally classified as bull markets and bear markets, consecutively. The Markov-switching process allows the stock returns to switch between regimes. In this report, the 0.5 cut-off value is applied to determine bull and bear market periods. Particularly, when the smoothing probabilities of S_t= 0 is more (less) than 0.5 are likely to be bull (bear) market.

Figure 1 and Figure 2 illustrate the smoothing probabilities of state 0 (bull market) and state 1 (bear market) for nominal stock returns, respectively. Clearly, all the bear markets in the US stock history has been captured by the Markov-switching model illustrated by the Figure 2; including stock crash in 1973 caused by rise in oil price and economic downturn, Silver market-led stock market crash in 1980, great stock market crash in response to Kuwait's Souk al-Manakh stock bubble burst in early 1980s, the largest one-day stock market crash as known as Black Monday in 1987, early 1990's stock crash caused by Japan's bubble economy and burst in property price, 1990-1991's economy recession from rise in oil prices, Russian financial crisis-led bear market in 1998, sharply drop in stock market due to September 11 terrorist attack in the late-2001s, burst in Dotcom/technology bubble-led bear market in 2002, stock market downfall from Subprime mortgage crisis in 2007, and bear markets in 2010 and 2011 caused by European sovereign debt crisis[3].

[3] The list of bear market periods is developed from the study of Cheng Jiang (2013).

Figure 1: The smoothed regime probabilities of bull market (nominal stock returns)

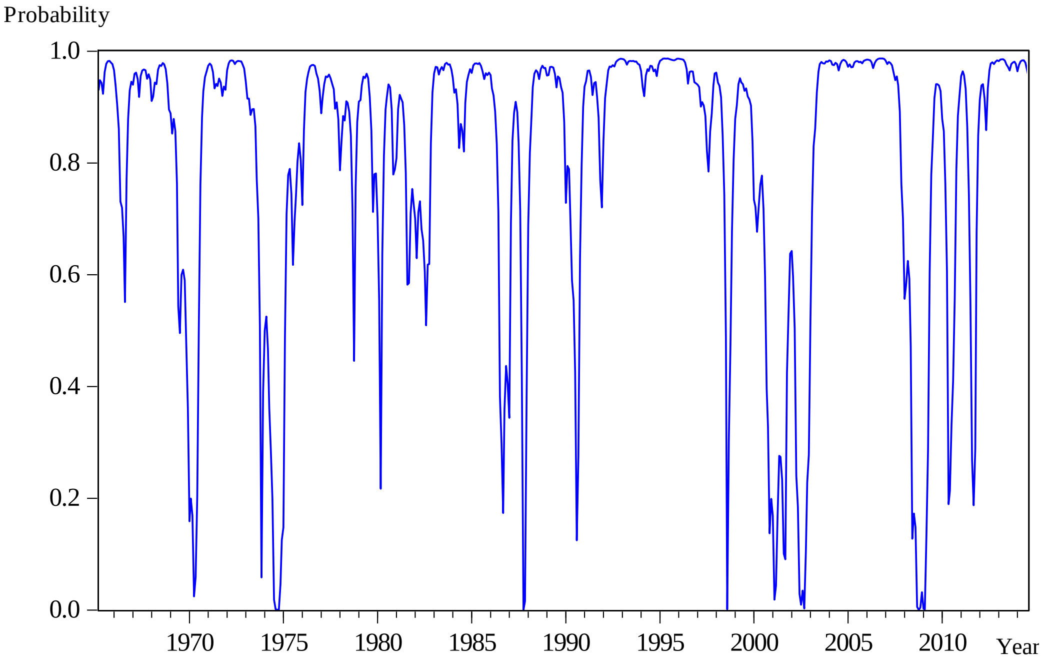
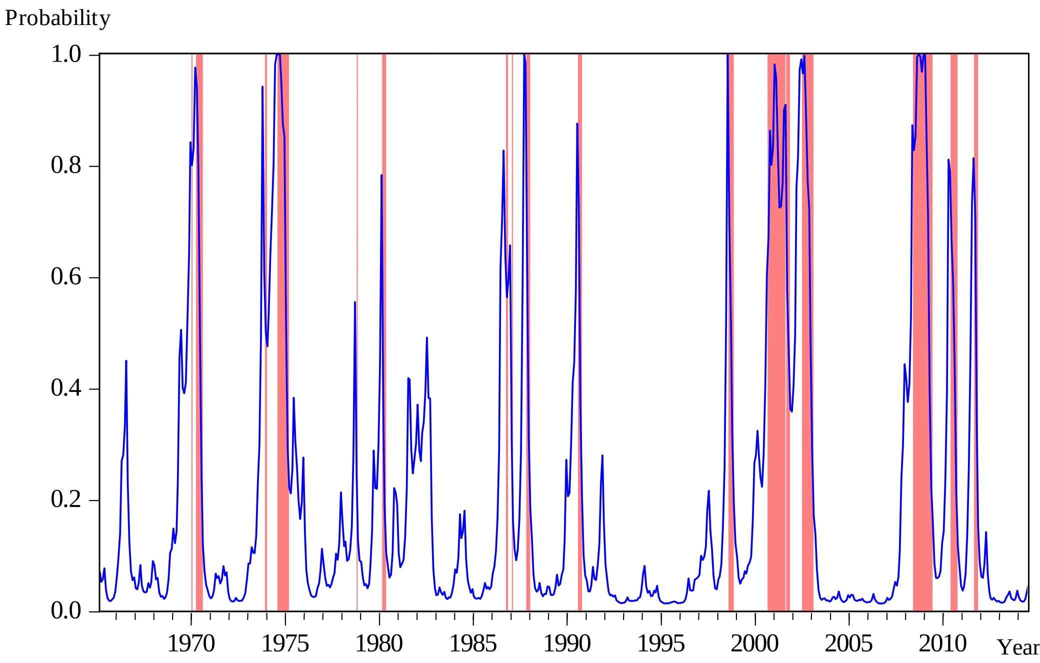


Figure 2: The smoothed regime probabilities of bear market and economic recession



Note: The red-shaded area in Figure 2 represent the identified bear market periods corresponding with the economic recession in each time period.

Mostly, the expected durations from the smoothing probabilities of both nominal and real stock returns suggest consistency of bull-market and bear-market periods. On average, the bull-market persists for 1/ (1-p^{00})= 20.63 months, while the bear-market will recur for 1/ (1- p^{11}) = 6.25 months. The estimated time durations of bear market is shown in Table 2

TABLE 2

BEAR-MARKET PERIODS IDENTIFED BY SMOOTHING PROBABILITIES

	(1) Nominal Returns	(2) Real Returns
Time period	1970:02	1970:01 – 1970:06
	1970:05 – 1970:07	
	1973:12 – 1974:01	1973:11 – 1973:12
	1974:08 – 1975:03	1974:04 – 1975:02
	1978:11	
	1980:04 – 1980:05	1980:03
	1982:11	
	1986:10 -1986:11	1986:07 – 1987:01
	1987:02	
	1987:11 – 1988:01	1987:09 – 1987:12
	1990:09 – 1990:10	1990:07 – 1990:09
	1998:09 – 1998:11	1998:07 – 1998:09
	2000:12	2000:09 – 2001:10
	2001:03 – 2001:05	
	2001:09 – 2001:11	
	2002:07 – 2003:02	2002:03 – 2003:01
	2008:07	2008:01
	2008:10 – 2009:06	2008:05 – 2009:04
	2010:06 – 2010:10	2010:05 – 2010:08
	2011:10 – 2011:11	2011:08 – 2010:10

NOTE: The nominal and real returns derive some slightly different periods of duration.

4 Monetary Policy Stance and Equity Market Conditions

4.1 A Modified Markov-Switching Model

Following Chen (2007) modified Markov-switching model:

$$R_t = \mu_{s_t} + \sum_{j=1}^{q} \beta_{s_t,j} X_{t-j} + \epsilon_t, \qquad \epsilon_t \sim i.i.d. \mathcal{N}(0, \sigma_{s_t}^2), \tag{5}$$

where X_t is the monetary policy at time t. The Markov-switching model allows the monetary policy as an explanatory variable to have different effects across different states of stock returns.

4.2 Monetary Policy Stance Measure

Different measures of monetary policy stance are as follows:

DFF: *Changes in the Federal funds rates*. The Federal funds rate has been widely used as measurement of monetary policy in the US, and also claimed to have the most immediate impact on monetary and financial conditions, Bernanke and Kuttner (2005).

DDR: *Changes in the discount rates.* The discount rate is one of the main instruments of monetary policy, suggested by Chen (2007), which is the interest rate served as the Federal Reserve Bank's lending facility known as the discount window. Moreover, the rate is charged to depository institutions and commercial banks on loans borrowed directly from the Federal Reserve.

In this study, there is no separation between anticipated and unanticipated changes in monetary policy represented by changes in the Federal funds rate and changes in the discount rate. Even though there exists the efficient market hypothesis, which argue that only unanticipated shocks in monetary policy can affect the stock markets as all of the information has already been enclosed in the stock prices. However, the conventional practice still holds that the efficient market hypothesis might not be able to assume for the current stock market conditions, and the available information may not perfectly embedded in the stock prices. Moreover, several studies found the larger equity market responses to perceived changes in monetary policy rather than the unanticipated ones[4].

It is noteworthy that the data used in this section also start from January 1965. However, according to zero-lower bound monetary policy trend after the financial crisis in 2007, the analysis is conducted using two different end-points: July 2007, being a sample that excludes the effects from the financial crisis; and August 2014. The financial crisis period has put challenges in the model as the Federal funds target rates reached the zero lower bound of monetary policy[5].

For all measures of monetary policy mentioned above, the unit root test is conducted to test whether the variables are stationary. The results of the augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test are represented in Table 3. Evidently, the hypothesis of unit root is rejected for each variables.

TABLE 3

UNIT ROOT TESTS

Variable	ADF	PP
Nominal returns	-23.099	-23.128
Real returns	-23.127	-23.152
DDR	-12.398	-18.145
DFF	-5.975	-14.908

Note: ADF and PP are augmented Dickey-Fuller and Phillips-Perron test statistics, respectively. In both tests, the null hypothesis is that the series has a unit root. Test critical values for ADF and PP are -3.441129 (1%), -2.866187 (5%), and -2.569304 (10%). Lags in ADF tests are chosen by Schwartz Bayesian information criterion (SC).

4 Empirical Results

[4] See Bernanke and Kuttner (2005), and Biniv (2007)

[5] Using the same end-point criteria as in the study of volatility of stock market and monetary policy by Bekaert, Hoerova, and Duca (2013)

4.1 Empirical Results for Sample Excluding the Financial Crisis: End-point at July 2007

From the Markov-switching model developed in equation (5), the empirical results are reported in Table 4 for the sample with the end-point of July 2007. In the models, the AR lags in monetary policy (X_t) are chosen by the Akaike's information criteria (AIC) and Schwarz's criterion (SC). According to the models, both information criteria suggest the same number of lags. The impact of monetary policy on stock returns is captured by the coefficient $\beta_{s_t,j}$. Therefore, the coefficients $\beta_{0,j}$ can be inferred as the impact of monetary policy on stock market in state 0 (bull markets), while the coefficients $\beta_{1,j}$ indicate how the stock returns in state 1 (bear markets) response to impact of monetary policy.

In the case of changes in the discount rates, the results are presented in columns (a) and (e) in Table 4 for both nominal and real returns, respectively. The empirical results show that an increase in the discount rate lowers stock returns regardless of the stock market regimes. However, the findings suggest a slightly stronger and negative effect of contractionary monetary policy (an increase in discount rate) on bear market regimes. However, the effect is not statistically significant in bear regime. This may suggest that the discount rates might not be a good measure of monetary policy stance[6].

TABLE 4
STATE-DEPENDENT EFFECTS OF MONETARY POLICY: DDR AND DFF
DATA RANGE: 1965M01 - 2007M07

[6] In general, the discount loan is no longer used regularly by the depository institutions. Moreover, it only serves as the emergency loan of last resort during the crisis periods. Hence, the discount rate might not be significantly in reflecting the financial conditions (Jiang, The Asymmetric Effects of Monetary Policy on Stock Market, 2013).

	Nominal Returns				Real Returns			
	(a) DDR(1)	(b) DFF(1)	(c) DFF(2)	(d) DFF(3)	(e) DDR(1)	(f) DFF(1)	(g) DFF(2)	(h) DFF(3)
μ_0	1.20	1.14	1.01	1.04	-0.83	-0.86	-1.00	-0.98
	(0.17)	(0.18)	(0.16)	(0.20)	(0.16)	(0.16)	(0.15)	(0.18)
μ_1	-1.96	-0.45	-2.41	-1.43	-3.88	-2.51	-4.61	-3.48
	(0.98)	(0.63)	(1.02)	(1.16)	(1.04)	(0.57)	(1.00)	(1.10)
σ_0^2	1.22	1.13	1.26	1.24	1.22	1.14	1.26	1.25
	(0.05)	(0.08)	(0.05)	(0.06)	(0.05)	(0.06)	(0.04)	(0.05)
σ_1^2	1.79	1.74	1.82	1.85	1.82	1.76	1.83	1.87
	(0.10)	(0.08)	(0.10)	(0.11)	(0.10)	(0.07)	(0.10)	(0.11)
$\beta_{0,1}$	-2.77	-2.77			-2.78	-2.80		
	(0.74)	(0.67)			(0.75)	(0.63)		
$\beta_{0,2}$			-0.70				-0.70	
			(0.31)				(0.31)	
$\beta_{0,3}$				-0.50				-0.49
				(0.45)				(0.39)
$\beta_{1,1}$	-2.36	-0.38			-2.04	-0.35		
	(3.67)	(0.52)			(3.27)	(0.55)		
$\beta_{1,2}$			-4.91				-5.53	-1.38
			(2.03)				(1.98)	(2.32)
$\beta_{1,3}$				-1.01				
				(2.22)				
p^{00}-c	3.21	3.09	3.55	3.28	3.34	3.26	3.73	3.45
	(0.55)	(0.60)	(0.64)	(0.66)	(0.54)	(0.53)	(0.60)	(0.65)
p^{10}-c	-1.61	-2.30	-1.61	-1.66	-1.64	-2.34	-1.68	-1.69
	(0.57)	(0.57)	(0.64)	(0.72)	(0.59)	(0.54)	(0.63)	(0.70)
p^{00}	0.96	0.96	0.97	0.96	0.97	0.96	0.98	0.97
p^{11}	0.83	0.91	0.83	0.84	0.84	0.91	0.84	0.84
LogLik	-1421.71	-1421.45	-1420.13	-1422.62	-1420.17	-1419.57	-1417.93	-1420.80

NOTE: The standard errors are entries in parentheses. The dependent variable in this model is the nominal or real stock returns. The model is $R_t = \mu_{st} + \sum_{j=1}^{q} \beta_{s_t,j} X_{t-j} + \varepsilon_t$ with mean and regime specific error variance (μ_0, σ_0^2) in regime 0 or bull market and (μ_1, σ_1^2) in regime 1 or bear market. The measure of monetary policy is represented as X_t. DDR(1) represents one lag in changes in discount rates. DFF(1), DFF(2), and DFF(3) represent one, two, and three lags in changes in Federal funds rates, respectively. The transition matrix parameters are specified as p^{00}-c and p^{10}-c. LogLik represents the log likelihood value of the models.

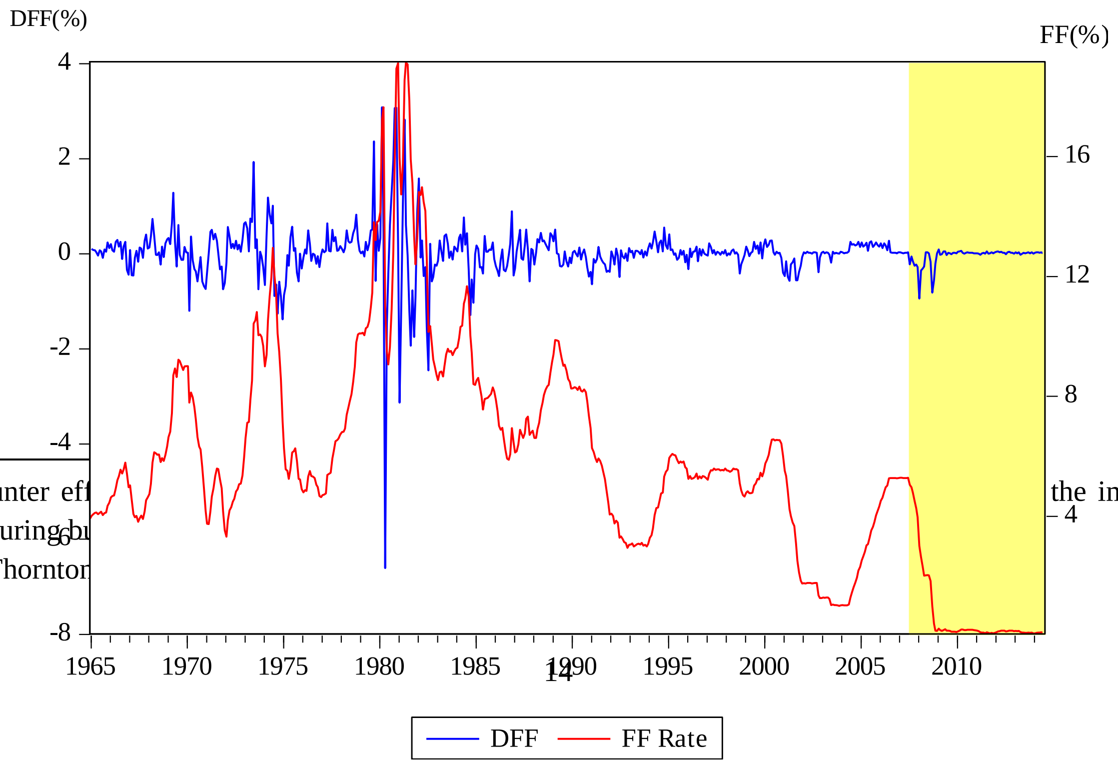
The results from columns (b) to (d), and columns (f) to (h) in Table 4, show how nominal and real stock returns response to changes in the Federal funds rates, correspondingly. For both nominal and real stock returns, an increase in the Federal funds rate leads to a reduction in stock returns in both regimes; bull and bear markets. However, the impacts of changes in the Federal funds rates are stronger in bear markets. For instance, a 1% increase in the Federal funds rate leads to a 0.70% reduction in nominal stock returns during bull market, and a 4.91% shrinkage in bear markets. Evidently, a contractionary monetary policy has a statistically significant and stronger impacts during bear market; as represented as $|\hat{\beta}_{1.j}| > |\hat{\beta}_{0.j}|$ in most cases[7].

4.2 Empirical Results for Sample regarding the Financial Crisis: End-point at August 2014

The subprime mortgage-led financial crisis, started in the late-2007, has put a special case in analyzing the impact of monetary policy on the stock markets. As the interest instrument of the monetary policy has been substantially lowered and hit its zero-lower bound, the sub-sample of the impacts regarding the zero-lower bound of monetary policy is worth making.

Figure 3 illustrates the historical data and changes in the Federal funds rate from January 1965 to August 2014, with the responses of the Federal funds rate regarding the Subprime mortgage financial crisis in the shaded areas. Clearly, the Federal funds rate has been lowered and stayed at the zero-lower bound since the late-2008[8].

Figure 3: The historical data and changes in the Federal funds rate (1965-2014)



[7] A counter eff… the impact is larger during bu…

[8] See (Thornton…

The empirical results of the Markov-switching models for the sample ended in August 2014, including effects of the financial crisis on the interest instruments, are shown in Table 5. Note that the model, identification of stock market regimes, and suggested lags in monetary policy are equivalent to those in the previous section.

TABLE 5
STATE-DEPENDENT EFFECTS OF MONETARY POLICY: DDR AND DFF
DATA RANGE: 1965M01 – 2014M08

	Nominal Returns				**Real Returns**			
	(a) DDR(1)	(b) DFF(1)	(c) DFF(2)	(d) DFF(3)	(e) DDR(1)	(f) DFF(1)	(g) DFF(2)	(h) DFF(3)
μ_0	1.28	1.22	1.11	1.12	-0.78	-0.85	-0.94	-0.92
	(0.19)	(0.17)	(0.18)	(0.19)	(0.16)	(0.17)	(0.16)	(0.18)
μ_1	-1.93	-0.67	-2.70	-1.84	-4.97	-3.86	-5.20	-4.05
	(1.05)	(0.60)	(1.32)	(1.11)	(0.93)	(1.17)	(1.15)	(1.13)

σ_0^2	1.20	1.11	1.25	1.23	1.20	1.20	1.26	1.24
	(0.06)	(0.07)	(0.06)	(0.06)	(0.05)	(0.06)	(0.05)	(0.06)
σ_1^2	1.82	1.78	1.86	1.88	1.84	1.88	1.86	1.89
	(0.09)	(0.07)	(0.09)	(0.10)	(0.08)	(0.09)	(0.09)	(0.10)
$\beta_{0,1}$	-2.72	-2.64			-2.75	-1.11		
	(0.79)	(0.78)			(0.73)	(0.44)		
$\beta_{0,2}$			-0.67				-0.68	
			(0.31)				(0.31)	
$\beta_{0,3}$				-0.45				-0.49
				(0.35)				(0.36)
$\beta_{1,1}$	0.29	-0.22			0.57	0.04		
	(1.58)	(0.40)			(2.02)	(0.19)		
$\beta_{1,2}$			-3.77				-4.71	
			(2.53)				(2.30)	
$\beta_{1,3}$				-0.35				-0.33
				(0.92)				(1.11)
p^{00}-c	2.90	2.84	3.31	3.09	3.01	2.90	3.47	3.18
	(0.50)	(0.49)	(0.62)	(0.54)	(0.46)	(0.47)	(0.55)	(0.52)
p^{10}-c	-1.46	-2.10	-1.48	-1.48	-1.45	-1.33	-1.52	-1.47
	(0.48)	(0.49)	(0.55)	(0.57)	(0.48)	(0.55)	(0.55)	(0.56)
p^{00}	0.95	0.94	0.96	0.96	0.95	0.95	0.97	0.96
p^{11}	0.81	0.89	0.81	0.81	0.81	0.79	0.82	0.81
LogLik	-1670.85	-1670.90	-1671.62	-1670.97	-1668.79	-1669.49	-1667.02	-1668.99

NOTE: The standard errors are entries in parentheses. The dependent variable in this model is the nominal or real stock returns. The model is $R_t = \mu_{st} + \sum_{j=1}^{q} \beta_{s_t,j} X_{t-j} + \varepsilon_t$ with mean and regime specific error variance (μ_0, σ_0^2) in regime 0 or bull market and (μ_1, σ_1^2) in regime 1 or bear market. The measure of monetary policy is represented as X_t. DDR(1) represents one lag in changes in discount rates. DFF(1), DFF(2), and DFF(3) represent one, two, and three lags in changes in Federal funds rates, respectively. The transition matrix parameters are specified as p^{00}-c and p^{10}-c. LogLik represents the log likelihood value of the models.

Let us focus on the impacts of the discount rates, the results are presented in columns (a) and (e) in the Table 5 for the nominal and real returns, respectively. Surprisingly, the controversial results emerged as changes in the discount rates affect stock returns during bull and bear markets unevenly and in opposite direction as found in the previous section with prior-to the financial crisis sample. Evidently, as $|\hat{\beta}_{0.j}| > |\hat{\beta}_{1.j}|$, it is interpretable that a contractionary monetary policy (an increase in discount rate) has a stronger effect on bull market. In addition, the assumption that the monetary policy will negatively impact stock returns is no longer holds, where the impact of monetary policy has entered positively in bear markets. However, the contradict effects in bear markets are proved to be statistically insignificant. Similar to the results found in the previous section, this may suggest that the discount rates might not be a good choice for measuring the monetary policy stance.

The results from columns (b) to (d), and columns (f) to (h) in Table 5, shows how nominal and real stock returns response to changes in the Federal funds rate, taking into account the financial crisis responses. In most cases, an increase in the Federal funds rate leads to a reduction in stock returns in both regimes; bull and bear markets. However, the magnitude effects from changes in the Federal funds rate on stock regimes become unclear across different models. By taking into account the statistical significance, the DFF (2) models which are the statistically strongest among all, still suggests the same results as previous findings; a tightening monetary policy lowers stock return in both regimes but its magnitude effect is higher during bear market regimes. For instance, a 1% increase in the Federal funds rates leads to a 0.67% reduction in nominal stock returns during bull market, and a 3.77% shrinkage in bear markets. Evidently, in terms of statistical significance, the Federal funds rates is more preferable as a measure of monetary policy than the discount rates, which supports the suggestion of the Federal funds rates by Bernanke and Kuttner (2005).

A couple of remarks are worth making. Note that the analysis conducted by taking into account the zero-lower bound of monetary policy in this section, has proved to be more challenging. First, the overall effects of the monetary policy on stock returns regardless of regimes, become less statistically relevant. In some cases, the coefficients indicating the relationship between monetary policy and stock returns are proved to be statistically insignificant. This findings emphasize the complication in analyzing the monetary policy with the zero-lower bound of interest instruments. Second, magnitude and direction of the effects become unclear in less statistically relevant; namely the models with the discount rates and some lag models of the Federal funds rates. However, assumptions suggested by several studies[9] that a contracionary monetary policy is more effective during volatile states of stock markets is still held in statistically strong models; namely the models with two-lags in the changes in the Federal funds rates.

5 Influences of the US Monetary Policy on Asian Equity Performance

In this section, we turn our interests to the influences of the U.S. monetary policy on the equity market conditions outside the U.S. Several literatures have motivated to find the global impacts of U.S. monetary policy on other regions in various aspects of economic conditions[10]. In addition, one of the key aspects that drawn interests among economists is the equity market responses. Among Asian emerging countries, we are motivated to address influences of the US monetary policy in Asian equity market perspectives. In order to address the answer, the modified Markov-switching model in equation (5) is revisited.

$$R_t = \mu_{s_t} + \sum_{j=1}^{q} \beta_{s_t,j} X_{t-j} + \epsilon_t, \qquad \epsilon_t \sim i.i.d. \mathcal{N}\left(0, \sigma_{s_t}^2\right), \tag{5}$$

where X_t is the US monetary policy at time t, represented as interest instruments including changes in the discount rates and changes in the Federal funds rates. However, the stock returns (R_t) is now changed to measure the Asian equity market performance. Using the MSCI All Country (AC) Asia excluding Japan index, including the stock indexes in China, Hong Kong, India, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, and Thailand[11], this section focuses on the influences of US monetary policy on Asian equity market. Due to the availability of the MSCI AC

[9] See Chen (2007), Jansen and Tsai (2010), Kurov (2010).
[10] See Arora and Cerisola (2000), Yoshino, Taghizadeh-Hesary, Hassanzadeh, and Prasetyo (2014)
[11] The definition of the MSCI AC ex Japan index is from MSCI Inc., the data is retrieved from Bloomberg.

Asia ex Japan index, the data used in this section is ranged from January 1990. Moreover, the sub-samples prior- and post financial crisis are still applied. The analysis in this section is conducted using two different end-points: July 2007, and August 2014.

5.1 Empirical Results

In this section, the empirical results are shown in Table 6. Note that the dependent variable of the Markov-switching models is Asian stock returns using the MSCI All Country (AC) Asia excluding Japan index. In addition, the AR lags in monetary policy (X_t) are chosen by the Akaike's information criteria (AIC) and Schwarz's criterion (SC). According to the models, both information criteria suggest the same number of lags. The results prior to the financial crisis are in column (a) to (d), while columns (e) to (h) represent outcomes aftermath.

In the case of changes in the discount rates, the results are shown in columns (a) to (b), and in columns (e) to (f) in Table 6, regarding the suggested lags. Evidently, the impacts of monetary policy reflected by the discount rates on Asian stock returns are ambiguous and statistically insignificant in most cases. This finding also emphasizes that the discount rates might not be a good monetary policy stance indicator for the models, as it is statistically weak in reflecting Asian equity performance.

The results from columns (c) to (d), and columns (g) to (h) in Table 5, shows how Asian stock returns response to changes in the Federal funds rates, respectively prior- and after the financial crisis. In most cases, an increase in the Federal funds rates leads to a reduction in stock returns in both regimes; bull and bear markets. However, the magnitude effects from changes in the Federal funds rates on stock regimes become unclear in the model with one-lag in the Federal funds rates. However, by deliberating the statistical significance into consideration, the model prior to the financial crisis (end-point: July 2007) with no lag in the Federal fund rates which provides the highest statically relevance, still suggests the negative impacts of the Federal funds rates on Asian stock returns. A contractionary monetary policy lowers Asian stock return in both regimes but its magnitude effect is stronger during bear market regimes. For instance, before the financial crisis, a 1% increase in the Federal funds rates affects Asian stock markets by reducing 3.36% of stock returns in bull markets, and an 8.41% shrinkage during bear markets. However, regarding the financial crisis, the results from the models with no-lag in the Federal funds rates suggests the opposite magnitude impacts. Despite of the negative relationship between the Federal funds rates and Asian stock returns, the magnitude of those effects appear to be stronger during bull markets rather than bear regimes.

In the end, a couple of remarks regarding two different sub-sample; before and after the crisis, is worth making. Firstly, as evidence shows, the overall effects of the US monetary policy identified as interest instruments becomes less relevant and less effective to Asian stock performance after the crisis in 2007. Secondly, in spite of the negative linkages between the Federal funds rates and Asian stock returns, the magnitude effects across bull and bear regimes are contradict regarding the end-points of the sub-samples. Prior to the financial crisis periods, the asymmetric effects of the monetary policy on stock returns are stronger during bear market regimes, however, the reversed magnitude impacts occur after the financial crisis where the changes in the US monetary policy are more effective to Asian stock performance during bull market regimes.

TABLE 6
STATE-DEPENDENT EFFECTS OF MONETARY POLICY: DDR AND DFF
DEPENDENT VARIABLE: MSCI AC EX.JAPAN INDEX

	End-point: July 2007				**End-point: August 2014**			
	(a) DDR(1)	(b) DDR(2)	(c) DFF	(d) DFF(1)	(e) DDR(1)	(f) DDR(2)	(g) DFF	(h) DFF(1)
μ_0	1.39	1.41	1.42	1.41	1.17	1.19	1.21	1.18
	(0.43)	(0.43)	(0.47)	(0.44)	(0.37)	(0.37)	(0.39)	(0.38)
μ_1	-0.91	-0.73	-1.25	-0.70	-0.40	-0.92	-1.29	-0.70

	(1.32)	(1.29)	(1.51)	(1.40)	(1.50)	(1.27)	(1.37)	(1.28)
σ_0^2	1.23	1.11	1.13	1.13	1.12	1.11	1.13	1.13
	(0.09)	(0.09)	(0.09)	(0.09)	(0.08)	(0.08)	(0.08)	(0.08)
σ_1^2	2.04	2.05	2.03	2.05	2.07	2.07	2.07	2.08
	(0.10)	(0.10)	(0.10)	(0.10)	(0.09)	(0.09)	(0.09)	(0.09)
$\beta_{0,1}$	0.01		-3.36	-0.96	-0.04		-3.82	-0.71
	(0.12)		(2.86)	(2.37)	(1.50)		(2.88)	(2.50)
$\beta_{0,2}$		-1.99				-1.51		
		(1.38)				(1.43)		
$\beta_{1,1}$	-5.19		-8.41	2.36	-2.80		-1.71	3.49
	(5.84)		(5.43)	(6.11)	(3.12)		(5.05)	(4.50)
$\beta_{1,2}$		1.37				0.65		
		(5.36)				(3.93)		
p^{00}-c	3.31	3.32	3.31	3.31	3.31	3.31	3.30	3.32
	(0.59)	(0.59)	(0.59)	(0.59)	(0.53)	(0.53)	(0.53)	(0.53)
p^{10}-c	-2.94	-2.94	-2.89	-2.91	-2.72	-2.76	-2.68	-2.73
	(0.65)	(0.65)	(0.68)	(0.65)	(0.56)	(0.55)	(0.57)	(-0.56)
p^{00}	0.96	0.97	0.96	0.96	0.96	0.96	0.96	0.97
p^{11}	0.95	0.95	0.95	0.95	0.94	0.94	0.94	0.94
LogLik	-613.60	-609.73	-614.26	-613.87	-859.23	-855.71	-861.41	-859.56

NOTE: The standard errors are entries in parentheses. The dependent variable in this model is returns on Asian stock markets: represented by the MSCI AC ex Japan index. The model is $R_t = \mu_{st} + \sum_{j=1}^{q} \beta_{s_t,j} X_{t-j} + \varepsilon_t$ with mean and regime specific error variance (μ_0, σ_0^2) in regime 0 or bull market and (μ_1, σ_1^2) in regime 1 or bear market. The measure of monetary policy is represented as X_t. DDR(1) and DDR(2) represents one, and two lags in changes in discount rates. DFF, and DFF(1) represent zero, and one lag in changes in Federal funds rates, respectively. The transition matrix parameters are specified as p^{00}-c and p^{10}-c. LogLik represents the log likelihood value of the models.

6 Risk-Taking Channel of Monetary Policy in Equity Market

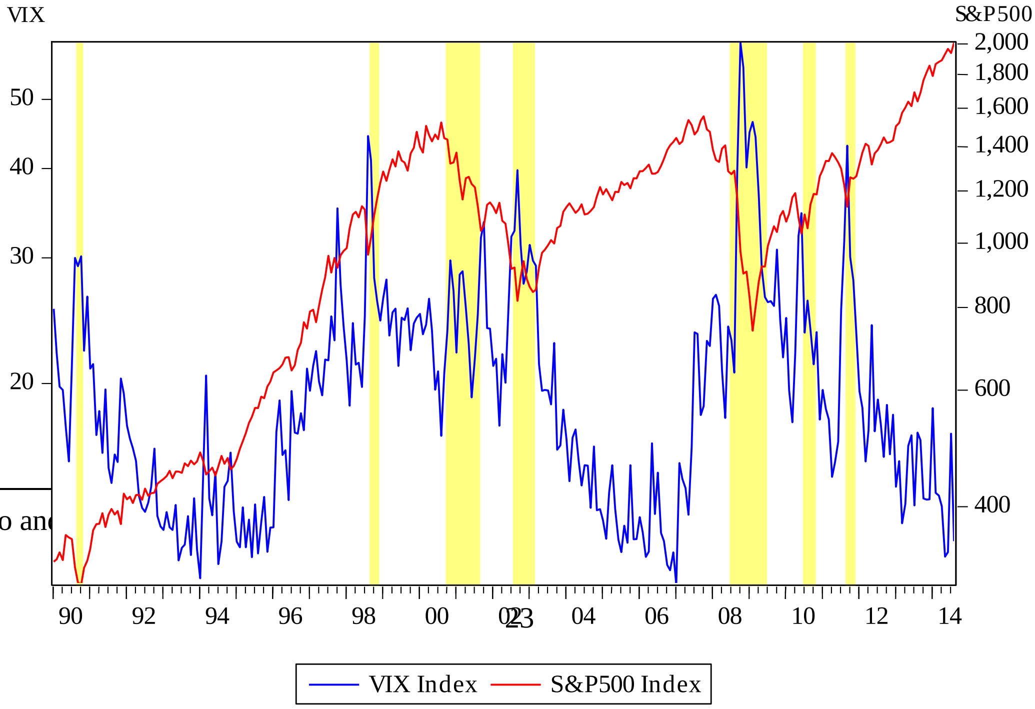
A number of empirical results from previous sections suggest a potential linkage between stance of monetary policy and equity market conditions. However, the important question still persists, what is the economical reason behind the linkage? Why equity market respond to monetary policy as they do in previous empirical evidence. In order to address these questions, the concept of monetary policy transmission mechanism is revised to find the linkages between monetary policy and equity markets. According to Mishkin (2001), the monetary policy transmission mechanisms involving stock markets are through Tobin's q theory and firm balance-sheet effect. Briefly, the Tobin's q approach proposes that an expansionary monetary policy affects stock prices by lowering the relative attractiveness of alternative investment, i.e. bonds, and resulting in higher stock prices. On the other hand, firm's balance-sheet effect, which is often referred as "the credit channel"[12], involves the asymmetric information and informational frictions; adverse selection and moral hazard problem in credit markets that are weaken during periods of tightening monetary policy. However, Bernanke and Kuttner (2005) provided evidence of the stock markets response to changes in monetary policy changes. Notably, the stock market response to policy changes through expected future excess returns, and expected future dividends, Bernanke and Kuttner (2005). Therefore, a tightening monetary poicy or an increase in policy rates reduces stock prices by increasing the prevailing equity premiums in two ways. First, the contracted monetary condition lead to an increase in interest cost and lower the stock market-listed firms' balance sheets, which resulted in higher riskiness in stock markets. Second, a tighening monetary policy could affect investors' behavior by lowering their incentives to bear risk.

Eventually, it has been a great interest for both financial economists and monetary economists to develop channels of transmission mechanism to further explain the influences of monetary policy on stock markets. One of the most focused channels in recent studies, is the linkages of monetary policy to financial markets through the "risk-taking channel". Even though, there is no conclusive literature that provides a solid link between monetary policy and risk-taking indicator in equity markets, this section is devoted to address the insights and raised the discussions of this channel.

[12] See Bernanke and Gertler (1995)

The concept of the risk-taking channel of monetary policy often relates to how monetary policy impacts either risk-perception or risk-tolerance in financial markets; for instance, risk in the investment portfolios, and assets price. From the recent study by Borio and Zhu (2012), there are many possible ways that the risk-taking channel can play a role in financial markets. For instance, a loose monetary policy (lower interest rate) increases value of assets and collaterals together with incomes and profits, which lead to reduction in risk-perception or increase in risk-tolerance[13]. Regarding the deliberation concerning the risk-taking channel of monetary policy, numbers of empirical works have conducted to address the correlation between monetary policy and the risk-taking behavior in financial markets, especially in equity markets. In order to address the risk-taking behavior in stock markets, many empirical works choose "the VIX index" to be an indicator of risk-neutral or expected variance in stock markets. The VIX index is a widely used indicator of implied volatility in the US stock market; specifically, for the S&P500 index. Empirically, the risk-taking channel of monetary policy in equity market can be interpreted from the correlation between the monetary policy and the VIX index; as referred as "fear index" or "risk-appetite" in the stock markets. Figure 4 shows the correlation between the VIX index and the S&P500 index. Clearly, the VIX index performs well in capturing the downturn periods in stock markets, as well as the economic crisis in the shaded areas.

Figure 4: The VIX Index and The S&P 500 Index



[13] See Borio an

Using a vector-autoregressive (VAR) framework, Bekaert, Hoerova, and Duca, (2013) found the stong correlation between the VIX index and measures of monetary policy stance. This study develops and provides the precise empirical effects on the channel suggested by the Bernanke and Kuttner (2005) that the loose monetary policy affects positively in the stock markets by lowering risk volatility and increase the risk-tolerance of investors in financial markets. In conclusion, the study found that an expansionary monetary policy lowers the risk aversion in the stock markets (represented by the VIX index), which in turn increases risk-appetite of the investors in the future as well[14]. Similarly to the hypothesis of Rajan (2006), during the time with expansionary monetary policy measuring by the liquidity provided by the Central bank, investment managers tend to engage in riskier investments and take excessive risk[15].

7 Concluding Remarks

In this paper, a modified version of the Markov-switching models suggested by Chen (2007) are applied to empirically investigate, first, the regime-switches in the US stock market using the S&P 500 price index, second, the magnitude effects of monetary policy on stock returns across regimes, third, the influences of the US monetary policy on Asian equity market performance using

[14] See Bekaert, Hoerova, and Duca (2013)
[15] See Rajan (2006)

the MSCI AC ex Japan index. Furthermore, I have deliberated the discussion of the new approach of monetary policy transmission mechanism in the equity markets; namely, “the risk-taking channel”.

Clearly, the identification of stock market regimes from the models is consistent with the previous literatures where bull markets are the stable states with higher stock returns, whereas, the bear markets are referred to volatile states with lower stock returns. Empirically, the results show that the Markov-switching models perform well in capturing most of the bull and bear markets, and match them with the periods of crisis in stock markets. It also presents that the duration of bull market regimes tend to persist for longer periods than the bear market regimes.

The paper also provides empirical results of the impacts of the US monetary policy on both local and Asian equity markets. Similarly, a contractionary (tightening) monetary policy affects the stock markets inversely by increasing (reducing) stock returns in both regimes. However, the asymmetric impacts of monetary policy also exist in terms of magnitude effects on stock returns across regimes. Precisely, an increase in interest instruments of monetary policy is more effective during bear markets where the asymmetric information is weaken and the financial constraints are higher.

Throughout the paper, the interest instruments have been used as measure of monetary policy stance which are suggested by several literatures. However, a decent attribute in measuring monetary policy of the interest instruments might not be held in the times of unconventional monetary policy stance, for instance, the zero-lower bound of monetary policy conducted in several developed countries as a responsive policy to the financial crisis. Therefore, the analysis using the conventional monetary policy measurement as an interest instruments might not be suffice in capturing the influences of monetary policy on equity markets. As there is no extant studies suggesting a new approach to measure an unconventional monetary policy, I hope that this remark will encourage the studies in this particular area to enhance the analysis in the monetary economics and the financial economics as well.

Finally, the discussions of monetary policy transmission mechanism in equity markets focusing on the new approach, "the risk-taking channel" is deliberate for further comprehension of the empirical findings. Even though, there still no extant research establishes a solid linkage between monetary policy and risk-perception in the financial markets, specifically, the equity markets, the strong correlation between monetary policy and the VIX index will be able to inspire for further empirical research on the theoretical linkage in order to develop the transmission channels to reflect the impacts of monetary policy on equity markets.

References

[1] Altunbas, Y., Gambacorta, L., & Marques-Ibanez, D. (2010). Does Monetary Policy Affects Bank Risk-Taking? *BIS Working Paper No. 298*.

[2] Ang, A., & Timmermann, A. (2011). Regime Changes and Financial Markets. *NBER Working Paper Series 17182*.

[3] Arora, V., & Cerisola, M. (2000). How Does U.S. Monetary Policy Influence Economic Conditions in Emerging Markets? *IMF Working Paper*.

[4] Bernanke, B. S., & Blinder, A. S. (1992). The Federal Funds Rate and the Channels of Monetary Transmission. *American Economic Association, 82*(4), 901-921.

[5] Bernanke, B. S., & Gertler, M. (1996). Inside The Black Box: The Credit Channel of Monetary Policy Transmission. *NBER Working Paper Series 5146*.

[6] Bernanke, B. S., & Kuttner, K. N. (2005). What Explains the Stock Market's Reaction to Federal Reserve Policy? *The Journal of Finance*, 1221-1257.

[7] Bernanke, B. S., Reinhart, V. R., & Sack, B. P. (2004). Monetary Policy Alternatives at the Zero Bound: An Empirical Assessment. *Brookings Papers on Economic Activity, 2*, 1-100.

[8] Bernanke, B., & Gertler, M. (1989). Agency Costs, Net Worth, and Business Fluctuations. *The American Economic Review, 79*(1), 14-31.

[9] Borio, C., & Zhu, H. (2012). Capital Regulation, Risk-Taking and Monetary Policy: A Missing Link in the Transmission Mechanism? *Journal of Financial Stability, 8,* 236-251.

[10] Chauvet, M., & Piger, J. (2002). Identifying Business Cycle Turning Points in Real Time. *Federal Reserve Bank of Atlanta Working Paper 2002-27*.

[11] Chen, S.-S. (2005). Does Monetary Policy Have Asymmetric Effects on Stock Returns? *Journal of Money, Credit and Banking, 39*(2-3), 668-688.

[12] Claus, E., Claus, I., & Krippner, L. (2014). Asset Markets and Monetary Policy Shocks at the Zero Lower Bound. *Reserve Bank of New Zealand Discussion Paper Series*.

[13] Conover, M. C., Jensen, G. R., & Johnson, R. R. (1999). Monetary Environments and International Stock Returns. *Journal of Banking & FInance, 23*, 1357-1381.

[14] Edwards, S., Biscarri, J. G., & Gracia, F. P. (2003). Stock Market Cycles, Financial Liberalization and Volatility. *Journal of International Money and Finance, 22*, 925-955.

[15] Gaggl, P., & Valderrama, M. T. (2010). Does a Low Interest Rate Environment Affect Risk Taking in Austria. *Monetary Policy & The Economy*, 32-48.

[16] Gambacorta, L. (2009). Monetary Policy and the Risk-Taking Channel. *BIS Quarterly Review*, 43-53.

[17] Hamilton, J. D. (1989). A New Approach to the Economic Analysis of Nonstationary Time Series and the Business Cycle. *Econometrica*, *57*(2), 357-384.

[18] Hamilton, J. D. (2005). Regime-Switching Models. *Palgrave Dictionary of Economics*.

[19] Jansen, D. W., & Tsai, C.-L. (2010). Monetary Policy and Stock Returns: Financing Constraints and Asymmetries in Bull and Bear Markets. *Journal of Empirical Finance, 17*, 981-990.

[20] Jiang, C. (2013). The Asymmetric Effects of Monetary Policy on Stock Market. *Job Market Paper*.

[21] Keran, M. W. (1971). Expectations, Money, and the Stock Market. *Federal Reserve Bank of St. Louis*, 16-31.

[22] Kim, C.-J. (1994). Dynamic Linear Models with Markov-Switching. *Journal of Econometrics, 60*, 1-22.

[23] Kim, C.-J., Piger, J., & Startz, R. (2008). Estimation of Markov Regime-Switching Regression Models with Endogenous Switching. *Journal of Econometrics*, *143*, 263-273.

[24] Kiyotaki, N., & Moore, J. (1995). Credit Cycles. *NBER Working Paper No. 5083*.

[25] Kuan, C.-M. (2002). Lecture on The Markov Switching Model. *Institute of Economics Academia Sinica*.

[26] Laopodis, N. T. (2013). Monetary Policy and Stock Market Dynamics across Monetary Regimes. *Journal of International Money and Finance, 33*, 381-406.

[27] Leelahaphan, T. (2009). Monetary Policy, Exchange Rate and Asian Stock Markets. *Bank of Thailand Research Workshop*.

[28] Lunde, A., & Timmermann, A. (2004). Duration Dependence in Stock Prices. *Journal of Business & Economic Statistics, 22*(3), 253-273.

[29] Maheu, J. M., & McCurdy, T. H. (2000). Identifying Bull and Bear Markets in Stock Returns. *Journal of Business & Economic Statistics*, *18*(1), 100-112.

[30] Maskay, B. (2007). Analyzing the Effect of Change in Money Supply on Stock Prices. *The Park Place Economist*, *15*(1), 72-79.

[31] Mishkin, F. S. (1996). The Channels of Monetary Transmission: Lessons for Monetary Policy. *NBER Working Paper Series 5464*.

[32] Mishkin, F. S. (2001). The Transmission Mechanism and The Role of Asset Prices in Monetary Policy. *NBER Working Paper Series 8617*.

[33] Pagan, A. R., & Sossounov, K. A. (2003). A Simple Framework for Analysing Bull and Bear Markets. *Journal of Applied Econometrics*, *18*, 23-46.

[34] Patelis, A. D. (1997). Stock Returns Predictability and The Role of Monetary Policy. *The Journal of Finance*, 1951-1972.

[35] Rajan, R. G. (2006). Has Finance Made the World Riskier? *European Financial Management*, *12*(4), 499-533.

[36] Ravn, M. O., & Sola, M. (2004). Asymmetric Effects of Monetary Policy in the United States. *Federal Reserve Bank of St. Louis Review*, *86*(5), 41-60.

[37] Rigobon, R., & Sack, B. (2004). The Impact of Monetary Policy on Asset Prices. *Journal of Monetary Economics*, *51*, 1553-1575.

[38] Thorbecke, W. (1997). On Stock Market Returns and Monetary Policy. *The Journal of Finance*, 635-654.

[39] Thornton, D. L. (2012). The Federal Reserve's Response to the Financial Crisis: What It Did and What It Should Have Done. *Federal Reserve Bank of St. Louis Working Paper Series*.

[40] Yoshino, N., Taghizadeh-Hesary, F., Hassanzadeh, A., & Prasetyo, A. D. (2014). Response of Stock Markets to Monetary Policy: An Asian Stock Market Perspective. *ADBI Working Paper Series No. 497*.