The Effects Of Foreign Central Bank Monetary Policies On BIST 100 Index Volatility

Hüseyin AKTAŞ* Tuna Can GÜLEÇ ** Elif ERER ***

ABSTRACT

National and international investors are closely monitoring the policies implemented by central banks when making investment decisions. These policies influence the macroeconomic and financial factors of the countries. Due to the high level of worldwide economic integration, interest rate decisions of the international central banks are simultaneously affecting the stability of international financial system. The aim of this study is to examine the effects of the monetary policies and the interest rate decisions implemented by various central banks (CBRT, The Federal Reserve, the European Central Bank, the Central Bank of India, the Central Bank of the Netherlands, the Central Bank of the Russian Federation and the Central Bank of Brazil) for the period of 02.01.2004-31.01.2017 on the stock markets. With this purpose, the daily closing price data for the BIST-100 index has been modeled with ARMA (9,9) -GJR-GARCH (1,1).

Results of the analyses indicate that the monetary policy decisions made by FED, ECB, CBI, CBN, CBR and CBB cause an increment of volatility in BIST 100 index under bear market conditions. In bull market, however only the monetary policy decisions made by FED and ECB increase the volatility in BIST 100 index. In addition, the bear market environment is found to be more volatile and persistent compared to the bull market environment. The findings of the analysis are aimed to be influential on the decisions of portfolio managers and market regulators.

Keywords: Central Bank, Monetary Policy, BIST 100

JEL Code: E30, G10

Yabancı Merkez Bankası Para Politikalarının BİST 100 Endeksi Volatilitesine Etkileri

ÖZ

Ulusal ve uluslararası yatırımcılar, yatırım kararlarını verirken merkez bankalarının uyguladıkları politikaları yakından takip etmektedirler. Çünkü söz konusu politikalar ülkenin makroekonomik ve finansal faktörleri üzerinde etkili olmaktadır. Ülkelerin yüksek derecede ekonomik entegresyonu nedeniyle sadece ulusal merkez bankasının değil, uluslararası merkez bankalarının faiz kararları da ülkenin finans sektörünü yakından etkilemektedir. Bu çalışmanın amacı 02.01.2004-31.01.2017 dönemi için TCMB, Amerikan Merkez Bankası, Avrupa Merkez Bankası, Hindistan Merkez Bankası, Rusya Merkez Bankası ve Brezilya Merkez Bankaları'nın finansal istikrarı sağlamak amacıyla uyguladığı para politikaların ve faiz kararlarının hisse senedi piyasası üzerindeki etkilerini incelemektir. Bu amaçla BIST-100 endeksine ilişkin günlük kapanış verileri kullanılmış ve ARMA (9,9)-GJR-GARCH(1,1) modellemesinden yararlanılmıştır.

Yapılan analiz sonuçlarına gore söz konusu tüm merkez bankalarının para politikası değişim kararlarının ayı piyasası koşulları altında BIST 100 endeksi oynaklığında artışa yol açtıkları gözlemlenmiştir. Boğa piyasası koşulları altında ise sadece FED ve ECB para politikası değişim kararları BIST 100 endeksi oynaklığında artışa sebep olmaktadır. Buna ek olarak ayı piyasası

* Prof. at Manisa Celal Bayar Üniverstiy

** Research Assistant. at Manisa Celal Bayar Üniverstiy

*** PHD Student in Ege Üniversity

(Makale Gönderim Tarihi: 07.05.2018 / Yayına Kabul Tarihi: 27.11.2018)

Doi Number: 10.18657/yonveek.421591

ortamının boğa piyasası ortamına kıyasla daha oynak ve daha kalıcı piyasalar oldukları sonucuna ulaşılmıştır. Araştırma bulguları portföy yöneticileri ve piyasa düzenleyicilerinin kararlarını etkileyici nitelikte olması amacı taşımaktadır.

Anahtar Kelimeler: *Merkez Bankası, Para Politikası, BIST100*

JEL Kodu: *E30, G10*

INTRODUCTION

Volatility is an integral part of all financial markets. Speculative nature of market markers is a guarantee that markets will always be volatile to a certain level. Globalization and integration of worldwide financial markets influences not only the prices but also the volatility of the financial markets. With the transmission of cyclical deviations in financial markets the markets worldwide are expected to have a lower level of perceived volatility. However, there are studies that find conflicting results with this opinion, these studies will be further discusses in the literature review.

As the depth of market increases, markets are expected to become more resilient to volatility shocks. Worldwide integration of financial markets is a factor that contributes to the depth of financial market. However, several studies find conflicting results. This may be due to the fact that when markets integrate, it is not only the cyclical volatility that is being integrated but also the volatility shocks among the markets are integrated as well. General consensus on the literature supports that the pattern of volatility transmission among financial markets is usually from deeper market to shallower market. Volatility spillovers from American markets to emerging country markets are significant examples of this unilateral transmission mechanism. In order for study to be as accurate and realistic as possible, monetary policy changes are defined as not only the changes in interest rate but also as the alternative policy influences such as changes in required reserve ratio. With no direct relationship with each other, Central Bank of Brazil, Russia and India along with globally influential central banks such as FED and ECB provide the study with a varied and multidimensional sample.

I. LITERATURE REVIEW

There are several studies on the literature that focus on effects of FED or ECB on other stock markets, however the amount of studies that include developing country central banks are rather limited. The U.S. market's effects on Asia-Pacific country stocks markets have been analyzed by Arshanapalli et.al. (1995), Durand and Watson (2001), Kim (2003) and Phylaktis and Ravazzolo (2005), Kim (2009), Yang and Hamori (2014), Fong and Wong (2015), Apostolou and Beirne (2017). All of the studies have found a significant relationship between The U.S. stock market and the Asia-pacific country equity and debt markets. A portion of the studies in the literature are more focused on a more case-specific than the others, such as Bernanke and Kuttner (2005), according to the results of the study the monetary policy changes are more influential on stock returns of firms in cyclical industries compared to those in non-cyclical industries. Chulia vd. (2010) examined that the asymmetric impacts of FED announcements on stock market volatility using realized volatility over the period of 1997-2006. In the study, they used high-frequency intraday data connected S&P100. In the result of the analysis, they found that bad news more affected stock market volatility than good news. Moreover, presence of news is more important for bad news while the magnitude of so-called news is more important for good news.

Chen (2013) investigated how FED monetary policy movement affected airline, gambling, hotel and travel and leisure index returns in bull and bear markets. For this purpose, an event study based on Markov-switching model was used. From the result of the study, it was seen that airline, gambling and hotel index returns have been significantly more influenced by monetary policy in bear markets in comparison to bull markets. However, travel and leisure index returns was greatly affected by monetary policy in bear markets.

Asymmetric effects of monetary policy on stock returns under bear and bull markets have been studied by Chen (2007), Jansen and Tsai (2010), Kurov (2010), Laopodis (2010), Chuliá, and van Dijk (2010), Zare et. al. (2013), Simo-Kengne et.al. (2013), Li (2015) and Hung and Ma (2017). Results of the studies are varied while the majority of the studies find that expansionary monetary policy decisions are more effective during bear markets and less effective on bull markets. Similarly, contractionary monetary policies are significantly more effective during bull markets and less effective during bear markets. Asymmetries impact of monetary policy decisions under different market environments and different stock markets is also explained by agency theory which states that due to agency costs of financial intermediaries are increased due to higher levels of perceived information asymmetry among markets. In the study of Jansen and Tsai (2010), the effects of monetary policy surprises on stock returns are analyzed under bear and bull markets. According to the findings of the study, the impact of a surprise monetary policy in a bear market is significantly larger while both markets are affected negatively. The impact of a surprise monetary policy in a bear market is especially greater industries that have higher debt leverage.

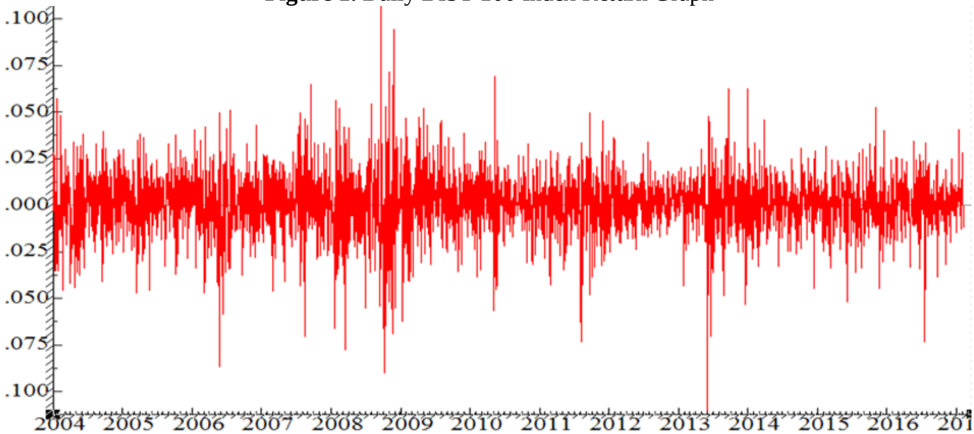
II. DATASET AND METHODOLOGY

The aim of this study is to examine the effects of the monetary policies and the interest rate decisions implemented by various central banks (CBRT, The Federal Reserve, the European Central Bank, the Central Bank of India, the Central Bank of the Netherlands, the Central Bank of the Russian Federation and the Central Bank of Brazil) for the period of 02.01.2004-31.01.2017 on the stock markets under bear and bull market conditions. Variables used in the study are explained in Table 1. Dataset used in the study has been gathered from Yahoo Finance database.

Table 1. Explanations Regarding Variables

Variables	Explanations
RBIST100	BIST 100 Daily Returns
CBRT	Dummy Variable Representing Monetary Policy Changes Announced by CBRT
FED	Dummy Variable Representing Monetary Policy Changes Announced by FED
ECB	Dummy Variable Representing Monetary Policy Changes Announced by ECB
RBI	Dummy Variable Representing Monetary Policy Changes Announced by RBI
CBR	Dummy Variable Representing Monetary Policy Changes Announced by CBR
BCB	Dummy Variable Representing Monetary Policy Changes Announced by BCB

Figure 1. Daily BIST 100 Index Return Graph



Daily return graph of BIST 100 index in Figure 1 demonstrates that small shocks are followed by small shocks while larger shocks are followed by larger shocks which represents a case of volatility clustering. Additionally it can be seen that return volatility is significantly higher in years 2007, 2008, 2013 and 2016 in BIST 100 index. Descriptive statistics regarding to BIST 100 daily return index are listed in Table 2:

Table 2. Descriptive Statistics Regarding BIST100 Daily Return Index.

Statistics	BIST100
Mean	0.000448
Median	0.000429
Std. Dev.	0.016803
Skewness	-0.272470
Kurtosis	6.508303
J-B	1779.427***
Q(15)	22.639*
Observations	3388

Note: Jarque-Bera, represents normal distribution test statistics. Q(15), represents Ljung-Box autocorrelation test statistics with 15 lags. *,**, *** respectively represent %10, %5 and %1 levels of statistical significance in which null hypothesis is rejected.

Descriptive statistics in table 2 indicate that mean of index return is positive and very small compared to standard deviation of series. Skewness, Kurtosis and J-B statistic of series indicate that series is not normally distributed is hard-tailed and skewed to left. Additionally, Q(15) value indicates that return series has serial dependence.

III. CONCLUSION REGARDING EMPIRICAL FINDINGS

In order to eliminate serial independence property in daily BIST 100 return series, an appropriate ARMA model is estimated. With the help of Akaike and Schwarz information criterion and log-likelyhood, ARMA(9,9) model is estimated as the ideal model. Ljung-Box criterion in descriptive statistics of this model indicate that there is a serial dependance in error terms. Additionally, $Q^2(15)$ and ARCH-LM statistics indicate an existence of ARCH effect. In order to model the volatility in BIST 100 index, alternative auto regressive conditional heteroskedasticity models have been used. Among these models, the most suitable model is decided as ARMA(9,9)-GJR-GARCH(1,1) via usage of log-likelihood and Akaike and Schwarz information criterion.

ARMA(9,9)-GJR-GARCH(1,1) model estimation results for the effects of CBRT, FED, ECB, RBI, CBR and BCB monetary policty decisions on BIST 100 index can be found on Table 3 below:

Table 3: The Effects of Monetary policy decisions made by CBRT, FED and ECB on volatility of BIST 100 using ARMA(9,9)-GJR-GARCH(1,1) Model.

Models	**CBRT**	**FED**	**ECB**	**RBI**	**CBR**	**BCB**
$\boldsymbol{\alpha_0}$	0.125633***	0.130728***	0.144404***	0.148512***	0.148909***	-0.0000011***
	(0.016106)	(0.039432)	(0.048793)	(0.046875)	(0.044663)	(.6123e-016)
$\boldsymbol{\alpha_1}$	0.035127***	0.035835***	0.038820***	0.039056***	0.039360***	0.038839***
	(0.011832)	(0.011699)	(0.012030)	(0.012229)	(0.012752)	(0.011959)
$\boldsymbol{\beta_1}$	0.860172***	0.858390***	0.848887***	0.844980***	0.842149***	0.847739***
	(0.012904)	(0.028534)	(0.034018)	(0.032813)	(0.031296)	(0.033280)
$\boldsymbol{\gamma_1}$	0.860172***	0.112385***	0.116398***	0.118977***	0.121790***	0.117541***
	(0.012904)	(0.030160)	(0.035563)	(0.034635)	(0.034506)	(0.034839)
Dummy	0.0000092***	0.0000184***	0.0000052***	0.0000071***	0.00000203***	0.0000061***
	(0.1125e-8)	(0.1784e-007)	(0.8386e-0161)	(0.4066e-016)	(0.6752e-0165)	(0.5135e-0224)
GED	6.291634***	6.166078***	1.294406***	0.118977***	1.296724***	1.294390***
	(0.69636)	(0.52856)	(0.0017902)	(0.034635)	(0.0050721)	(0.0010703)
Akaike	-5.529518	-5.530268	-5.531266	-5.531578	-5.532649	-5.530663
Schwarz	-5.486108	-5.486859	-5.487857	-5.488168	-5.489239	-5.487253
Q(50)	53.1408***	53.5135*	56.9361***	56.5001***	55.2055***	57.2299**
ARCH-LM(5)	0.69934	0.84450	0.79383	0.80909	0.78939	0.76901
$\mathbf{Q^2(50)}$	39.8438	42.5398	43.3809	44.1388	43.3906	43.8005

Note: Values in parentheses indicate standard errors. Q(50), represents Ljung-Box autocorrelation test statistics with 50 lags. *,**, *** respectively represent %10, %5 and %1 levels of statistical significance in which null hypothesis is rejected. ARCH-LM is a separate variance test statistic. $Q^2(50)$, represents Ljung-Box residual square statistics with 50 lags.

In Table 3, γ_1 quotient represents the asymmetric effect for all models. It is positive and statistically significant at 0.05 level of significance. It can also be seen that CBRT, FED, ECB, RBI and CBR monetary policy decision changes affect the volatility of BIST100.

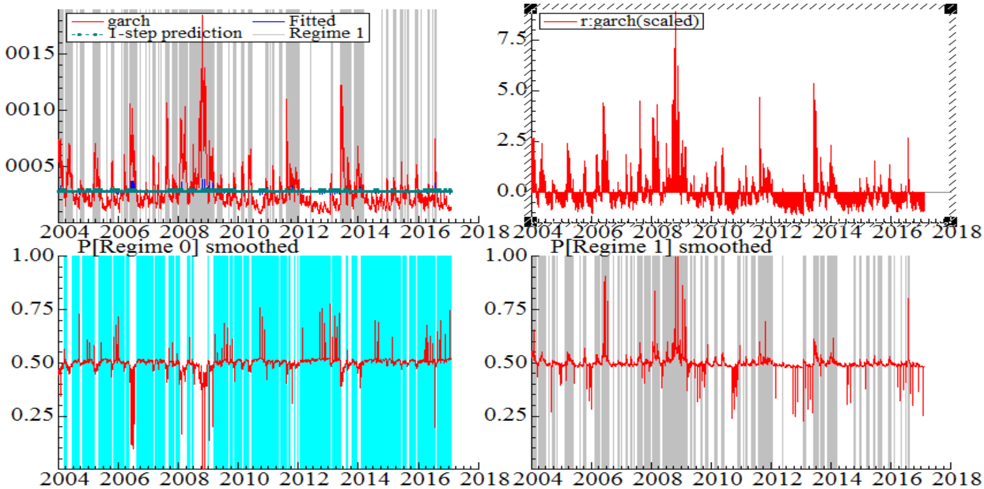
Using Markov switching model, provided insight on the differences between the effects of monetary policy changes on BIST 100 index on bull and bear markets since it allows regime switches within model. As Markov switching model assumes coexistence of economic expansion and recession, we can define two regimes as st = {1, 2}, with st = 1 as recession and st = 2 expansion, then we can demonstrate switching probabilities between two regimes as following:

$$Pr[(s_1 = 1|s_{t-1} = 1)] = p_{11}$$
$$Pr[(s_1 = 2|s_{t-1} = 1)] = p_{12}$$
$$Pr[(s_1 = 2|s_{t-1} = 2)] = p_{22}$$
$$Pr[(s_1 = 1|s_{t-1} = 2)] = p_{21}$$

Figure 1: Smoothed Graphic regarding MS-ARMA(2,1,0,1) model

Model selection criteria indicates MS-ARMA(2,1,0,1) model as the most suitable model. Smoothed Graph of MS-ARMA(2,1,0,1) model is demonstrated in

Figure 2: Recession and Expansion Regimes



Regime 0 represents the expansion and Regime 1 represents the recession in Figure 2. In case of our study Regime 0 represents bear market and Regime 1 represents bull market conditions. Table 4 represents the estimated respective effects of central banks under bear and bull markets for MS-ARMA(2,1,0,1) model:

Table 4: MS-ARMA(2,1,0,1) Model Estimation Results:

Modeller	CBRT	FED	ECB	RBI	CBR	BCB
$\sigma_{t-1}(0)$	0.687345***	0.728441***	0.733138***	0.743418***	0.738988***	0.742140***
	(0.009638)	(0.003916)	(0.002726)	(0.004922)	(0.005654)	(0.004707)
$\sigma_{t-1}(1)$	0.863102***	0.846609***	0.850093***	0.858851***	0.857565***	0.858406***
	(0.008522)	(0.006844)	(0.007227)	(0.006660)	(0.006754)	(0.006688)
α_0 (0)	0.000321***	0.000290***	0.000282***	0.000293***	0.000299***	0.000294***
	(3.203e-005)	(7.023e-006)	(7.427e-006)	(6.997e-006)	(6.950e-006)	(7.106e-006)
α_0 (1)	0.000340***	0.000342***	0.000342***	0.000341***	0.0003417***	0.000342***
	(3.732e-005)	(6.945e-006)	(7.854e-006)	(6.557e-006)	(6.358e-006)	(6.571e-00)
Dummy(0)	1.15202e-005	3.66909e-005***	1.54079e-005*	1.30026e-006	-8.67025e-006	-4.64614e-006
	(1.489e-005)	(1.222e-005)	(1.052e-005)	(1.981e-005)	(2.478e-005)	(2.242e-005)
Dummy(1)	0.000137**	0.000248***	0.0002862***	0.000455***	0.000443***	0.000466***
	(7.286e-005)	(7.733e-005)	(7.558e-005)	(3.50e-05)	(4.28e-05)	(1.81e-05)
Akaike	-16.174544	-16.87256	-16.909773	-16.9256738	-16.9006769	-16.932657
Log-likelihood	27401.5908	28583.6885	28646.7006	28673.6286	28631.2964	28685.4546
Linearity LR	553.99***	353.06***	480.08***	533.27***	449.38***	557.85***

*Note: Values in parentheses indicate standard errors. *,**, *** respectively represent %10, %5 and %1 levels of statistical significance in which null hypothesis is rejected. σ, represents conditional variance, α_0 represents the average and dummy represents monetary policy decision changes. Values in parentheses respectively represent regime 0(Bear) and regime 1 (Bull).*

MS-ARMA(2,1,0,1) model estimation results indicate that, under bull market conditions, only policy changes made by FED and ECB increase the volatility of BIST100 index. While statistically significant, this effect has a comparably low influence on volatility. On the other hand, under bear market conditions, monetary policy decisions made by CBRT, FED, ECB, RBI, CBR and BCB all has a statistically significant positive effect on the volatility of BIST100 index, furthermore this effect is comparatively more influential. From this result it can be understood that when there is a situation of consistent downward trend or crisis in a market, decisions of central banks gain significant influence. Table 5 demonstrates MS-ARMA(2,1,0,1) model regime classification details

Table 5: Regime Classification under MS-ARMA(2,1,0,1) model

Transition Probability Matrix	$P = \begin{bmatrix} 0.981862 & 0.018138 \\ 0.040748 & 0.959252 \end{bmatrix}$		
Regime Specifications:			
	Probability	Observation	Duration (Year)
Regime 0	87.04	2948	9.39
Regime 1	12.96	439	1.40

*Note: The MS-ARMA model was estimated using the Monte Carlo Markov Chain (MCMC) method using the Gibbs sample. *** Significance at significance level of 0.01. Regime 0 represents bear market while Regime 1 represents Bull Market.*

According to the matrix of the two-regime transition probabilities, the regimes were estimated to be quite permanent. The long-term mean probabilities of regime 0 and regimen 1 are 87.04 and 12.96, respectively. Of the total 3387 observations, 2948 are in Regime 0 and 439 are in Regime 1. The average duration in regime 0 is 9 years, and in Regime 1 1.5 years. Transition probability matrix results can be interpreted as that bear market conditions is prevalent and more persistent compared to bull market conditions.

REFERENCES

Apostolou, A., & Beirne, J. (2017). Volatility Spillovers of Federal Reserve and ECB Balance Sheet Expansions to Emerging Market Economies.

Arshanapalli, B., Doukas, J., & Lang, L. H. (1995). Pre and post-October 1987 stock market linkages between US and Asian markets. Pacific-Basin Finance Journal, 3(1), 57-73.

Bernanke, B. S., & Kuttner, K. N. (2005). What explains the stock market's reaction to Federal Reserve policy?. The Journal of finance, 60(3), 1221-1257.

Chen, Ming,Hsiang (2013). Asymmetric Response of Hospitality Stock Prices to FED Policy Actions. International Journal of Hospitality Management, 33: 129-139.

CHEN, S. S. (2007). Does monetary policy have asymmetric effects on stock returns?. Journal of Money, Credit and Banking, 39(2-3), 667-688.

Chkili, W., & Nguyen, D. K. (2014). Exchange rate movements and stock market returns in a regime-switching environment: Evidence for BRICS countries. Research in International Business and Finance, 31, 46-56.

Chuliá, H., Martens, M., & van Dijk, D. (2010). Asymmetric effects of federal funds target rate changes on S&P100 stock returns, volatilities and correlations. Journal of Banking & Finance, 34(4), 834-839.

Chulia, H.; Martens, M.; Dijk, D. (2010). Asymmetric Effecrs of Federal Funds Target Rate Changes on S&P100 Stock Returns, Volatilities and Correlations. Journal of Banking and Finance, 34: 834-839.

Durand, R. B., Kee, K. S., & Watson, I. (2001). Who moved Asian-Pacific stock markets? A further consideration of the impact of the US and Japan. Australian Journal of Management, 26(2), 125-145.

Fong, T., Hui, C., & Wong, A. (2015). How might sovereign bond yields in Asia Pacific react to US monetary normalisation under turbulent market conditions?.

Hung, K. C., & Ma, T. (2017). The effects of expectations-based monetary policy on international stock markets: An application of heterogeneous agent model. International Review of Economics & Finance, 47, 70-87.

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(5), 981-990.

Kim, S. and Nguyen, D. Q. (2009). The Spilover Effects of Target Interest Rate News From the U.S. FED and the European Central Bank on the Asia-Pacific Stock Markets. International Financial Markets, Institutions and Money, 19: 415-431

Kim, S. J. (2003). The spillover effects of US and Japanese public information news in advanced Asia-Pacific stock markets. Pacific-Basin Finance Journal, 11(5), 611-630.

Kim, S. J. (2009). The spillover effects of target interest rate news from the US Fed and the European Central Bank on the Asia-Pacific stock markets. Journal of International Financial Markets, Institutions and Money, 19(3), 415-431.

Kurov, A. (2010). Investor sentiment and the stock market's reaction to monetary policy. Journal of Banking & Finance, 34(1), 139-149.

Laopodis, N. T. (2010). Dynamic linkages between monetary policy and the stock market. Review of Quantitative Finance and Accounting, 35(3), 271-293.

Li, J. (2015). The asymmetric effects of investor sentiment and monetary policy on stock prices. Applied Economics, 47(24), 2514-2522.

Phylaktis, K., Ravazzolo, F., "Stock prices and exchange rate dynamics," Journal of International Money and Finance 24 (2005): 1031-1053.

Simo-Kengne, B. D., Balcilar, M., Gupta, R., Reid, M., & Aye, G. C. (2013). Is the relationship between monetary policy and house prices asymmetric across bull and bear markets in South Africa? Evidence from a Markov-Switching Vector Autoregressive model. Economic Modelling, 32, 161-171.

Yang, L., & Hamori, S. (2014). Spillover effect of US monetary policy to ASEAN stock markets: Evidence from Indonesia, Singapore, and Thailand. Pacific-Basin Finance Journal, 26, 145-155.

Zare, R., Azali, M., & Habibullah, M. S. (2013). Monetary policy and stock market volatility in the ASEAN5: Asymmetries over Bull and Bear markets. Procedia Economics and Finance, 7, 18-27.

SUMMARY

The results of the research can be interpreted by focusing under two main topics. Firstly while having effects to varying degrees, all of the central banks that are included in the study have a significant relationship with BIST100 index under certain market conditions. This may indicate that BIST100 has a very diverse investor portfolio that follow monetary policy changes in various countries. The fact that selected country markets are related to Turkish market in various ways may have contributed to this finding as well.

The differences between bull and bear market conditions is significant. Bear market conditions are more persistent in BIST100 index while bull market conditions are less persistent and more prone to switching to bear market whenever they arise. In terms of volatility, in times where bear market conditions are prevalent, market is significantly more volatile and more prone to external and internal shocks. All monetary policy decisions made by the central banks that are included in the study have a significant positive effect in market volatility under bear market conditions. On bull market conditions however, volatility is significantly lower and market is less prone to external shocks. Only the monetary policy decisions made by ECB and FED have a statistically significant positive effect on market volatility under bull market and these effects are substantially less influential. This may point to the the fact that the investors have a reduced perception of risk, or increased appetite for return under bull market conditions. These finding of the study aimed to be influential on the decisions of portfolio managers and market regulators.