# Effects Of Economic Instability On Stock Market Under Different Regimes: Ms-Garch Approach

**Koray Kayalidere[1], Tuna Can Güleç[2], Elif Erer[3]**

**Abstract**

Purpose of the study is to analyze how the economic instability influences stock market performance on bear and bull markets. We use weekly credit default swaps, exchange rate volatility and stock market returns in Turkey for the period of 01.02.2010-17.03.2017. Markov Switching GARCH(1,1) model is used in the study for its convenience with the structure of the study. Results of the analysis indicate that, both credit default swaps and exchange rate volatility negatively affect the stock market performance in bear and bull markets. However, effects are significantly stronger in bear market than in bull markets. This can be interpreted as that adverse economic conditions, in other words economic instability, lead to diminish stock market returns by increasing investors' risk perception with reference to the country.

**Keywords:** Economic Instability, Financial Markets, Markov Switching

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1 Manisa Celal Bayar University, Faculty of Economics and Administrative Sciences, koray.kayalidere@cbu.edu.tr
2 Manisa Celal Bayar University, Faculty of Economics and Administrative Sciences, tunacg@gmail.com
3 Ege University, Faculty of Economics and Administrative Sciences, elif_erer_@hotmail.com

## INTRODUCTION

The subject of stock market volatility is a very influential topic for portfolio managers, policy makers and even for international strategists. Determining the present value of investment projects, constructing optimum capital budgeting practices and minimizing the cost of capital for firms depend mainly on the estimation of future market volatility. Values and returns of assets traded in stock markets demonstrate the future expectations from real economy. Fluctuations in the expectations cause the volatility in asset prices to soar. These fluctuations can be caused by many factors such as firm level minor events, however minor events are highly unlikely to sway the trend of the market as a whole and the volatility effect caused by these firm level have temporary effects on the volatility that are unable to permanently affect the trend according to numerous studies such as (Poon & Granger, 2003; Bloom, 2009; Jones & Olson, 2013).

We have defined "Economic Instability" separately with Credit Default Swap (CDS) premiums and exchange rate volatility variables. With the aim of modelling the economic instability on macroeconomic level, we did not include factors that are generally accepted as temporary or minor into our economic instability variable.

In theory it is expected that as economic instability increases the stock market volatility should increase as well. Corzo (2012) emphasized that a country's credit risk prime increases when its economic conditions get worse and, so that investors' risk perceptions are affected negatively by this situation. Similarly, deterioration in financial sector enhances credit default prime. Sovereign debt crisis occurred in Europe in 2008 has revealed the effect of both public-to-private and private-to-public risk transition. CDS premiums also directly indicate a country's access to international global debt markets as well as its attractiveness for international capital. General consensus in the literature is that CDS premiums partially indicate the risk for equity market volatility in addition to debt market volatility (Chan & Kim, 2004).

Volatility of exchange rate is the other variable that we use to define the "Economic Instability". All assets and portfolios in stock markets are directly affected by exchange rate movements, even if they are expressed in domestic currency, exchange rate systematically affects the value, return and risks associated with these assets. Majority of studies reviewed

suggests a strong and statistically significant relation between the stock market volatility and exchange rate volatility.

## LITERATURE REVIEW

There are a number of studies in the literature that focus on the effects of CDS on stock market returns and volatility (Norden and Weber, 2009; Blanco, Brennan and Marsh, 2005; Madan and Unal, 2000; Zhang, Zhou, and Zhu, 2009, Coronado et. al., 2011; Aktuğ, 2011). There are also studies that analyze the effects of exchange rate on stock market returns and volatility. However, we didn't encounter any study comparing the effects of both exchange rate volatility and CDS premiums on stock market volatility.

The impact of sovereign CDS on the stock market was first addressed by Chan-Lua and Kim (2004). According to their study the bond prices are significantly affected by Sovereign CDS prime the domestic country. Effect is found to be more significant for higher-rated issuers while less significant for lower-rated issuers. It is also indicated that relationship between CDS spreads and stock prices is analogous and this allows Merton theory to be used for sovereign issuers as well.

Chan-Lau and Kim (2004) analyzed the effect of CDS on stock markets in Brazil, Bulgaria, Colombia, Mexico, Philippines, Russia, Turkey and Venezuela via Granger causality model. According to the finding in the study there is no cointegration over the period of 2001-2003.

While most of the studies that deal with the effects of CDS on the stock market state that there is a negative relationship between the two variables (Chan et. al., 2008; Coronado et. al., 2011), there are also a few studies show that the relationship is insignificant.

Coronade et. al. (2011) has studies the relationship between CDS and stock market indices for 8 European countries. According to the findings of the study there is a significant negative lead lag relationship within markets. Study also finds a strong linkage between CDS and stock market volatility. Linkage is stronger in markets with lower CDS spreads while weaker in markets with higher CDS spreads. CDS market also becomes a more significant indicator of future price as volatility in the stock market rises.

Chan et. al. (2008) analyzed the sovereign CDS market of Asian region for period from 2001 to 2007. Study finds a consistent negative correlation between Asian sovereign CDS spreads and stock market indices, with the exception of China.

A number of studies in the literature focus on the relationship between stock market returns and CDS using regime switching models. A recent study of Fei et. al. (2017) Fei et. al. (2017) investigated how CDS affected European stock market, auto and financial sector using MS-ARMA model for 2005-2010. They have found a negative co-movements between the variables in question. Other studies that focus on the same relationship using regime switching models are as follows: Yu (2006) embraced the effect of CDS in terms of "turbulent" and "calm" regimes and pointed out to be higher in "turbulent" regime than in "calm" regime. Similarly, Alexander and Kaeck (2008) expressed from the results of Markov-Switching regression that CDS play a more important role in so-called relationship in high volatility regime. Bystrom (2008) finds that stock returns and the stock market volatility is capable of explaining a significant portion of iTraxx CDS spreads.

Another economic instability indicators that we use in our analysis is the exchange rate volatility. The some of the studies exploring the impact of the changes in exchange rate on stock market is as below: Phylaktis and Ravazzolo (2005) investigated the exchange rate-stock market relationship using vector error correction model for pacific basin countries. Study stated that there is a positive linkage between the mentioned variables. Using multivariate EGARCH model, Yang and Doong (2004) emphasized negative relationship between exchange rate changes and stock market volatility. Accordingly, Aloui (2007) analyzed volatility spillover between exchange rate-stock market for USA and European countries with multivariate EGARCH model. Studies indicate that the exchange rate volatility has a negative impact on stock market. Similarly, Adjasi et. al. (2008) revealed that an increase in exchange rate volatility reduces stock market returns. However, Zhao (2010) analyzed this linkage via VAR with multivariate GARCH model and found insignificant long-run relationship for mentioned markets. Kutty (2010) executed from the results of the analysis carried out using vector error correction model that there is no long-run relationship within the markets in Mexico. Mlambo et. al. (2013) showed that there is weak relationship between exchange rate volatility and stock market performance by analyzing the mentioned relationship with GARCH(1,1) model in South Africa. Hajilee and Nasser (2014) investigated exchange rate risk via bound test. They stated that exchange rate uncertainty is one of the most important factors affecting stock market performance both in the short run and in the long run. However, this effect varies by country's characteristics. Lim and Sek (2014) explored how exchange rate volatility affects stock return in Indonesia, Korea and Thailand via causality test. They have found a significant two-way causality relationship between the exchange rate and the stock market volatility. Lawar and Ijirshar (2015) have found one-way

causality relationship from exchange rate volatility to stock market in Nigeria as a conclusion of Granger causality model.

There are a few studies examining the impacts of the movements in exchange rate in terms of regime classifications in the literature. Some of these studies are as follows: Flavin et. al. (2008) showed volatility spillover between exchange rate and stock market in "turbulent" and "calm" periods using Markov Switching method. Walid et. al. (2011) expressed that the volatility relationship between exchange rate-stock markets differentiate "high mean-low variance" regime and "low mean-high variance" regime employing Markov Switching EGARCH. Also, it was inferred from the analysis that exchange rate movements affect transition probability across regimes.

## DATA

The aim of the study is to examine how the effect of economic instability on volatility of BIST 100 Index change across different regimes. For this purpose, we use weekly data covering the period 01.02.2010-17.03.2017. Firstly, we obtained stock market returns by using the following formula:

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

Where $P_{it}$ is closing prices of stock market index in period t.

We used credit default swap and exchange rate volatility to define economic stability. Exchange rate volatility was generated by conditional variance of GARCH(1,1) model. The variables are exhibited in Table 1.

**Table 1 Definition of the Variables**

| Variables | Definition |
|---|---|
| Gbist | Return of Borsa Istanbul 100 index |
| Cds | Credit default swap |
| Vdollar | The conditional variance of USD/TRY exchange rate |

Descriptive statistics for the returns related to BIST100 index, credit default swap and USD/TRY exchange rate are shown in Table 2. As demonstrated in Table 2, return does not have a normal distribution. According to the skewness and kurtosis values, they exhibit leptokurtic distribution.

**Table 2 Descriptive Statistics**

| | GBIST | GCDS | GDOLAR |
|---|---|---|---|
| Mean | 0.000330 | 5.71E-05 | 0.000506 |
| Median | 0.000893 | -0.000596 | 0.000000 |
| Maximum | 0.102007 | 0.226692 | 0.046667 |
| Minimum | -0.110638 | -0.236391 | -0.034601 |
| Std. Dev. | 0.014774 | 0.030075 | 0.007362 |
| Skewness | -0.383101 | -0.033063 | 0.447655 |
| Kurtosis | 7.905876 | 9.571649 | 5.911344 |
| Jarque-Bera | 1779.247 | 3116.946 | 669.5263 |
| Probability | 0.000000 | 0.000000 | 0.000000 |
| Sum Sq. Dev. | 0.377827 | 1.565661 | 0.093806 |
| Observations | 1732 | 1732 | 1732 |

**Figure 1: The Graphs Relating to the Returns**

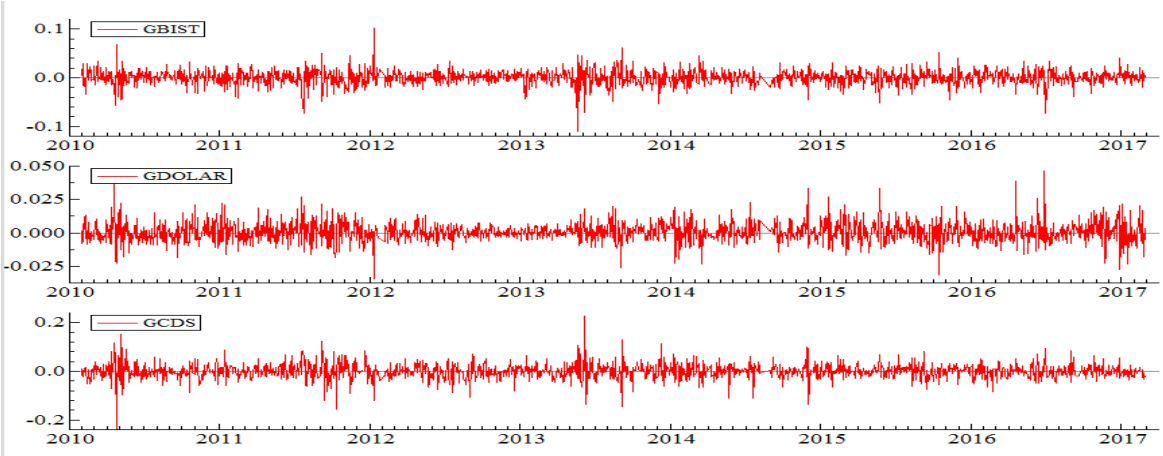
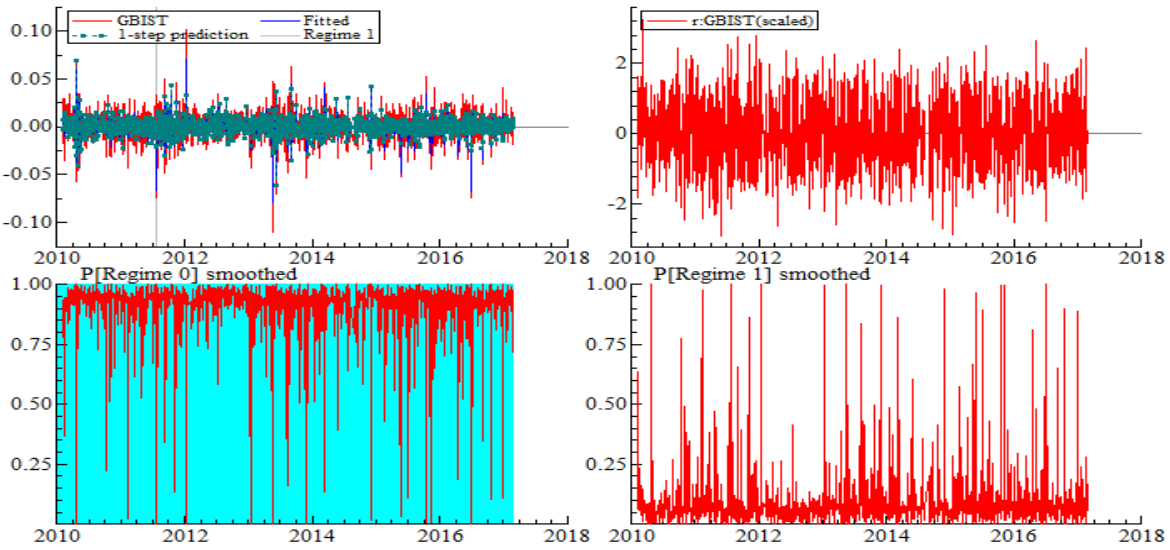



Figure 1 plots the returns related to BIST100, credit default swap and USD/TRY exchange rate over the period of 2010-2017. Accordingly, it can be observed that the volatility of the returns increase in the crisis periods.

## EMPIRICAL RESULTS

We applied Markov Switching approach so as to see how the effect of economic instability on BIST100 volatility change across different regimes. Therefore, we investigated the impact in low and high volatility regimes based on the variance-covariance matrix of stock prices. We generated MS-ARMA-GARCH (2,2,1,1) model under Akaike and Schwharz information criteria.

**Figure 2 Smoothed Regime Probabilities (Credit Default Swap)**




MS-ARMA-GARCH (2,2,1,1) model estimation results for the impact of credit default swaps are exhibit in Table 3 and regime properties are shown in Table 4. Also, the smoothed regime probabilities for models are given in Figure 2.

According to Figure 2, shaded areas correspond to low volatility regime and other areas are relating to high volatility regime. High volatility occurs especially in the crisis periods, for example in 2007 global financial crisis which started in United States and 2008 sovereign debt crisis in the European area. Therefore, we can define high volatility regime as recessions and low volatility regime as expansions. As considered in terms of financial markets, high and low volatility regimes respectively state bear and bull markets. We define regime 0 as bull market (expansion term) and regime 1 as bear market (recession term).

**Table 3 MS-ARMA-GARCH(2,2,1,1) Model Estimation (Credit Default Swap)**

| | Regime 0 | Regime 1 |
|---|---|---|
| Average Equation | | |
| Constant | 0.00101346*** | -0.00499329** |
| | (0.0003158) | (0.002270) |
| AR(1) | -0.00751930 | -0.143685 |
| | (0.05030) | (0.1325) |
| AR(2) | -0.00112118 | 0.100539 |
| | (0.03091) | (0.1347) |
| MA(1) | -0.0620403* | 0.296951** |
| | (0.03545) | (0.1428) |
| GCDS | -0.230055*** | -0.647726*** |
| | (0.01205) | (0.07992) |
| Variance Equation | | |
| Constant | 0.00187006*** | 0.00135018 |
| | (0.0005162) | (0.004190) |
| Alpha | 0.0243105*** | 0.0605243* |

| | | |
|---|---|---|
| | (0.008025) | (0.03908) |
| Beta | 0.936276*** | 0.909157*** |
| | (0.02491) | (0.06085) |
| Diagnostic Tests | | |
| AIC | -6.09371293 | |
| Log-likelihood | 5289.06168 | |
| ARCH | 0.016537 | |
| Portmanteau autocorrelation | 44.554 | |

Note: *, **, *** represent respectively 0.1, 0.05 and 0.01 significant levels.
The values in parenthesis represent standard errors.
Alpha and beta coefficients represent respectively ARCH and GARCH parameters.

Table 3 reports MS-ARMA-GARCH (2,2,1,1) model results for credit default swap. Credit default swap series affect BIST100 index negatively in both bull and bear markets. The increases in credit default swap are evaluated as rise in investors' risk perception because, CDS ratios represent not only economic conditions but also political conditions. From this point of view, stock market returns decrease when CDS ratios increases in the country. However, the effect size of CDS on stock market is higher in bear market than bull market. As examined variance equation, the volatility is seen to have higher persistency in the bear market than in bull market. The volatility persistency in bull market equal to 0.96056 while it is 0.96969 in bear market.

*Table 4 Regime Properties for MS-ARMA-GARCH(2,2,1,1) (Credit Default Swap)*

| | Regime 0, t+1 | Regime 1, t+1 | Observation | Duration (Months) |
|---|---|---|---|---|
| Regime 0, t+1 | 0.91180 | 0.90857 | 1700 | 680 |
| Regime 1, t+1 | 0.088198 | 0.091431 | 30 | 13 |

The regime properties for MS-ARMA-GARCH(2,2,1,1) model for credit default swap is exhibited in Table 4. The transition probability from regime 0 to regime 0 and regime 1 respectively equal to 0.91180 and 0.90857. However the transition probability from regime 1 to regime 0 and regime 1 respectively are 0.088198 and 0.091431. This situation indicates that regime 0 is persistent. Also, the transition probability to period of recessions in the economy is rather high.

Figure 3 Smoothed Regime Probabilities (Exchange Rate Volatility)

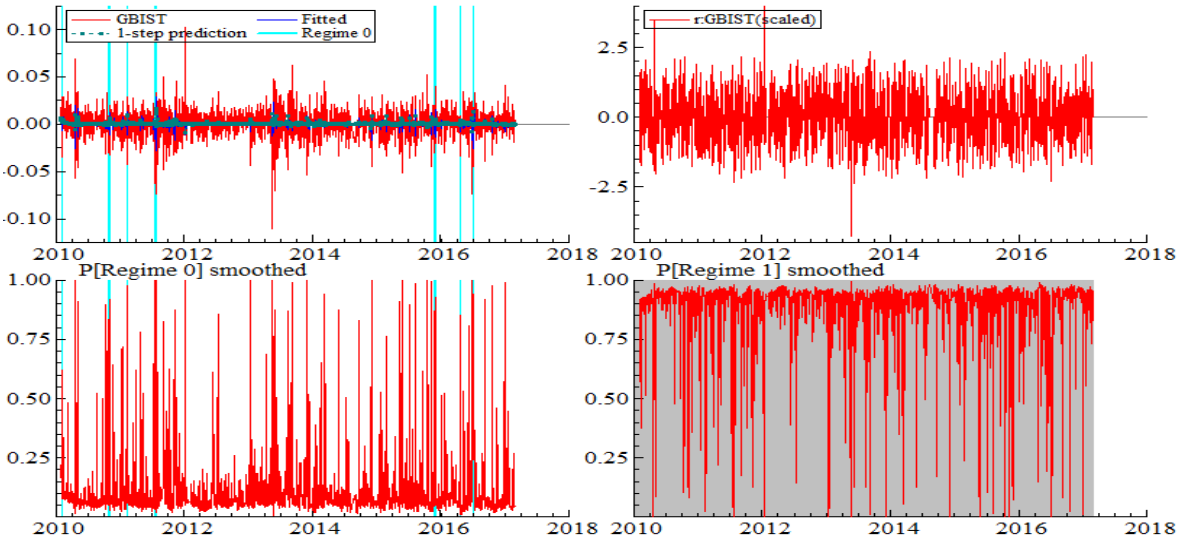



Figure 3 plots smoothed regime probabilities for MS-ARMA-GARCH(2,1,1,1) model for exchange rate volatility. As seen in Figure 3, regime 0 and regime 1 indicate respectively bear and bull markets.

**Table 5 MS-ARMA-GARCH(2,1,1,1) Model Estimation (Exchange Rate Volatility)**

| | Regime 0 | Regime 1 |
|---|---|---|
| Average Equation | | |
| Constant | 0.00595511*** | 0.00924207*** |
| | (0.004813) | (0.004086) |
| AR(1) | 0.781934*** | 0.915411*** |
| | (0.05857) | (0.03736) |
| MA(1) | -0.549726*** | -0.910456*** |
| | (0.1325) | (0.03600) |
| VDOLLAR | -115.876*** | -56.4652** |
| | (32.22) | (30.54) |
| Variance Equation | | |
| Constant | 0.00303027** | 0.00148982** |
| | (0.001497) | (0.0004694) |
| Alpha | 0.0227995* | 0.0179032* |
| | (0.02171) | (0.008076) |
| Beta | 0.974993*** | 0.953908*** |
| | (0.01987) | (0.01978) |
| Diagnostic Tests | | |
| AIC | -5.74510204 | |
| Log-likelihood | 4988.38582 | |
| ARCH | 0.016537 | |
| Portmanteau autocorrelation | 28.985 | |

Note: *, **, *** represent respectively 0.1, 0.05 and 0.01 significant levels.
The values in parenthesis represent standard errors.
Alpha and beta coefficients represent respectively ARCH and GARCH parameters.

Table 5 indicates MS-ARMA-GARCH(2,1,1,1) model estimation created to show the effect of exchange rate volatility. The exchange rate volatility is seen to have negative effect on BIST100 in both bull market and bear market. The investors consider increases in the exchange rate volatility as an economic risk indicator, and thus, the investors' risk perceptions enhance and stock market returns diminish. The effect in question change across the regimes. The effect size of exchange rate volatility in the bear market is higher than in the bull market.

*Table 6 Regime Properties for MS-ARMA-GARCH(2,2,1,1) (Exchange Rate Volatility)*

| | Regime 0, t+1 | Regime 1, t+1 | Observation | Duration (Months) |
|---|---|---|---|---|
| Regime 0, t+1 | 0.23635 | 0.10475 | 79 | 13.68 |
| Regime 1, t+1 | 0.76385 | 0.89525 | 1652 | 283.3 |

Table 6 reports the regime properties for MS-ARMA-GARCH(2,1,1,1) model for exchange rate volatility. The transition probability from regime 0 to regime 0 and regime 1 respectively equal to 0.23635 and 0.10475. However the transition probability from regime 1 to regime 0 and regime 1 respectively are 0.76385 and 0.89525. Therefore, regime 1 is persistent.

## CONCLUSION

In this study, the effects of economic instability on the Turkish stock market has been examined under bull and bear market regimes for the period of 01.02.2010-17.03.2017. Objective of the study is to understand the investors' risk perceptions under different market regimes. In the study, CDS and exchange rate volatility were taken as indicators of economic instability. As a result of the study, it was seen that both the CDS and exchange rate volatility negatively affected the stock market in both regime periods. However, the effect of the two variables is more on the bear market than on the bull market. This means investors' risk perception is higher under unfavorable political, financial and economic conditions and therefore the market is more fragile.

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