EGE AKADEMİK BAKIŞ / *EGE ACADEMIC REVIEW*

Cilt 18. Sayı 4. Ekim 2018
SS. 699-710
DOI: 10.21121/eab.2018443010
Received: 15.03.2018 • Accepted: 26.07.2018

The Impact of Monetary Policy on Stock Returns During Bull and Bear Markets: The Evidence From Turkey*

Para Politikasının Boğa ve Ayı Piyasalarında Hisse Senedi Getirilerine Etkisi: Türkiye Örneği

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Abstract

Purpose of this study is to analyze the asymmetric response of stock market returns and volatility to monetary policy in bull and bear markets in Turkey over the period of 2002:1-2016:12. We used Markov switching model in order to identify bull and bear markets. We used policy rate as monetary policy instrument. From the empirical results, we deduced that monetary policy is more effective in bull market periods.

Keywords

Monetary Policy • Stock Market • Markov Regime Switching Model

Jel Codes

E52 • E44 • C22

Öz

Bu çalışmanın amacı, 2002:1-2016:12 döneminde Türkiye'de ayı ve boğa piyasaları açısından hisse senedi getirilerinin ve oynaklığının para politikasına asimetrik tepkisini analiz etmektir. Ayı ve boğa piyasalarını tanımlamak amacıyla Markov rejim değişim modeli kullanılmıştır. Para politikası aracı olarak ise politika faiz oranı kullanılmıştır. Çalışmanın sonucunda, para politikasının boğa piyasasında daha etkin olduğu sonucuna ulaşılmıştır.

Anahtar Kelimeler

Para Politikası • Hisse Senedi Piyasası • Markov Rejim Değişim Modeli

Jel Kodları

E52 • E44 • C22

The main purposes of CBRT are to provide both price stability and financial stability. CBRT has various policy instruments to achieve so-called purposes. Policy interest rate is one of the most important of these policy instruments. One-week repo rate is considered as policy interest rate by CBRT. In Monetary Policy Committee, the decisions towards increase or decrease in monetary policy rate are made in terms of exhibited performance of country economy.

Volatility in stock market is taken in consideration as financial instability indicator. The reason is that volatility in stock market cause negative effects on real sector and money market. Therefore, CBRT carry out policies diminishing financial instability.

Monetary policy have affect directly and instantly financial markets. Monetary policymakers can change economic behaviour in order to attain ultimate objectives by influencing asset prices. Therefore, it is extremely important to understandant for relationships between monetary policy and asset prices to understand monetary transmission mechanism (Bernanke and Kuttner, 2005).

It is of great important to determine impact of monetary policy on stock returns for both financial participants and policy makers. The reason is that the changes in stock prices can lead to financial instability and affect adversely economic activity. Besides, so-called changes influence price dynamics through investment and consumption decisions (Duran et. al., 2010).

The purpose of this study is to examine asymmetric impacts of monetary policy on stock returns during bull and bear markets over the period of 2002:01-2016:12 in Turkey. Considered period in the study includes many financial, economic and jeopolitic risks. To examine nonlinear structure of stock market, we used Markov switching model by Hamilton (1989). The reason of using Markov switching approach is that this model seperates data endegenously different regimes, and can statistically define the date of turning points via the smoothed probabilities (Jiang, 2013). Thus, we purposed to execute the impact of decisions related monetary policy on volatility in stock markets in both high risk regime and low risk regime. Thereby, the effectiveness of monetary policy in diminshing financial

* This study is an extended and revised version of our paper, presented at the EconWorld2017 Congress in Paris on 25-27 July 2017.

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Citaiton: Gacener Atis, A. and Erer, D. (2018). The impact of monetary policy on stock returns during bull and bear markets: The evidence from Turkey. *Ege Academic Review*, 18(4), 699-710.

instability has been evaluated under different regimes.

Theoretical Framework

Monetary policy influences the stock markets via several transmission channels. One of the so-called channels is deposits. This channel states that stock returns become less attractive for inverstors when interest rates remain. Therefore, companies don't immediately react to increasing dividends. Because of decrease in holding earnings, countries's profitabilitiy will be diminished. Another channel is banking system. According to this channel, a change in monetary policy rate impacts negatively banking system's profitability. In other words, it causes volatility in banking sector to increase. Thereby, both firms's cost of borrowing and their financial transactions will arise (Hancock, 1985). Gordon and Shapiro (1956) states that companies having debt structure depending flexible rate loans are directly impacted by volatility in interest rates. Increments in monetary policy rate rise both required risk premium and risk-free rate due to volatility in financial markets (Gordon and Shapiro, 1956).

Monetary policy decisions influence discounted value of future cash flows by changing short term interest rates; and thus, so-called decisions lead to increase or decrease in stock market prices (Zare et. al., 2013). Higher stock returns cause lower volatility in stock market via leverage effect. The effect in question represents the nonlinear relationship between stock market volatility and returns (Gospodinov and Jamali, 2012).

Tobin (1969) states that changes in monetary policy rate influence firm's market performance via changes in expectation relating to future cash flows. The model purposed by Tobin (1969) supposes that increase in interest rates have negative effect on firm's market price. Similarly, Thorbecke (1997) indicated that "stock prices equal the expected present value of future net cash flows". According to Thorbecke, expansionary monetary policy raise stock returns through enhancing future cash flows. The changes in monetary policy rate made by CBRT play a crucial role in shaping economic agents' expectations relating to future of economics. This situation has influence on investors' decions. For example, an increase-way decision in monetary policy rate induce increase in short term interest rate and long term interest rate affecting decisions of both firms and households (Aklan and Nargeleçekenler, 2012; Kasapoğlu, 2007). Therefore, increase-way decisions impact stock market returns by causing future expectations of firms's profits, balance sheets, financial structures and loans to change. Also, a decrease-way decision in monetary policy rate enhances demand for financial instruments (such as bonds and bills) and alternative cost of holding stock; and thus, stock returns decrease (Akay and Nargeleçekenler, 2009; Şahin, 2011).

Bernanke and Gertler (1999, 2001) has stated that monetary policy affects asset prices and stock returns inasmuch as they influence expected inflation. Besides, Alan Greenspan has expressed that the central banks should maintain price stability and sustainable growth, and so influence stock prices to the degree that the prices in question affect output and inflation (Rigobon and Sack, 2003).

Literature

Empirical and theoritical studies examining relationship between monetary policy and stock prices show that contractionary monetary policy shocks, in other words, increase in monetary policy rates have negative impact on stock prices in short term; however, so-called impact is stronger during period of high stock market volatility (Akay and Nargeleçekenler, 2009; Leaven and Tong, 2010; Şahin, 2011).

There are a number of studies in the literature that focus on the effects of monetary policy on asset prices and stock prices (Thorbecke, 1997; Bomfim, 2000; Rigobon and Sack, 2003; Bernanke and Kuttner, 2005). These studies indicated there is a significant relationship between monetary policy and stock market prices. Thorbecke (1997) stated the effect of monetary policy on stock returns is high. Rigobon and Sack (2003) stated that monetary policy affects asset prices and also asset prices affect monetary policy, and thus, there is endogeneity problem. Therefore, they used GMM method based on heteroscedasticity to overcome so-called problem. In the end of their study, they found an increment in short term interest rate leads to decrease stock prices and cause upward shift of yield curve. Bernanke and Kuttner (2005) investigated impact of monetary policy on stock prices using Federal funds rate to measure policy expectations. They inferred from results of the study that an incerease in unexpected 25 basis point rate in Federal funds rate lead to decrease approximately %1 in stock prices. They also expressed that contractionary monetary policy reduces stock prices thereby enhancing the expected equity premium. Li, Iscan and Xu (2010) examined impacts of mnetary policy shocks on stock prices using structural VAR for Canada and the United States. They found that the instant response of stock prices to a contractionary monetary policy shock is small in Canada while the so-called response is relatively large in United States.

Some studies have defined bull and bear markets in stock prices (Maheu and McCurdy, 2000; Pagan and Sossounov, 2003; Edwards, Gome Biscarri and Perezde Gracia, 2003; Bejaoui and Karaa, 2016). Maheu and McCurdy (2000) used Markov Switching model to obtain nonlinear behavior in stock prices and to identify bull and bear markets. They showed that high returns have a low conditional variance while low returns have a higher conditional variance, and investors have the highest return in the early of bull market and volatility rise over the period of bear market. Pagan and Sossounov (2003) and Edwards, Gome Biscarri and Perezde Gracia (2003) used nonparametric method in order to define stock market cycle. Pagan and Sossounov (2003) stated that a pure random work explained bull and bear markets better. Jiang and Fang (2015) determined four state in US stock market, which are extreme bear market, the general bear market, the volatile bull market and the steady bull market, using Bayesian Markov Switching model.

Several studies have examined the response of stock markets to monetary policy in both bull and bear markets (Chen, 2007; Kondrad, 2009; Zare, Azali and Habibullah, 2013; Chatziantoniou, Filis and Floros, 2017). Chen (2007) investigated the asymmetric effects of monetary policy on Standard&Poor's 500 price index using Markov switching model. He found that monetary policy more highly impacts stock returns during bear market. In addition, contractionary monetary policy increase probability of switching to bear market regime. It is seen for monetary policy to have higher impact on stock market in bear market regime than bull market regime. Kondrad (2009) used GARCH-M model to analyze effects of monetary policy implemented by FED and ECB on German stock and bond markets and identify bull and bear markets using the turning point algorithm by Bry and Boschan (1971). Kondrad (2009) found that the impact of monetary policy on German stock return volatility is larger in bear markets than bull markets. Zare, Azali and Habibullah (2013) examined effects of monetary policy on stock market volatility countries during bull and bear markets in ASEAN5 using Markov switching model. From analysis results, they deduced that tight monetary policy affects more stock market volatility in bear market than bull market. Chatziantoniou, Filis and Floros (2017) analyzed effects of monetary policy shocks on UK housing market and the UK stock market. Firstly, they separated regimes as the high risk environment and low risk environment applied Markov regime switching modelling. Then, they performed probit regression in order to determine whether a monetary policy shock affects on the probability that both markets move across these two regimes. In the end of the study, they indicated that an increase in short term interest rate induce the stock market to remain at the high volatility regime. Besides, for both markets, raises in the level of inflation have a key role to play.

As examined studies for Turkey in literature, it is seen that short term interest rates affect negatively stock market prices (Duran, Ozlu and Unalmıs, 2010; Duran vd., 2012; Ozdemir and Otluoglu, 2015). Duran vd. (2012) examined effects of monetary policy on asset prices using the heteroscedasticity-based GMM in Turkey and found that rises in the policy rate induce a decline in stock prices. Gokalp (2016) analyzed the so-called relationship using Case Study and the GMM methods for the period May 2010 – November 2014. He used upper and lower bound of the interest rate corridor as monetary policy variable. In the end of the study, he obtained the findings that rises in upper bound of the corridor reduce the stock market prices, however; decreases in lower bound enhance stock market prices. However, we don't find so-called relationship investigating with regime switching model in literature for Turkey. Thus, we purpose to contribute the literature.

As examined also the studies which explain the relationship between monetary policy and stock market volatility, some of these studies has found significant relationship between so-called variables while some of them states that there is no significant relationship. Bomfirm (2003) examined relationship in question via EGARCH model and found that positive shocks have higher effect on volatiliy in stock market than negative shocksHowever, Lobo (2000) indicated that decisions due to changes in monetary policy rate transmited new information to stock market and that stock market didn't respond to expansionary monetary policy. Maya et. al. (2013) found negative relationship between changes in interest rates and stock market using wavelet approach. Using two-stage GMM, Bleich et al. (2011) stated that decrease in interest rates caused stock market volatility to increase.

Zhang et.al. (2011) investigated monetary policy-stock market relationship using Markov Switching GARCH model. They found that expansionary monetary policy affected more stock market in bull market. Zare et. al. (2013) used Markov Switching GARCH model and stated that contractionary monetary policy have more stronger effect on stock market volatility in bear market than bull market. Chang and Lee (2011) used STAR-GARCH model and showed that the effects unexpected monetary policy shocks on volatility is lower than expected so-called shocks.

Methodology

Markov regime switching model proposed by Hamilton (1989) is one of the nonlinear time series models. In this model it is allowed that an economy changes from one regime to another or in other words, behaviour of time series becomes distinct in different regimes. The switching mechanism is controlled by an unobservable state variable that follows a first-order Markov chain.

In two – regime Markov switching model it is assumed that the state variable S_t is unobserved and change based on a first – order Markov chain with transition probabilities:

$$P(S_t = i | S_{t-1} = j, z_t) = P_{ij}(z_t) \quad (1)$$

The transition probabilities are influenced by a (qx1) vector of covariance-stationary exogenous or predetermined variables z_t, where z_t may include elements of x_t. The Markov chain is assumed to be stationary and to change independently of all of those elements of x_t not included in z_t[2].

In this study, we used Markov switching

dynamic regression in order to obtain behaviour of return of BIST 100 index in different regimes, which we defined regimes as low volatility and high volatility periods. Markov switching dynamic regression allows states to evolve based on a Markov process and for quick adjustments after a change of state. The model we estimated is as follows:

$$y_t = \mu_s + x_t\alpha + z_t\beta_s + \epsilon_{s,t} \quad (2)$$

where; y_t is return of BIST 100 index, μ_s is state-dependent intercept, x_t is vector of exogenous variable, which is policy rate, with state invariant coefficients α, z_t is vector of exogenous variable, which is policy rate, with state-dependent coefficients β_s and $\epsilon_{s,t} \sim iid\ N(0, \sigma_s^2)$

.Data

In this study, we purposed to analyze asymmetric response of stock price volatility to monetary policy in bull and bear markets in Turkey. For this purpose, we used Markov switching GARCH model. We considerated policy rate as a proxy variable for monetary policy, which is drawn from the International Financial Statistics (IFS) database of the IMF, and used BIST 100 index as stock market prices, which is drawn from Yahoo Finance database, over the period of 2002:01 – 2016:12. Also, we added industrial production index (IP), spot exchange rate (FX) and inflation rate (INF) to the model as control variables. All variables are seasonally adjusted. We obtained stock market return by using the formula as follows:

$$R_{it} = log\left(\frac{P_{it}}{P_{it-1}}\right) \quad (3)$$

where P_{it} is close prices of stock market index in period t. Figure 1 and Figure 2 have exhibited respectively the graphs of return of BIST 100 index and policy rate.

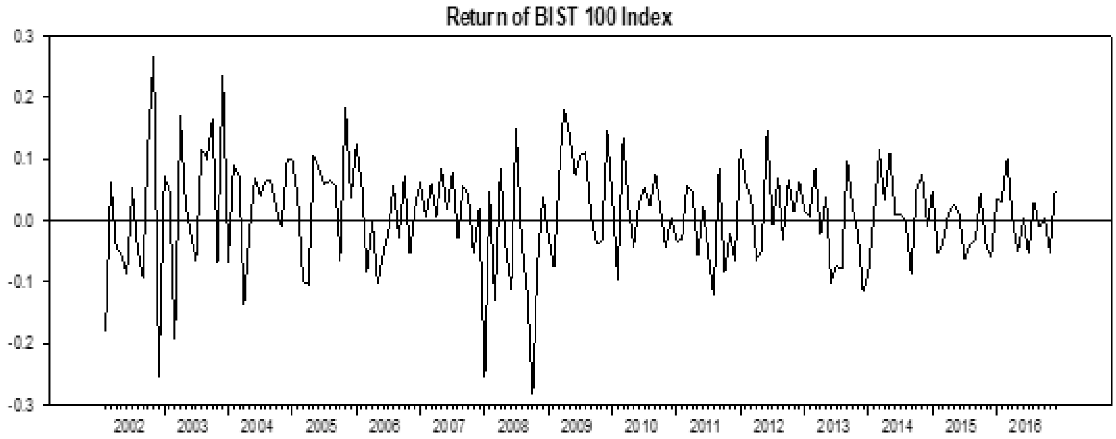

Figure 1: *The Return of BIST 100 Index*

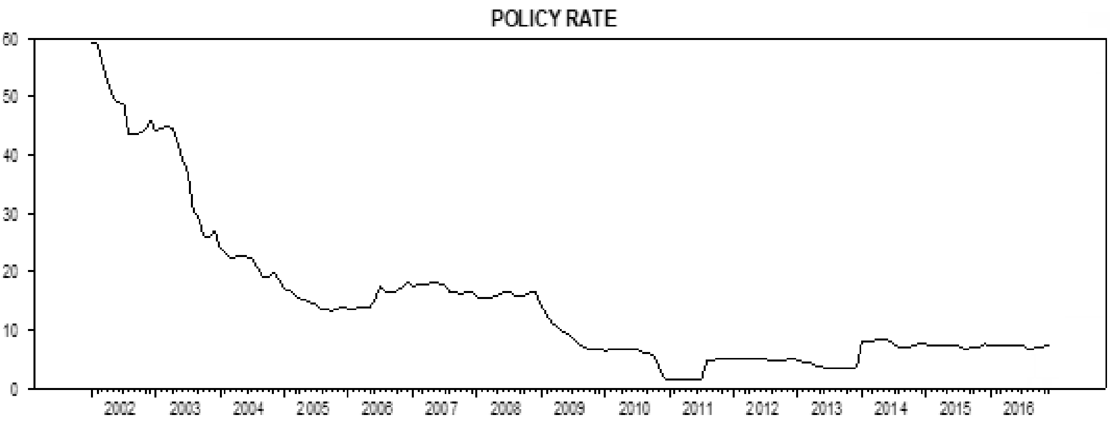

Figure 2: *The Graph of Policy Rate*

In the study, firstly, we investigated whether so-called variables are stationary. For this purpose, we utilized from both KPSS (Kwiatkowski-Phillips-Schmidt-Shin) and ERS (Elliott-Rothenberg-Stock) unit root tests. The results relating to KPSS unit root test are shown in Tablo 1. As seen in Table 1, RETURN is stationary at level according to KPSS and ERS unit root tests. However, POLICYRATE is non-stationary according to KPSS test while it is stationary according to ERS test. Also, INF, IP and FX are seen to be nonstationary at level in KPSS test while so-called variables are stationary in ERS test.

Because of that the results of both tests are different from each other and also data inolve financial crises, we applied Lee-Stratizch unit root test with two breaks. The results relating to Lee-Stratizch unit root test are shown in Table 2. As examined the results of Lee-Strazicich unit root test, it has seen that all variables are stationary at first level except for RETURN. Also, break points reflect effects of 2007 global financial crisis emerging in USA and Eurozone debt crisis in 2008-2009.After investigating stationarity of the variable in question, we applied BDS test to see whether these variables have a linear structure.The results of BDS tests relating to RETURN and POLICYRATE are shown in Table 3. According to Table 3, we rejected null hypothesis that series are linear for both of them; because, probability values for all dimensions are less than 0.05. Therefore, we concluded that RETURN and POLICYRATE have a non-linear structure and can be modelled non-linear time series models.

Table 1: *BDS Test For RETURN and POLICYRATE*

RETURN				
Dimension	BDS Statistic	Std. Error	z-Statistic	Prob.
2	0.019334***	0.005587	3.460286	0.0005
3	0.036324***	0.008882	4.089720	0.0000
4	0.048967***	0.010578	4.629242	0.0000
5	0.057368***	0.011026	5.203172	0.0000
6	0.059127***	0.010633	5.560747	0.0000
POLICYRATE				
Dimension	BDS Statistic	Std. Error	z-Statistic	Prob.
2	0.203953***	0.008860	23.01853	0.0000
3	0.346204***	0.014157	24.45423	0.0000
4	0.444444***	0.016959	26.20678	0.0000
5	0.511654***	0.017787	28.76614	0.0000
6	0.556704***	0.017264	32.24692	0.0000

Note: *, **, *** represent respectively 0.1, 0.05 and 0.01 significant levels.

Table 2: *The Results of KPSS and ERS Unit Root Tests*

	KPSS		ERS	
Variables	**Constant**	**Constant and Trend**	**Constant**	**Constant and Trend**
RETURN	0.244751	0.043115	2.489849***	2.991421
	CriticalValues	**CriticalValues**	**CriticalValues**	**CriticalValues**
	%1 0.739000	%1 0.216000	%1 1.922000	%1 4.113000
	%5 0.463000	%5 0.146000	%5 3.152000	%5 5.654000
	%10 0.347000	%10 0.119000	%10 4.282000	%10 6.839000
POLICYRATE	1.181202***	0.254431***	192.1251***	141.1477***
	CriticalValues	**CriticalValues**	**CriticalValues**	**CriticalValues**
	%1 0.739000	%1 0.216000	%1 1.922000	%1 4.113000
	%5 0.463000	%5 0.146000	%5 3.152000	%5 5.654000
	%10 0.347000	%10 0.119000	%10 4.282000	%10 6.839000
INF	0.613283**	0.192444**	327.3820***	229.0447***
	CriticalValues	**CriticalValues**	**CriticalValues**	**CriticalValues**
	%1 0.739000	%1 0.216000	%1 1.922000	%1 4.113000
	%5 0.463000	%5 0.146000	%5 3.152000	%5 5.654000
	%10 0.347000	%10 0.119000	%10 4.282000	%10 6.839000
IP	1.554501***	0.112832*	193.8649***	12.1127***
	CriticalValues	**CriticalValues**	**CriticalValues**	**CriticalValues**
	%1 0.739000	%1 0.216000	%1 1.922000	%1 4.113000
	%5 0.463000	%5 0.146000	%5 3.152000	%5 5.654000
	%10 0.347000	%10 0.119000	%10 4.282000	%10 6.839000
FX	1.271615***	0.371938***	31.57934***	50.14673***
	CriticalValues	**CriticalValues**	**CriticalValues**	**CriticalValues**
	%1 0.739000	%1 0.216000	%1 1.922000	%1 4.113000
	%5 0.463000	%5 0.146000	%5 3.152000	%5 5.654000
	%10 0.347000	%10 0.119000	%10 4.282000	%10 6.839000

Note: *, **, *** represent respectively 0.1, 0.05 and 0.01 significant levels.

Table 3: *Lee-Strazicich Unit Root Test*

	LM	Lag	Break Points				Critical Value
			D_{1t}		D_{2t}		%5
RETURN	-7.9115***	1	2009:03		2012:09		-3.5799
POLICYRATE	-1.5871	1	2011:08		2013:12		-3.5799
ΔPOLICYRATE	-13.4182***	0	2007:09		2009:02		-3.5799
INF	-0.9093	1	2006:09		2012.07		-3.5799
ΔINF	-45988***	1	2008:12		2012:11		-3.5799
FX	-2.3155	1	2006:06		2014:02		-3.5799
ΔFX	-9.5423***	0	2006:12		2011:12		-3.5799
IP	-2.7987	1	2007:07		2009:02		-3.5799
ΔIP	-9.8457***	0	2009:05		2013:03		-3.5799
	LM	**Lag**	**Break Points**				**Kritik Değer**
			D_{1t}	DT_{1t}	D_{2t}	DT_{2t}	%5
RETURN	-7.9115***	1	2009:04	2009:04	2011:03	2011:03	-5.9201
POLICYRATE	-1.5871	1	2006:04	2006:04	2011:01	2011:01	-5.7898
ΔPOLICYRATE	-13.4182***	0	2007:09	2007:09	2009.01	2009.01	-5.7085
INF	-0.9093	1	2004:07	2004:07	2009:03	2009:03	-5.7947
ΔINF	-45988***	1	2005:03	2005:03	2006.08	2006:08	-5.6115
FX	-2.3155	1	2008:12	2008:12	2012:08	2012:08	-5.8314
ΔFX	-9.5423***	0	2007:05	2007:05	2009:04	2009:04	-5.7265
IP	-2.7987	1	2008:08	2008:08	2010:10	2010:10	-5.7325
ΔIP	-9.8457***	0	2007:02	2007:02	2009:04	2009:04	-5.7205

Note : Model A is model with constant; Model B is model of constant and trend in LS test. Critical values are obtained by Lee and Strazicich (2003). *, **, *** represent respectively 0.1, 0.05 and 0.01 significant levels. Lag length is determined by Akaike information criteria.

Empirical Results

Defination of Stock Market Cycles

To examined the stock price volatility in Turkey, we firstly determined appropriate ARMA model for stock price. Considered Akaike and Schwarz information criteria and significant of the variables in the model, most appropriate model was choosen as ARMA(1,1). Statistics for ARMA(1,1) model are given in Table 4. Accordingly, both RETURN and POLICYRATE variables don’t have normal distribution. These series exhibit fat tail characteristic. Also, ARCH-LM test indicates there is ARCH effect in ARMA(1,1) model. Conditional heterodasticity model is used to eliminate ARCH effect. Then, we applied LR linearity test for testing the number of regimes. The results are shown in Table 5. According to LR linearity test, it is seen that two-regimed models have higher explanatory power. So, we set two-regimed MS(2) GARCH model with 394.808157 log-likelihood, -4.521525 AIC, -4.242600 SIC. The model estimation results are shown in Table 6. In Table 7, descriptive statistics relating to MS(2) ARMA(1,1) GARCH(1,1) model are exhibited.

Table 4: *Statistics and Diagnostic Tests*

Statistics	RETURN	POLICYRATE
Standart Deviation	0.037565	9.531801
Kurtosis	3.933734	5.832413
Skewness	-0.255269	1.646073
Mean	0.005189	12.53791
Median	0.010090	8.000000

Diagnostic Tests	
ARCH 1-1	5.704644***
Jarque-Bera	7.377949**
Skewness	-0.241724
Curtosis	3.926657
Q Statistics (5)	5.4723

Note: *, **, *** represent respectively 0.1, 0.05 and 0.01 significant levels.

Table 5: *Determining of Number of Regime*

	Test value	Probability
1 vs 2	135.2779	0.0000
2 vs 3	59.81229	0.3333

Table 6: *MS(2)-ARMA(1,1) GARCH(1,1) Model Estimation*

	Coefficient	**Standard Error**
AR-1(0)	-0.4578***	0.1208
AR-1(1)	-0.78008***	0.0802
MA-1(0)	0.132259**	0.06573
MA-1(1)	0.792199***	0.07479
Constant(0)	0.000313	0.001026
Constant(1)	0.001759	0.001528

	Coefficient	**Standard Error**
sigma(0)	0.008025***	0.00167
sigma(1)	0.014143***	0.005687
alpha_1(0)	0.253897***	0.1433
alpha_1(1)	0.621556**	0.2315
beta_1(0)	0.470789***	0.1513
beta_1(1)	0.345598***	0.1718
p_{0|0}	0.889573***	0.05285
p_{1|1}	0.912015***	0.05132

Note: *, **, *** represent respectively 0.1, 0.05 and 0.01 significant levels. 0 and 1 in the paranthesis reflect respectively bull and bear markets.

Table 7: *MS(2)-ARMA(1,1) GARCH(1,1) Model Descriptive Statistics*

Model	Log-likelihood	AIC	SIC	Q Statistics (lag 36)	ARCH-LM (1-1)
MS-ARMA(1,1) GARCH	394.808157	-4.521525	-4.242600	63.279***	0.12468

Note: *, **, *** represent respectively 0.1, 0.05 and 0.01 significant levels.

MS(2) ARMA(1,1) GARCH(1,1) model demonstrates that stock market volatility in Turkey have two different regimes one of those low volatility, other high volatility. Regime 0 and Regime 1 indicate respectively low and high volatility periods. Because of the fact that stock returns rise in low volatility periods, Regime 0 is identified as bull market. On the other hand, Regime 1 is identified as bear market due to low stock returns. BIST 100 index's duration of remaining at Regime 0 is averagely 9 months, and 11 months at Regime 1.

As examined regime transition probabilities (Table 8), transition probabilities from Regime 0 to Regime 0 and from Regime 1 to Regime 1 are 0.95516 and 0.97796, respectively. This situation states that regimes in both bull and bear markets are persistent. However, it is seen for remained duration in bear market to be higher than bull market.

Table 8: *Switching Probabilities*

Observed Regime	Switching Regime	
	Regime 0	Regime 1
Regime 0	0.95516	0.022041
Regime 1	0.044843	0.97796

Figure 1 shows the probability of existence for each regimes. Smoothed probabilities of Regime 0 (bull market) are characterised on the left and Regime 1 (bear market) on the right side. In this figure, shaded areas are related to low volatility regime and others are high volatility regime. High volatility emerge especially in the economic, political and financial instability periods.

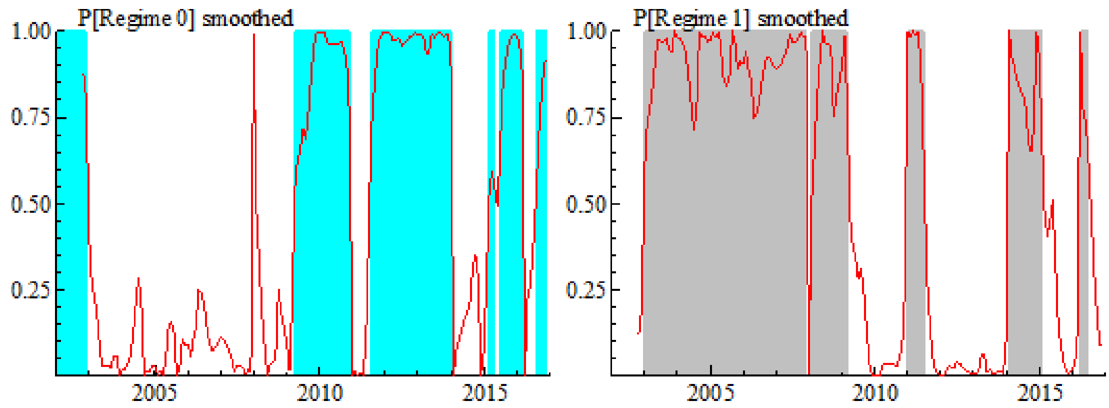

Figure 3: *Smoothed Probability Graphics*

Nonlinear Effects of Monetary Policy on Stock Market Volatility

To examined the non-linear effect of monetary policy on stok market volatility in both bear and bull markets, we set the following model base on the study by Zare et. al. (2013).

$$volatility_t = \beta_0 + \beta_1(POLICYRATE_t * bull_t) + \beta_2(POLICYRATE_t * bear_t) + \beta_3\, INF + \beta_4\, IP + \beta_5\, FX + \varepsilon_t \quad (4)$$

(4)In the model, bullt and beart variables indicate dummy variables representing bull and bear markets, respectively. bullt takes value of one if stock market is in low volatility periods and zero otherwise. beart takes value of one if stock market is in high volatility periods and zero otherwise. We created so-called dummy variables via regime classification periods from MS-GARCH model. POLICYRATEt*bullt and POLICYRATEt*beart show the impacts of monetary policy rate on stock market volatility in both bull and bear markets. These variables are taken into account as indicator variables in the model (Basistha and Kurov, 2008; Kurov, 2010; Jansen and Tsai, 2010). volatilityt is conditional variance from MS(2)-ARMA(1,1)-GARCH(1,1) model.

Table 9*: Johansen Cointegration Test*

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Max-Eigen Statistic
None *	0.372279	156.9185***	80.09342***
At most 1 *	0.215226	76.82508***	41.68573***
At most 2 *	0.101675	35.13936***	18.44240***
At most 3 *	0.091556	16.69696**	16.51588**
At most 4 *	0.001052	0.181077	0.181077

Note: *, **, *** represent respectively 0.1, 0.05 and 0.01 significant levels.

Firstly, we test cointegration between POLICYRATE, INF, IP and FX because of the fact that so-called variables are integrated at first level. Johansen cointegration test (Table 9) indicates that there are three cointegration vectors. So, we continue with short and long term equations to investigate the impact of monetary policy on volatility in stock market.

Table 10: *The Results of Monetary Policy on Stock Market Volatility*

	Long Term Results	
Variable	**Coefficient**	**Std. Error**
$(POLICYRATE_t * bull_t)$	0.000973**	0.000427
$(POLICYRATE_t * bear_t)$	0.000613*	0.000348
LIP	0.000739	0.001624
LFX	0.000246*	0.000151
INF	0.000216***	5.07E-05
C	-0.004863	0.007653
Akaike info criterion	-9.360895	
Schwarz criterion	-9.250220	
ARCH 1-1	0.450743	
White	3.983583***	
BG-LM Autocorrelation Test	6.601945**	
	Short Term Results	
Variable	**Coefficient**	**Std. Error**
Cointegration	-0.197988***	-0.05176
$\Delta(POLICYRATE_t * bull_t)$	4.15E-05	3.19E-05
$\Delta(POLICYRATE_t * bear_t)$	3.11E-05	2.13E-05
ΔLIP	-0.001500***	0.000534
ΔLFX	0.003573***	0.000923
ΔINF	-1.33E-05	1.38E-05
C	0.000194***	1.42E-05
Akaike info criterion	-14.47159	
Schwarz criterion	-14.36179	
ARCH 1-1	0.002299	
White	2.751741***	
BG-LM Autocorrelation Test	2.119236	

Note: *, **, *** represent respectively 0.1, 0.05 and 0.01 significant levels.

Table 10 exhibits the short and long term results of changes in monetary policy on stock market volatility in both bull and bear markets. In long term, the effect of policy rate on stock market is positive and higher at Regime 0 than Regime 1. In other words, increase-way decisions at monetary policy rate cause stock market prices to increase in both bull and bear market, but so-called increase is higher in bull market, which means that monetary policy is more influential in bull market than bears. Inflation rate is an economic instability indicator since increase in inflation lead to rise uncertainty in the markets. Therefore, inflation increase stock market volatility. Similarly, increment in foreign exchange rate is a financial instability indicator, because depreciate in domestic currency affects especially firms which have high debt in foreign currency. However, in the short term, monetary policy doesn't impact significantly stock market volatility in both bull and bear market periods. Industrial production index cause stock market volatility to decrease in short term. Increase in exchange rate rises volatility in the market. Finally, cointegration coefficient is negative and smaller than one. This situation indicates that deviations in the markets in the short term disappear in the long term, and the equlibrium is provided after about 5 months.

Nonlinear Effects of Monetary Policy on Stock Market Returns

To investigate the nonlinear effect of monetary policy on stok market returns in terms of bull and bear market periods, we set the model as follows:

$$RETURN_t = \beta_0 + \beta_1\ POLICYRA\beta_2\ INF + \beta_3\ IP + \beta_4\ FX + \varepsilon_t TE + \tag{5}$$

We applied Markov Switching regression to see differences in results of monetary policy on stock market returns in bull and bear market periods. The model estimation results are in Table 11. It follows from the results that monetary policy doesn't have significant effect on stock market return in both bull and bear market periods. In bear market periods, inflation rate and industrial production index negatively impact stock market returns. However, foreign exchange rate negatively affect returns only in bull market.

Table 11: *The Results of Monetary Policy on Stock Market Returns*

	Coefficient	Standard Error
AR-1(0)	-0.12636	0.1175
AR-1(1)	-0.77475^{**}	0.1789
MA-1(0)	-0.12248	0.08192
MA-1(1)	0.019474	0.1566
ΔPOLICYRATE(0)	0.055266	0.03143
ΔPOLICYRATE(1)	0.135788	0.1133
ΔLIP(0)	-0.00452	0.083
ΔLIP(1)	-1.42822^{***}	0.3002
ΔLFX(0)	-1.52961^{***}	0.1534
ΔLFX(1)	-0.40828	0.4953
ΔINF(0)	-0.00165	0.002346
ΔINF(1)	-0.01863^{***}	0.004002
Constant(0)	0.009375^{***}	0.002036
Constant(1)	-0.00992	0.007599
	Coefficient	**Standard Error**
sigma(0)	0.02404	0.001419
sigma(1)	0.035832	0.006062
p_{0|0}	0.99188	0.008163
p_{1|1}	0.911855	0.06055
ARCH1-1	0.73062	
Q Statistics (lag 36)	52.930^{**}	

Note: *, **, *** represent respectively 0.1, 0.05 and 0.01 significant levels. 0 and 1 in the paranthesis reflect respectively bull and bear markets.

Conclusion

This paper investigates how stock market return and volatility react to monetary policy changes and whether so-called reaction differs in bull and bear market periods in Turkey using monthly data during the period of 2002:1-2016:12. In the study, bull and bear markets are determined by using Markov switching model. From the analysis, we found that monetary policy rates positively influence stock market volatility in bull and bear market; however, the effect in question is higher in bull market period than bears. In other words, monetary policy is more effective in bull market periods. Nevertheless, stock market returns are not affected by changes in monetary policy in both markets. Also, it is seen for remained duration in bear market to be higher than bulls

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