

DO FED's UNCONVENTIONAL MONETARY POLICY AND CBRT's ROM
FACILITY AFFECT TURKISH BANKS' EXTERNAL BORROWING?

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ABSTRACT

DO FED’S UNCONVENTIONAL MONETARY POLICY AND CBRT’S ROM FACILITY AFFECT TURKISH BANKS’ EXTERNAL BORROWING?¹

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At the end of 2008, FED had to reduce its monetary policy interest rates to near zero level as a response to house market collapse. As this policy response was not find as enough, FED started to purchase papers, which resulted in an increase of its balance sheet to 4,5 trillion U.S. dollar. By large scale asset purchases, FED targeted to lower the yields on longer-term securities in order to increase the price of remaining securities and finally, to increase investment, demand for consumer durables and the prices of more risky assets. FED’s unconventional policy had some spillover effects on emerging markets who enjoyed cheap and abundant liquidity during that period. During same period, CBRT introduced ROM facility by which banks were able to use foreign exchange for their Turkish Lira reserve requirements.

The aim of this study is to demonstrate whether FED’s unconventional monetary policy and CBRT’s ROM facility affected Turkish banks’ external borrowings by using Event Study, Regression Analysis and VAR. The event study indicates that although FED’s unconventional monetary policy had significant effects on the external borrowings, the second phase had more impact. Regression analysis also indicates that FED’s and CBRT’s policies affect banks’ external borrowing levels. Finally, the VAR system indicates that both FED’s and CBRT’s policies may have effects on the external borrowing but the CBRT’s effect lasts longer compared to FED’s.

As a result, both FED’s unconventional monetary policy and CBRT’s ROM facility have impacts on Turkish banks’ external borrowings. For the following study, the impacts of FED’s unconventional monetary policy and its effects on emerging countries would be studied by using panel data set.

Keyword: FED, QE, External Borrowing, Spillover, ROM, VAR, CBRT, Emerging Markets, Turkey

¹ The views in this study belong to the author and cannot be associated with the Republic of the Central Bank of Turkey.

ÖZET

FED'İN GELENEKSEL OLMAYAN PARA POLİTİKASI İLE TCMB'NİN ROM UYGULAMASI TÜRK BANKALARININ YURTDIŞINDAN BORÇLANMALARINI ETKİLER Mİ?²

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2008 sonunda, FED, ev piyasası çöküşüne bir yanıt olarak para politikası faiz oranlarını sıfıra yakın seviyeye düşürmek zorunda kaldı. Bu politika cevabı yeterli bulunmadığı için, FED, bilançolarını 4,5 trilyon ABD Doları'na çıkararak kâğıt satın almaya başladı. Büyük ölçekli varlık alımları ile FED, kalan menkul kıymetlerin fiyatını artırmak ve nihayet yatırımları, dayanıklı tüketim malları ve daha riskli varlıkların fiyatlarını artırmak amacıyla, uzun vadeli menkul kıymetlerdeki getirileri düşürmeyi hedeflemiştir. FED'in geleneksel olmayan politikasının, o dönemde ucuz ve bol likiditeye sahip olan gelişmekte olan piyasalar üzerinde bazı yayılma etkileri oldu. Aynı dönemde, TCMB, bankaların Türk lirası zorunlu karşılıklarına yönelik döviz kullanabildikleri ROM imkânını uygulamaya koymuştur.

Bu çalışmanın amacı, FED'in geleneksel olmayan para politikası ve TCMB'nin ROM uygulamasının, Olay İncelemesi, Regresyon Analizi ve VAR kullanarak Türk bankalarının dış borçlarını etkileyip etkilemediğini göstermektir. Olay çalışması, FED'in para politikasının dış borçlanma üzerinde önemli etkiye sahip olmasına rağmen, ikinci aşamada daha fazla etkiye sahip olduğunu göstermektedir. Regresyon analizi ise FED ve TCMB politikalarının bankaların dış borçlanmalarını etkilediğine işaret etmektedir. Son olarak, VAR sistemi, hem FED'nin hem de TCMB'nin politikalarının bankaların yurtdışından borçlanmaları üzerinde etkili olabileceğini, ancak TCMB'nin etkisinin FED'le kıyaslandığında daha uzun sürdüğünü göstermektedir.

Sonuç olarak, hem FED'in geleneksel olmayan para politikası hem de TCMB'nin ROM tesisi ile Türk bankalarının yurtdışından borçlanmaları arasında istatistiki bir ilişki olduğu ortaya konulmaktadır. Takip eden bir çalışmada, FED'in geleneksel olmayan para politikasının etkileri ve gelişmekte olan ülkeler üzerindeki etkileri, panel veri seti kullanılarak incelenecektir.

Anahtar Kelime: FED, QE, Yurtdışından Borçlanma, Yayılma Etkisi, ROM, TCMB, VAR, Gelişmekte Olan Ülkeler, Türkiye

² Bu çalışmada yer alan görüşler yazara ait olup Türkiye Cumhuriyet Merkez Bankası ile ilişkilendirilemez.



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LIST OF ABBREVIATIONS

BRSA	Banking Regulation and Supervision Agency of Turkey
BoE	Bank of England
BoJ	Bank of Japan
CBRT	Central Bank of the Republic of Turkey
CDS	Credit Default Swap
CPI	Consumer Price Index
CPIS	Coordinated Portfolio Investment Survey
DSGE	Dynamic Stochastic General Equilibrium
DTSM	Dynamic Term Structure Models
ECB	European Central Bank
EMBI	JP Morgan's Emerging Markets Bond Index
IIF	Institute of International Finance
MSCI	Morgan Stanley Capital International
FA-VAR	A Factor-Augmented Vector Autoregressive
FED	Federal Reserve Bank of the United States
FOMC	Federal Open Market Committee
FX	Foreign Exchange
GARCH	Generalized Autoregressive Conditional Heteroscedasticity
GSE	Government Sponsored Enterprise
GVECM	Global Vector Error Correction Model
IIF	Institute of International Finance
LIBOR	London Interbank Offered Rates
MOVE	Merrill Lynch Option Volatility Estimate
OIS	Overnight Index Swaps
OLS	Ordinary Least Square

ROC	Reserve Option Coefficient
ROR	Reserve Option Ratio
QE	Quantitative Easing
PPP	Purchasing Power Parity
ROM	Reserve Option Mechanism of CBRT
REER	Real Effective Exchange Rate
S&P	Standard & Poor's
UIP	Uncovered Interest Parity
VAR	Vector Autoregressive
VECM	Vector Error Correction Model
VIX	Chicago Board of Exchange Volatility Index

1 INTRODUCTION

FED had to reduce its monetary policy interest rates to near zero levels as a response to house market collapse at the end of 2008. As the impact of the collapse could not be mitigated solely by conventional policies, FED, as a first reaction, started to purchase direct obligations and MBSs. However, as the initial stimulus plan was not enough to heal the economy, FED included the long-term Treasury securities in its purchase program. As a result of these large scale asset purchases, the balance sheet of the FED reached to 4,5 trillion U.S. dollar from 0,9 trillion U.S. dollar. Expansion of FED's balance sheet by purchasing securities in large scales at the secondary market during the low level interest rates is called unconventional monetary policies. By purchasing assets in large scales, FED directly targeted to help the yields on longer-term securities to reduce, which would lead the price of remaining securities in the market to increase and thus finally, would lower the yields across a range of financial assets. The desired aim of the unconventional monetary policy purchases was to increase investment, purchases of consumer durables and the prices of more risky assets, such as equities.

The FED's unconventional monetary policy had some spillover effects on emerging countries due to their high yielding assets. According to IMF (2013), unconventional monetary policies positively affected emerging countries at their early stages through higher global growth. Higher equity prices, lower costs of capital and borrowing rates were observed in emerging market countries during this period. Therefore, corporates situated in these emerging countries accessed to cheap and abundant liquidity from FED's unconventional monetary policy. Most of the emerging countries' financial institutions especially banking sectors due to their close linkages with external liquidity started to borrow these funds.

According to the Institute of International Finance (IIF), emerging market economies attracted about 1,7 trillion U.S. dollar in just portfolio inflows between May 2009 and November 2015 as presented Figure 1. Therefore, it can be said that some portion of the liquidity resulted from FED's large scale asset purchases (roughly 3,5 trillion U.S. dollar) went to emerging countries. The fund inflows had impacts not only on other currencies but

also on the economies. Especially countries with current account deficits accessed this liquidity to finance their external deficits. As a result, external borrowings of the private sectors of these fund receiving countries increased to record high levels.

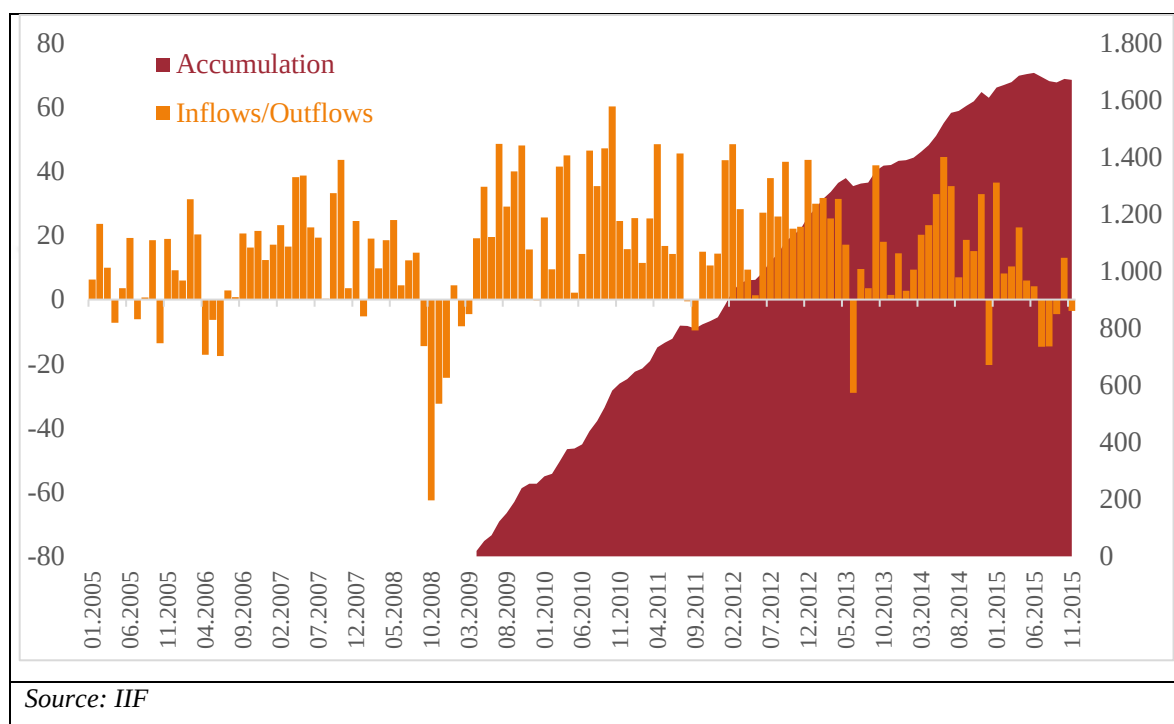


Figure 1 Portfolio Flows to Emerging Countries (billion U.S. dollar)

IMF's Coordinated Portfolio Investment Survey (CPIS) demonstrates the flows from U.S. to other countries. According to the survey, U.S. has been the biggest investors of the world to other countries. U.S. investors and U.S. dollar held about 30% of the world's portfolio investment assets throughout and was involved in 89% of all currency transactions in 2009, respectively. According to the survey, it can be interpreted that FED's monetary policy influences portfolio flows around the world. The survey also includes additional statistics related to Turkey. The survey indicates that there is a big jump in 2009 and 2011 in the investments to Turkey originated by U.S. as illustrated in Figure 2.

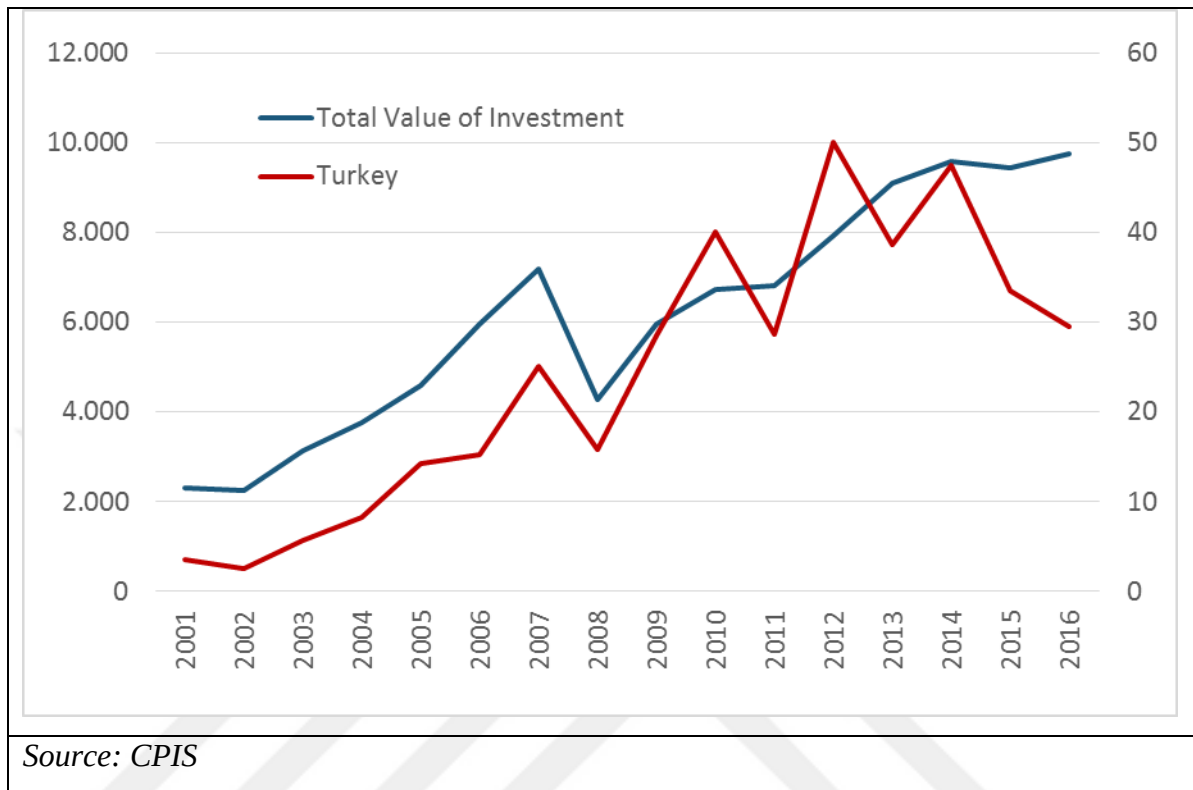


Figure 2 U.S. Portfolio Investments (billion U.S. dollar)

As being intermediators in the market by borrowing from abroad and lending in the domestic market, banks increased their external borrowing since then as they have generally easy access to global liquidity conditions compared to other private sectors. Turkish banks' external borrowing levels in terms of maturity were increased as presented Figure 3. Although in general banks prefer to borrow in short term, they increased their long term borrowings as well. Therefore, it can be said that the liquidity conditions that changed according to the FED's unconventional monetary policy may had highly effect the balance sheets of the banks in Turkey.

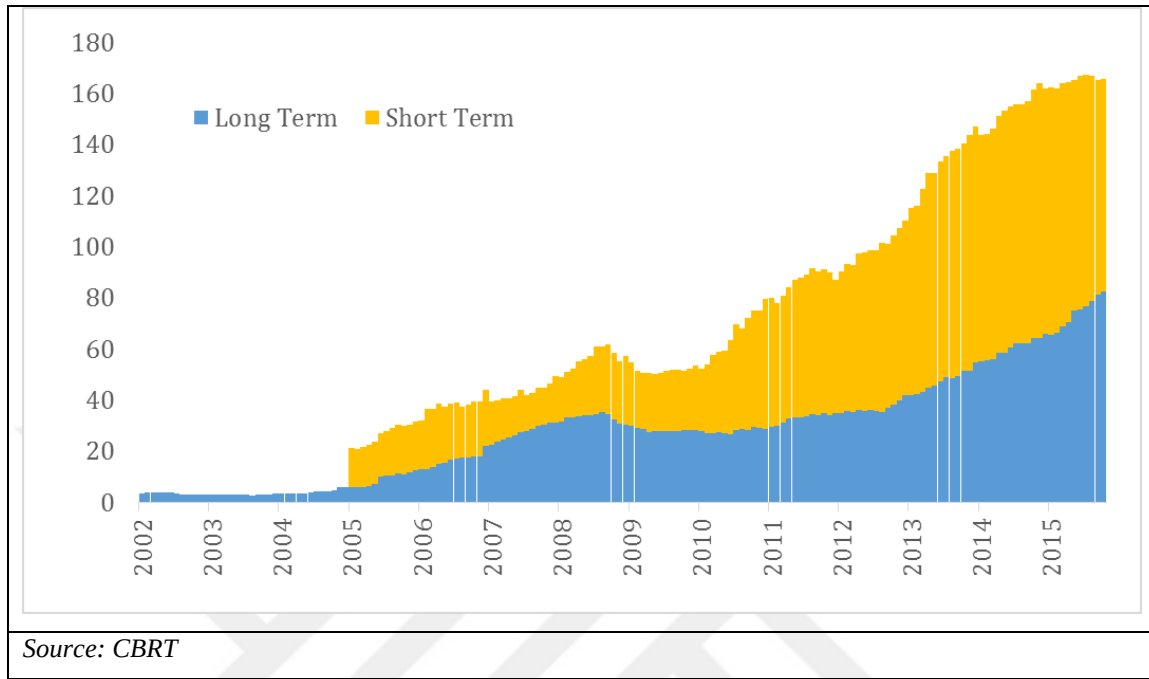


Figure 3 Turkish Banks' External Borrowings

As presented in Figure 3, the level of external borrowing of Turkish banks was very stable until 2011. Since then especially the short term external borrowings of Turkish banks started to increase after 2011 when CBRT started its ROM facility. Therefore, some of the increase in 2011 in external borrowing of Turkish banks may have been driven by ROM.

Therefore, whether the FED's unconventional monetary policy and CBRT's ROM facility do affect Turkish banks' external borrowing levels or not is measured in this study. The monetary policy actions of developed countries affect other countries mainly through portfolio, liquidity and signaling channels. Most of the literature on the effects of FED's unconventional monetary policy have focused heavily on the announcement effects. However, in addition to the announcements, the balance sheet increase stemming from FED's unconventional monetary policy operations have also real effects on the other countries. Therefore, one of the contributions of this study is to measure the effects of FED's balance sheet changes on the Turkish banks' external borrowing level instead of the portfolio inflows in the form of equity and bonds. Moreover, the related literature measures the effects of the policies by looking only equity return or the yield of the bonds.

In the following two parts, the general framework of FED's unconventional monetary policy and CBRT's ROM facility are presented. After related literature is reviewed in more detailed, the empirical methodologies are demonstrated at the fifth part in which Event Study, Regression Analysis and VAR model are used. Following results of the empirical analyses, the conclusion is presented at the end of the study.



2 FED's UNCONVENTIONAL MONETARY POLICY³

Effective from the end of 2008, FED implemented almost zero interest rates as a monetary policy to stimulate economic activity in the United States. During these times, United States witnessed low aggregate demand and large output gap. As a reaction to the developments, FED reduced its policy rates substantially in order to achieve full employment and to meet its inflation target. On the other hand, near zero level policy rates with constraints on moving them significantly below zero, using conventional monetary tools were not accommodative. Therefore, FED started to employ unconventional monetary policies by injecting U.S. dollar liquidity to the market through asset purchases during this period.

2.1 INTRODUCTION OF UNCONVENTIONAL MONETARY POLICY

Interbank overnight interest rate is one of the main conventional tools of the central banks, by which central banks try to affect directly the current and expected future path of the short term interest rates and by this way influence middle and longer term interest rates in the market. In addition to changing directly policy interest rates according to the market conditions, central banks employ open market operations to manage liquidity and thus the interest rates. On the other hand, it is not a common monetary policy to buy long term Treasury and/or private sector securities with large scales. Therefore, when policy rates are near zero levels, large scale asset purchases in the secondary market are considered as unconventional monetary policy actions. In this framework, FED directly targeted to force the yields on longer-term securities to decrease by large scale asset purchases. According to the portfolio balance channel, the asset purchases of the FED reduce the supply of long-term Treasury and agency securities in the market, which leads the price of remaining securities to increase and finally, lowers the yields across a range of financial assets. The final and desired result of the asset purchases is to reduce the interest rates among all maturities, stimulate investment, increase purchases of consumer durables and raise the prices of more risky assets.

³ All of the section information received from the official web page of FED.
<https://www.federalreserve.gov/newsevents/speech/brainard20151106a.htm>

2.2 MAIN COMPONENTS OF THE UNCONVENTIONAL MONETARY POLICY

During the financial crisis, the FED used several unconventional monetary liquidity tools in key markets. The main tools that were employed are as follows;

- The Money Market Investor Funding Facility (expired on October 30, 2009),
- The Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (ABCP MMMF) (closed on February 1, 2010),
- The Commercial Paper Funding Facility (closed on February 1, 2010),
- The Primary Dealer Credit Facility (closed on February 1, 2010),
- The Term Securities Lending Facility (closed on February 1, 2010),
- The Term Auction Facility Auction (conducted on March 8, 2010),
- The Term Asset-Backed Securities Loan Facility (on June 30, 2010).

Large-Scale Asset Purchase Programs: The FED increased its holding of long-term securities through purchases in the secondary market to force longer-term interest rates to decrease and eventually support economic activity and employment. Between the end of 2008 and October 2014, FED took following steps;

- 175 billion U.S. dollar in direct obligations of Fannie Mae, Freddie Mac, and the Federal Home Loan Banks and 1,25 trillion U.S. dollar in MBS guaranteed by Fannie Mae, Freddie Mac, and Ginnie Mae between December 2008 and August 2010 to reduce the cost of home financing and increase the availability of mortgage for the purchase of houses.
- 300 billion U.S. dollar of long-term Treasury papers to improve the private credit market conditions. Moreover, it expanded its holdings by purchasing an additional \$600 billion of longer-term Treasury securities. The FED started to buy long-term Treasury securities at a pace of \$45 billion per month, following the completion of the maturity extension program in December 2012.
- Additional MBS at a pace of \$40 billion per month to further increase policy accommodation starting in September 2012.

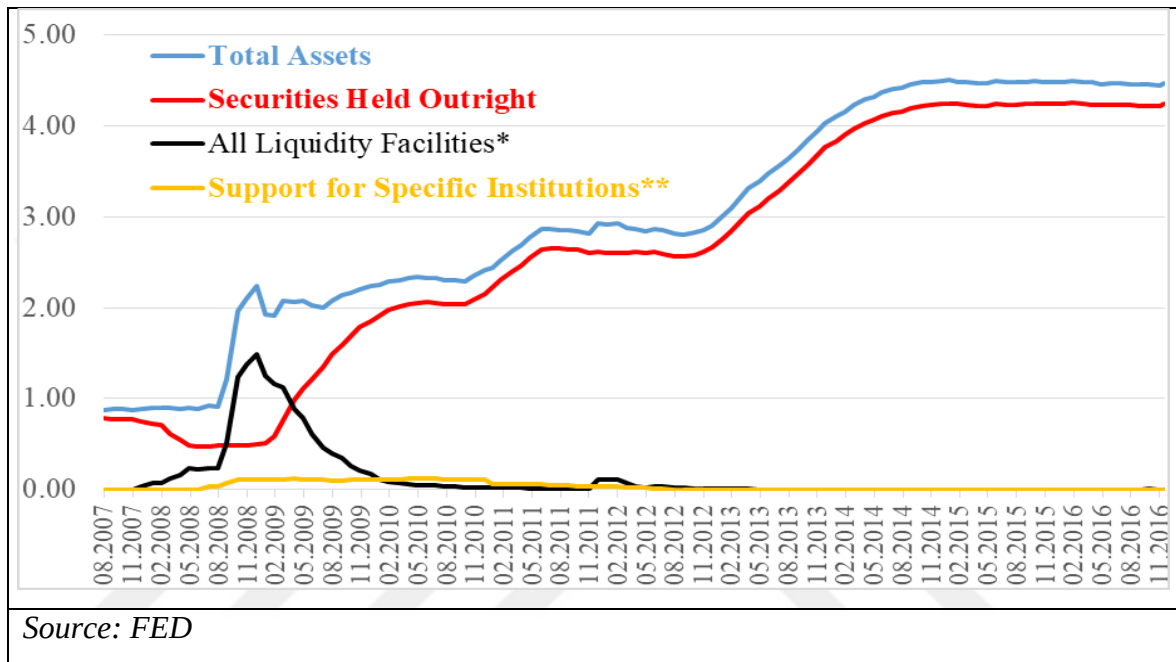
Table 1 FED's Unconventional Monetary Program Actions

Date	Explanation
25.11.2008	FED indicates purchases of up to 100 bio USD in agency debt and up to 500 bio USD in agency MBS at <u>intermeeting policy announcement</u>
01.12.2008	FED's Chairman states that "FED could purchase longer term Treasury securities in substantial quantities" <u>intermeeting policy announcement</u>
16.12.2008	FED indicates "exceptionally low level of the federal funds rate for some time"
18.03.2009	FED indicates purchases of up to additional 100 bio USD in agency debt, up to 750 bio USD in agency MBS and 300 bio USD in Treasury securities.
10.08.2010	FED indicates reinvestment principal payments from the first phase of QE purchases in Treasury
03.11.2010	FED indicates purchases of 600 bio USD in Treasury securities
21.09.2011	FED indicates maturity extension program
13.09.2012	FED indicates purchases of 40 bio USD per month of agency MBS, maintaining the federal funds rates at zero to mid-2015.
12.12.2012	FED indicates increase of 40 bio USD per month agency MBS purchases to 85 bio USD

In addition to the large scale asset purchase program, FED launched **Maturity Extension Program** to extend the average maturity of its Treasury security holdings to reduce the longer-term interest rates and to support its unconventional monetary policy. The maturity extension program was conducted via open market operations as well.

- The FED started to purchase 400 billion U.S. dollar of Treasury securities with remaining maturities of 6 years to 30 years and to sell with remaining maturities of 3 years or less at the end of June 2012.
- The FED continued the maturity extension program through the end of 2012, resulting in the additional purchase of more than about 250 billion U.S. dollar in Treasury securities.

- The FED established the Maturity Extension Program and Reinvestment Policy to additionally support the economic recovery from September 2011 through the end of 2012.



*All Liquidity Facilities include; Term Auction credit; primary credit; secondary credit; seasonal credit; Primary Dealer Credit Facility; Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility; Term Asset-Backed Securities Loan Facility; Commercial Paper Funding Facility; and central bank liquidity swaps.

**Support to Specific Institutions includes: Maiden Lane LLC; Maiden Lane II LLC; Maiden Lane III LLC; and support to AIG.

Figure 4 FED's Total Assets

As a result of the unconventional monetary policy which is mainly composed of some variations of large scale asset purchases with near zero policy rates, the balance sheet of the FED expanded to record levels of 4,5 trillion U.S. dollar. As presented from Figure 4, the main component of balance sheet of the FED was Securities Held Outright. The component of the securities that were used during the unconventional monetary policy implementation of the FED are;

- US Treasury Securities
- Federal Agency Debt Securities
- Mortgage Backed Securities (Guaranteed by Fannie Mae, Freddie Mac, and Ginnie Mae)

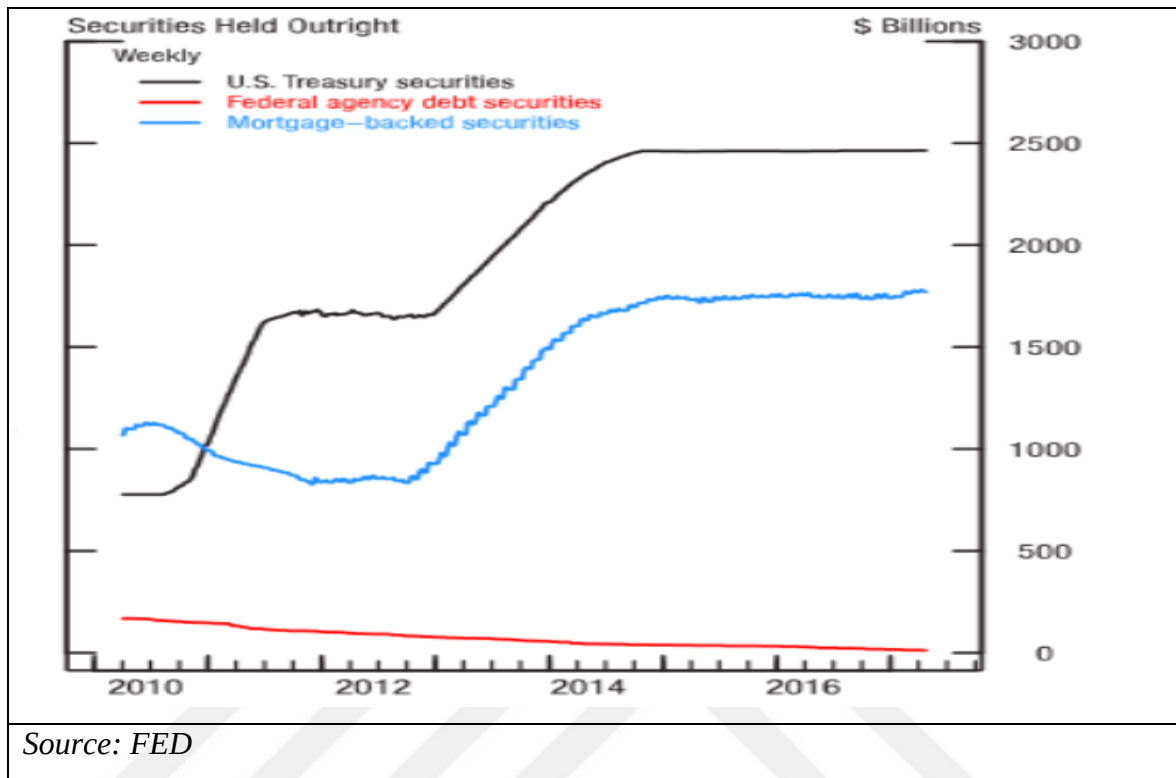


Figure 5 FED's Securities Held Outright

FED's outright asset purchases are presented at Figure 5. Although FED bought several securities at the secondary market, the large scale asset program's main drivers were the purchases of U.S. Treasury Securities and Mortgage-Backed Security.

3 CBRT'S RESERVE OPTION MECHANISM

In addition to FED's quantitative easing, as a result of a change in legal framework, banks in Turkey started to be able to use foreign exchange for their Turkish Lira reserve requirements with certain ratios at the end of 2011. The facility was later called Reserve Option Mechanism (ROM). In this part, its mechanism, the utilization and the impacts on the banks' balance sheet of the ROM is summarized.

3.1 FRAMEWORK OF ROM

Banks are able to keep a certain ratio of their Turkish lira reserve requirements in foreign exchange within the framework of ROM. In the system, the reserve option ratio (ROR) and the reserve option coefficient (ROC) are two main parameters that are used to calculate how much foreign exchange can be settled against Turkish Lira reserve requirements. ROR is used to set the fraction of Turkish lira required reserves that can be held in foreign exchange, whereas ROC is used to set the amount of foreign exchange that can be held per unit of Turkish lira.

Let's suppose that Bank A has to hold 1.000 Turkish lira reserve requirements for its Turkish lira liabilities upon the upcoming reserve requirement period; ROR is 80%, ROC is 1,0000 (which means banks can hold 1,0000 Turkish lira equivalent of foreign exchange) per unit of Turkish lira reserve requirement) and finally foreign exchange rate of USDTRY is 4,0000.

In this case, Bank A may hold up to 200 U.S. dollar (Turkish lira requirements*ROR*ROC/USDTRY Rates= $1.000 * 0,80 * 1,00 / 4,0000$) for its 1.000 Turkish lira reserve requirements in foreign exchange. In this case, Bank A is able to fulfill its reserve requirement by using 200 U.S. dollar plus 200 Turkish lira (as 80% of 1.000 Turkish lira partially matched FX in accordance with ROM) instead of using 1.000 Turkish lira. Therefore, ROM facility gives banks an alternative to fulfill main parts of their Turkish lira requirements in foreign exchange and use 800 Turkish lira for other purposes.

3.2 BALANCE SHEET EFFECTS OF ROM

If the interest rates and the liquidity conditions are similar for foreign exchange (mainly U.S. dollar) and Turkish lira, the ROM facility is not expected to change banks' balance sheet items. However, the cost of funding for Turkish lira and foreign exchange are different. As presented in Figure 6, the cost of Turkish lira funding is bigger compared to that of U.S. dollar especially during the FED's unconventional monetary policy period. The difference between the costs of funding encourage banks to utilize ROM facility near the maximum levels.

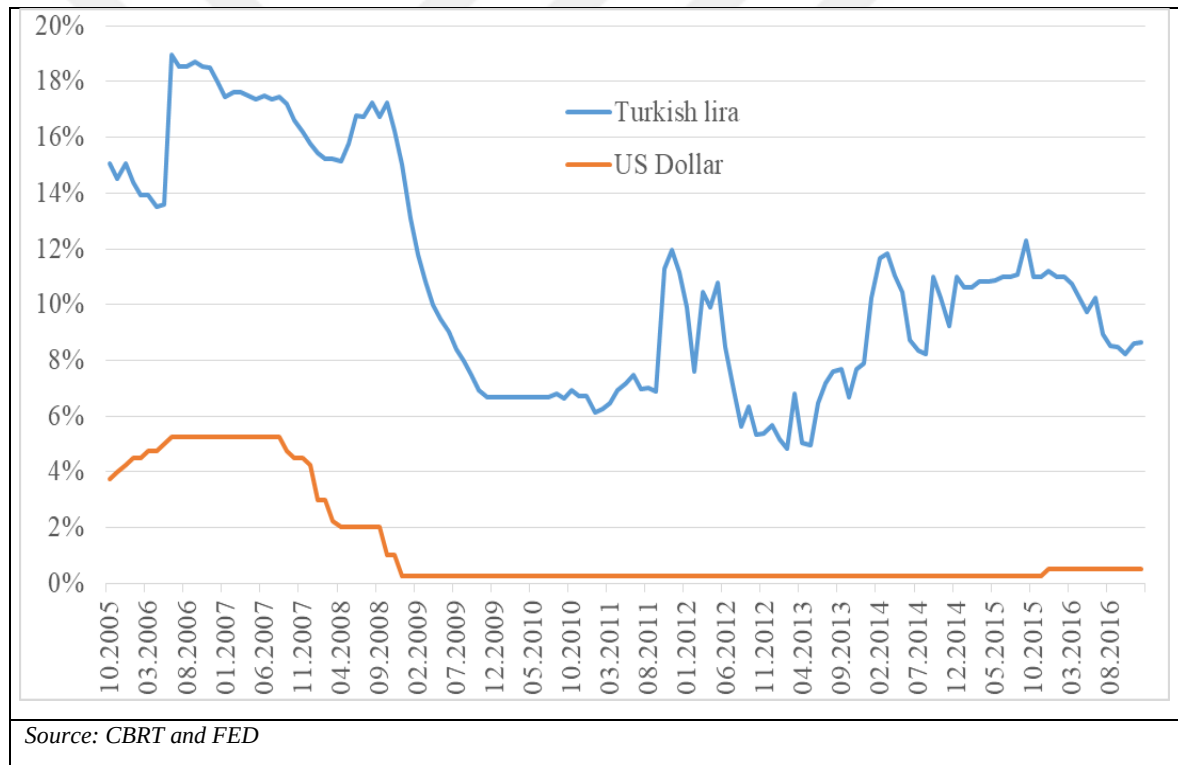


Figure 6 Cost of Funding

Therefore, the ROM facility substantially affected behavior of the banks in terms of foreign exchange items in their balance sheets. ROM can be considered as a kind of swap transaction by which banks are able to receive Turkish lira liquidity from CBRT by placing foreign exchange in CBRT as a Turkish lira reserve requirement. By this way, ROM indirectly encouraged banks to reduce their cross-currency swap positions. Having the option to match some part of their Turkish lira requirements in foreign exchange, banks substituted some of their cross currency swap positions with ROM. In fact, there has been a

significant reduction in cross currency swaps when ROM started to be implemented as presented in Figure 7.

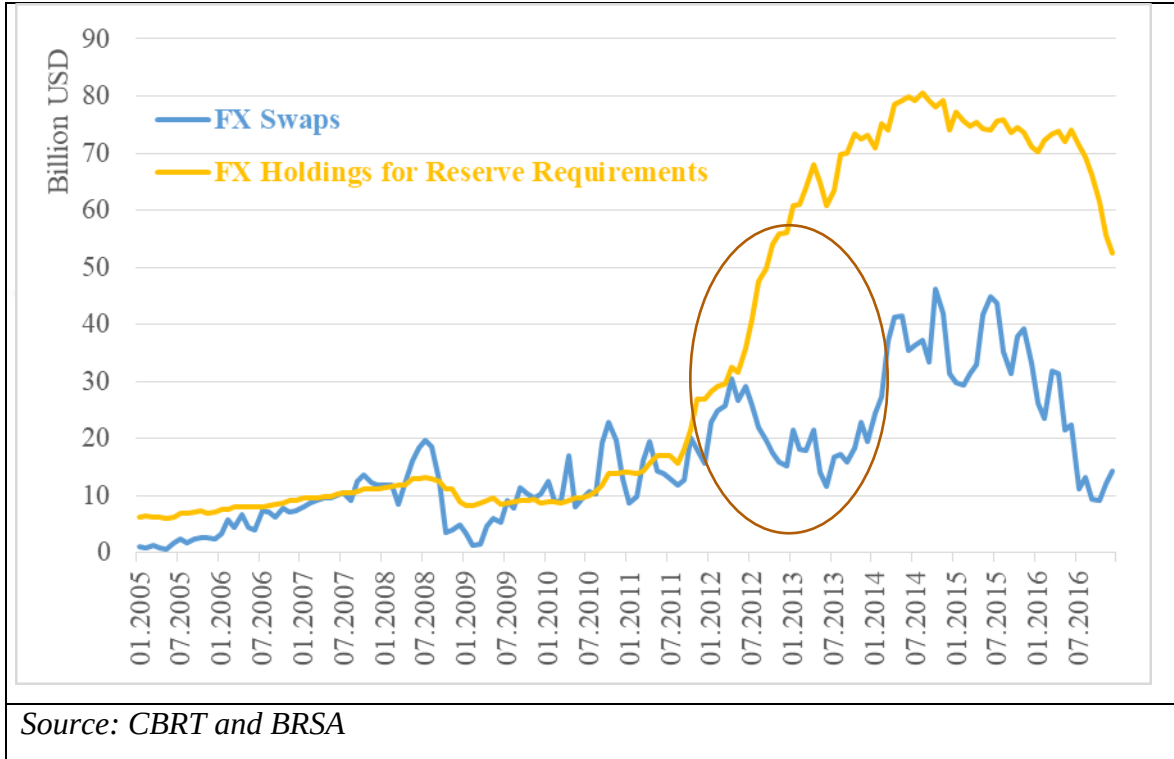


Figure 7 Swap to ROM Transitivity

As banks started to use ROM facility instead of swap transactions, their swap positions decreased at the beginning of the introduction of the ROM facility. Figure 7 demonstrates the transitivity between ROM and swap usages of the banks. According to the Figure 4, before the introduction of the ROM facility, banks' foreign exchange swap positions and foreign exchange reserve requirements move together. On the other hand, since the introduction of the ROM, banks increased their foreign exchange holdings for reserve requirements and decreased their foreign exchange positions.

In addition to the swap effect, several other balance sheet items of the banks were affected as a result of the utilization of the ROM facility. However, one of other balance sheet items which may had been effected by the ROM facility as well was the external borrowing levels of Turkish banks. Figure 8 demonstrates banks' external borrowings and the foreign exchange holdings as a reserve requirement mostly for the purpose of ROM. As

presented in Figure 8, the banks sharply increased their external borrowings at the end of 2011 when they started to utilize ROM facility.

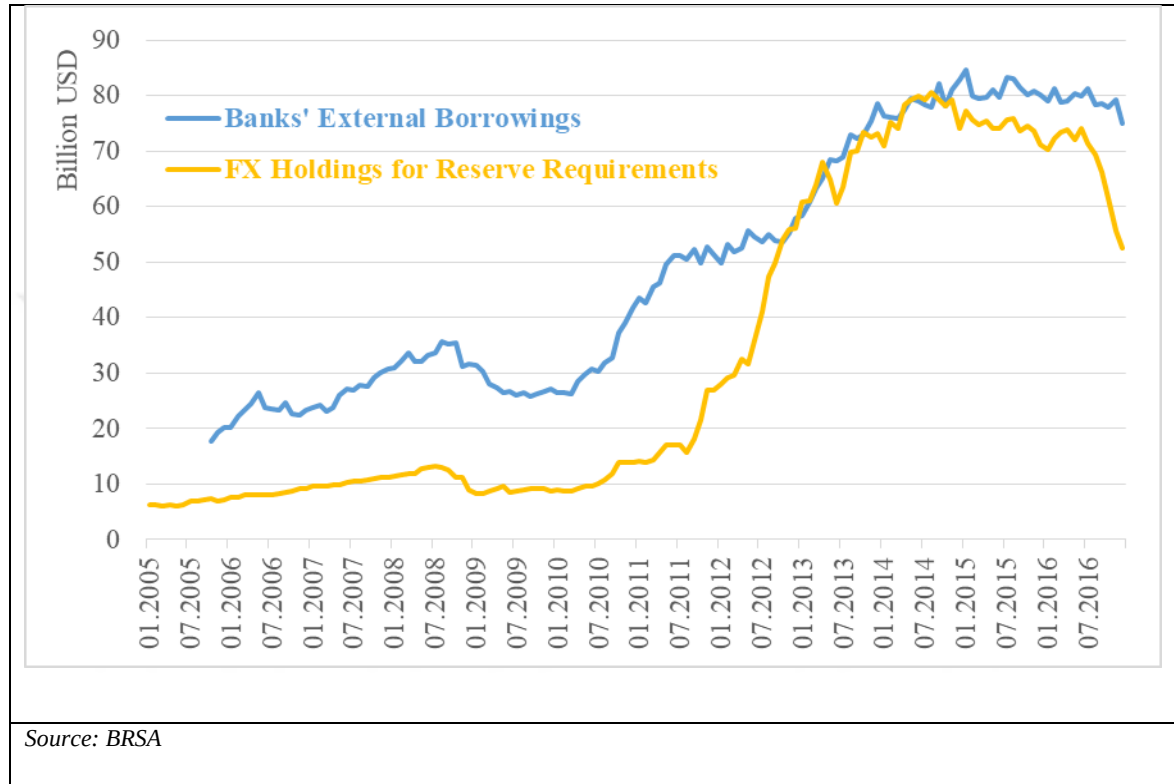


Figure 8 Turkish Bank's External Borrowings and ROM Usage (billion U.S. dollar)

As presented in this section, ROM facility may had encouraged banks to use foreign exchange to meet their Turkish lira reserve requirements. However, as the resources of foreign exchange was limited inside of Turkey, the banks searched foreign exchange funds abroad. Therefore, Turkish banks started to borrow externally mainly in the U.S. dollar thanks to the low cost of foreign exchange funding in this period.

4 LITERATURE REVIEW

As the aim of the study is to test whether the FED's unconventional monetary policy and CBRT's ROM policy do affect the external borrowing behavior of Turkish banks or not, we separated the literature review section into two separate subsections. After giving theoretical information regarding the channels by which FED's asset purchases affect other countries, we provide international effects of the FED's policy actions. Unfortunately, there are not enough studies regarding CBRT's ROM facility and its effects on banks' balance sheets.

4.1 CHANNELS THAT FED'S UNCONVENTIONAL MONETARY POLICY WORKS THROUGH

Before starting to analyze whether FED's unconventional monetary policy do affect other countries or not, it is important to identify and describe the channels through which liquidity is expected to run internationally. Although there are several channels through which liquidity works internationally, five of them are explained in this study; portfolio (balance), liquidity, signaling, interest rate and risk channels.

4.1.1 Portfolio Channel

The first and the mostly approved channel can be considered as "*Portfolio (Balance) Channel*" as FED's asset purchases decreased the level of available assets in the market (Bernanke, 2010). Although financial assets cannot be perfectly substituted due to their distinctive characteristics, FED's asset purchases at the secondary market may had changed demand and price of other assets by which portfolio channel works. As indicated before, FED's asset purchases included Government Sponsored Enterprises (GSE) and Treasury papers which in turn reduced the all available papers in the market. According to Lim et al. (2012), unmet risk appetite thus headed to other assets and so demand for the other risky papers' increased. Therefore, it is expected that the portfolio balance channel can be defined by both in terms of higher demand for longer term papers and other countries' papers, which can be identified as the investors rebalancing their portfolios. Lower prospective returns on papers that were purchased by FED encouraged investors to switch their portfolios into other

asset classes (Gagnon et al., 2010, 2011), which is described as portfolio balance channel. Moreover, Bauer and Neely (2014) state that the portfolio balance channel implies that the asset purchases of the central banks had huge impact in the term premium in long-term interest rates because of the imperfect substitution between assets of different maturities or classes.

4.1.2 Liquidity Channel

The other important channel that unconventional monetary policy works through is “*Liquidity Channel*” that affect asset prices (Krishnamurthy and Vissing-Jorgensen, 2011). As the FED’s large scale asset purchases increased the liquidity in a well-functioning market, the liquidity cost decreased in turn decreases the asset prices (Gagnon et al., 2011). Moreover, Glick and Leduc (2012) indicate that the active presence of central banks in the market may had improved the liquidity conditions in the market through decreasing liquidity premiums.

Moreover, Lim et al. (2012) indicate that the long-term assets purchased by FED through unconventional monetary policy operations were credited as increased reserves on the balance sheets of the banks. Since such reserves were more easily traded in secondary market than long-term private sectors’ papers, there was a decline in the liquidity premium in the market. Decreasing liquidity premium enabled previously liquidity-constrained banks to extend credit lines. This resulted in a decline in borrowing costs and increases overall bank lending to borrowers including developing countries. As a result of the large scale asset purchases of FED, the liquidity in the market increased and some part of the liquidity flowed to other countries through liquidity channel.

4.1.3 Signaling Channel

The other channel that FED’s asset purchases works through is “*Signaling Channel*”. FED’s monetary policy related announcements and purchases were interpreted as the rates in the future would be lower as stated by Bauer and Rudebusch (2013). Bauer and Neely (2016), Gagnon et al. (2011) and Woodford (2012) indicate that central banks’ announcements affected long-term interest rates via giving the market directly or indirectly a path for future rates. Asset purchases of FED served as a credible commitment that interest

rates would be near zero level for a long time as an early hike in interest rates implies a loss for the FED (Bauer and Rudebusch, 2013 and Clouse et al., 2003). Moreover, Beckworth and Hendrickson (2015) state that such signaling may have improved household and business sentiment by diminishing concerns about the risk. Due to the perception that FED would not increase the rates for a long time, the investors in the U.S. started to search higher yield assets such as assets of other countries.

4.1.4 Interest Rate Channel

Another channel in which FED's unconventional monetary policy works is "*Interest Rate Channel*". According to Chen et al (2011), as a result of large scale asset purchases, long term interest rates and thus real interest rates decreased. Moreover, lower interest rates encouraged households and firms to borrow more. According to Gagnon et al. (2011), FED's long term assets purchases caused an increase in reserves of the balance sheets of private banks. As these reserves were more easily traded in secondary markets than long-term securities, the liquidity premium decreased. This decrease enabled previously liquidity-constrained banks to extend their credits to investors, which caused a decline in borrowing costs and an increase overall bank lending, including direct lending to developing countries, and perhaps more importantly, indirect lending via the carry trade.

4.1.5 Risk Related Channel

Although risk premia and risk taking channels are classified as different types of channels, in this study both of them are explained together under the name of "Risk Related Channel". According to Gagnon et al (2011) FED's asset purchases work through to emerging countries via Risk Related Channel which is considered as the primary channel.

When FED purchased a particular asset class such as GSE or long term Treasury papers, investors displaced or reduced their holdings while private sector at the same time increased the amount of short-term risk free bank reserves. Another channel is called Risk Taking Channel through which FED's asset purchases work. Bruno and Shin (2013) indicate that the focus of this channel is on managing market expectations. For influencing long term rates which are expected to affect consumption and investment, central banks place a route

for short term rates and communicate it with the market. Bruno and Shin (2013) measure the effects of FED's unconventional policy on both domestic and international markets through risk-taking channel.

In this study, the main focus is on the portfolio and interest rates channels as the FED asset purchases would decrease the available assets for investors and lower the interest rates. FED's asset purchases in the secondary market forced investors to seek other high yielding assets to invest in. Therefore, investors who seek higher return started to invest in assets of other countries. This implies that the impacts of the FED asset purchases may have affected on the external borrowing level of banks in Turkey.

4.2 INTERNATIONAL EFFECTS OF FED'S QUANTITATIVE EASING POLICIES

Shortly after FED started to employ unconventional monetary policy by large scale asset purchases along with near zero policy interest rates, related literature started to emerge. In these studies, generally, the success of the FED's unconventional monetary policy strategy itself and its effects on the assets classes and interest rates in the U.S. have been questioned and investigated. Most of these studies such as Kuttner (2001), Ehrmann and Fratzscher (2004) and Bernanke and Kuttner (2005) documented large and significant effects of FED's unconventional monetary policy announcements on U.S. financial markets. However, especially since the second phase of the large scale asset purchases had started by including purchasing of Treasury papers, the effects on the other countries increased. In this part, only the strand of literature related to the international, spill over, effects of the FED's unconventional monetary policy is presented.

Gagnon et al. (2010, 2011) searched the effectiveness of FED's asset purchases on the domestic bond market by using an event study method. The results indicate that U.S. domestic bond yields were significantly affected by FED's asset purchases in the secondary market. However, the authors claim that this reduction mainly stemmed from lower risk premiums rather than lower expectations of future interest rates. The results indicate that the risk channel is more effective than signaling channel. Gagnon et al. (2010, 2011) show that FED's asset purchases cause reduction in the longer-term private sector borrowing rates.

Although the impacts were significant in mortgage market interest rates, the purchases also impact Treasury securities, corporate bonds and interest rate swaps. According to Hancock and Passmore (2011), FED's MBS and agency security purchases forced to decrease the interest rates of the mortgage during the first phase of the QE. On the other hand, Treasury security purchases lead the economic activity to increase in the U.S. by increasing prices of the longer term Treasuries. FED's asset purchases in private debt market resulted in 90-200 bps of 10 year U.S. Treasury paper yields (IMF, 2013). Therefore, it can be said that as a result the FED's unconventional monetary policy seems to have significant effects on the U.S. economy.

Furthermore, the policy actions have some spillover effects on international markets. Therefore, at the next subsection, we try to demonstrate FED's policy implications on other countries especially emerging countries. There is only a limited number of studies related to the unconventional monetary policy actions of developed countries' central banks and their impacts on emerging countries. The study of Calvo et al. (1993) and Husted and Kitchen (1985) can be considered as one of the first papers on this issue long before the FED's quantitative easing policy started in 2008. According to Calvo et al. (1993) and Husted and Kitchen (1985), the significant part of the total variance in real exchange rates in Latin America could be explained by external shocks during 1988 and 1991. Later, Ehrmann and Fratzscher (2002 and 2006), Faust et al. (2003), Canova (2005), Wongswan (2006), Andersen et al. (2007) and Mackowiak (2007) are considered as other early works on how FED's policy surprises affect other countries before 2008 crises. For example, Mackowiak (2007) shows that FED's policy shocks quickly affect the interest rates and foreign exchange rates of emerging countries. Generally, their findings indicate that the FED's unconventional policy shocks quickly and significantly affect some asset classes in other countries.

Using large scale asset purchase programs along with near zero policy rates was not a common strategy and later called as "*unconventional monetary policy*". Namely one of the first comprehensive studies, which include FED's unconventional policies related to the impacts of FED's quantitative easing on other countries after 2008 crises is done by Neely (2010). According to the author, FED's announcements related to large scale asset purchases

had significant impacts on foreign exchange rates and Treasury security interest rates abroad through portfolio channel. Neely (2010) measures the change in 10-year Treasury yields and exchange rates by using a simple portfolio balance model and Uncovered Interest Parity (UIP)/Purchasing Power Parity (PPP) models. In his model, the U.S., Australian, Canadian, German, Japan and the United Kingdom data used for the period of January 1985-May 2010. According to their models' results, FED's asset purchase program affected both returns of MBS, agency debt and Treasury securities in the U.S. Moreover, expected real yields in the U.S. positively affected the Treasury yields of foreign countries. More specifically, Neely (2010) indicates that as a result of FED's unconventional monetary policy; U.S. dollar depreciated against the currencies of Australia, Canada, Japan, Germany and the United Kingdom and 10-year Treasury yields of those countries significantly decreased. On the other hand, the author was not able to demonstrate any significant relationship with short term interest rates among U.S. and these countries. According to the results, during the first phase of FED's asset purchase program, 10-Year U.S. Treasury yields decrease by 118 basis points when other developed countries' Treasury bond yields decrease by only between 45-70 basis points. The event study results, performed by daily data suggest that the FED's announcements related to unconventional monetary policy significantly reduce the yields of U.S. and foreign Treasury bonds and lead depreciation in U.S. dollar against those currencies. Intraday event study mostly supports the daily results.

In their studies, Ammer et al. (2010) analyze the effects of FED's policy related announcements on the global equity prices during its unconventional monetary policy period. The study is focused on three main transmission channels; demand channel, credit channel and interest rate channel. The authors use a dataset of over 12,000 companies from 44 countries for the period from February 1994 to December 2006. Ammer et al. (2010) use the spread of announced and Federal Funds Rates as the policy surprise component and the returns of equity prices as dependent variable in their model. According to their base model's results, the U.S. and foreign equity prices respond to FED's 25 basis point tightening surprise by a decrease of 1.59% and 1.71%, respectively. When they include other variables to their base model in order to see how different channels work, the results do not change dramatically. In demand channel, the foreign firms which operate in more cyclical industries

and sell their majority of the products to abroad are more sensitive to FED's monetary policies. In credit channel, the foreign firms which do not finance their capital expenditures with their operating cash flows and not pay dividends regularly are more sensitive to FED's monetary policies. However, the evidence is weak. Finally, regarding interest rate channel, the foreign firms which are situated in countries where exchange rates pegged to U.S. dollar are more sensitive to FED's monetary policy actions. Therefore, the results indicate that the impacts of FED's monetary policy actions highly depend on the foreign exchange rate regime.

Chen et al. (2011) measure how unconventional monetary policies of advanced economies (US, UK, Japan and Euro Area) affect other countries' economic indicators such as inflation and equity prices. After using event study method for this purpose, they use an estimated Global Vector Error Correction Model (GVECM) to explore the effects of FED's unconventional monetary policy on the financials of other countries. Chen et al. (2011) use a dataset of 17 countries for the period of February 1990-December 2010. According to their event study results, FED's asset purchases have sizeable effects on domestic markets with mostly equity prices through confidence, liquidity and bank lending channels. Their main finding is that although main purpose of the FED's unconventional monetary policy is to stimulate the U.S. economy, it has also spillover effects on other countries where asset prices increase as well. Moreover, the effects of unconventional monetary policies of FED work through several channels such as interest rate, confidence and an endogenous monetary policy response. These effects on emerging countries are diverse and in some cases even stronger compare to that on the US. Their VECM model indicates that the impacts of FED's unconventional policy actions on emerging countries are short or medium term depending on various variables such as their exchange rate regimes and financial linkages to the U.S.

Hausman and Wongswan (2011) measure the effects of FED's unconventional policy surprises on the equity indexes, interest rates and foreign exchange rates in 49 countries. They use event study method with a daily data set for the period of November 2009-October 2010. Changes in the current target Federal Funds Rates and the revisions in the expected path of future monetary policy of FED are used as proxies for monetary policy surprises and

defined as target and path surprises, respectively. According to Hausman and Wongswan (2011), although global equity indexes are significantly affected by the target surprise; exchange rates and long-term interest rates are more affected by the path surprises. However, the impacts of FED's monetary policy related announcement vary depending on exchange rate regimes of countries. FED's monetary policy surprises are more effective in equity markets and interest rates in countries with less flexible exchange rate regime. In addition to foreign exchange rate regime, the results indicate that equity market capitalization ratio may be another determinant factor that cause differences in the equity market responses of the country at focus.

Morgan (2011) measures the impacts of FED's quantitative easing policy on selected Asian countries. He uses event study method for the period of November 2009 to October 2010 as the base period. The author also compares the base period with first and second phases of FED's unconventional monetary policy periods. According to the results, the value of capital outflows from the U.S. are estimated as about 32 billion U.S. dollar per quarter. Moreover, the U.S. monetary base increased about 40% during the first phase of unconventional monetary policy period. These corresponding figures are 74 billion U.S. dollar and 34% during the second phase of QE, respectively. Emerging Asia received 16 billion U.S. dollar and 9 billion U.S. dollar portfolio inflows per quarter during the first and second phases of QE, respectively. Moreover, Morgan (2011) investigates the impacts of FED's unconventional monetary policy on domestic liquidity, foreign exchange rates and interest rates of emerging Asia countries. The author indicates that the FED's unconventional monetary policy has significant effects on domestic liquidity in emerging Asia. The emerging Asia currencies generally appreciate against the U.S. dollar, however there are no significant impact on long term interest rates of these countries except for Indonesia during unconventional monetary policy period.

Hayo et al. (2012) study the effects of FED's monetary policy announcements (more specifically the official target rate decisions) on selected emerging countries' equity markets. The authors prefer to use both formal and informal communication channels such as speeches and announcements rather than just the balance sheet figures of the FED. Moreover,

they use a Generalized Autoregressive Conditional Heteroscedasticity Model (GARCH) with a daily dataset of 17 emerging countries for the period of January 1998 to December 2009. The control variables are Standard & Poor's (S&P) index, emerging countries' equity returns, corresponding Emerging Market Bond Index (EMBIG) and nominal exchange rates against to U.S. dollar. According to the empirical analysis, both monetary policy actions and communications significantly affect the equity returns of emerging countries. Although surprise FED's policy rate changes are one of the most important drivers of the equity market returns of emerging countries, the returns are significantly affected by informal communications compared to target rate surprises. Furthermore, the equity returns of Latin American emerging countries are more sensitive to FED's communications compared to non-Latin American emerging countries.

Glick and Leduc (2012) investigate the effects of FED's asset purchases on global financial markets with the focus on long-term interest rates, exchange rates and commodity prices. They use event study method as empirical model with a daily dataset for the period of January 2004-July 2011. In addition to the event study, Glick and Leduc (2012) use regression analysis to verify their main findings. To identify policy surprises, unconventional monetary policy announcements are employed. In addition to long-term interest rates and foreign exchange rates, Glick and Leduc (2012) prefer to use global commodity prices to see the announcement effects on global markets. Study results demonstrate that 10 year U.S. Treasury yields generally decrease in response to FED's policy announcements related to asset purchases because market participants consider these announcements as a signal for lower future economic growth in the US. As FED's unconventional monetary policy is viewed by the market participants as a signal for lower future economic growth, U.S. dollar depreciates, the long term interest rates and commodity prices decrease. On the other hand, the effects differ according to the phases of the unconventional monetary policy of FED. Glick and Leduc (2012) claim that second phase of quantitative easing has larger effects on 10 year Treasury yields.

Aït-Sahalia et al. (2012) investigate the impact of the monetary policy related announcements on the economy and financial sectors in selected countries through interbank

credit and liquidity risk channels. Event study methodology is used with a daily dataset between June 1, 2007 and March 31, 2009. Aït-Sahalia et al. (2012) use the spread between London Interbank Offered Rates (LIBOR) and Overnight Index Swaps (OIS) and the U.S. dollar as a financial distress indicator which is a widely used measure of credit and liquidity risk premia in the global interbank markets. The results indicate that selected countries are affected by some of the policy announcements. According to the results of the event study, decrease in monetary policy rates has significant cross-country effects on other developed countries. Moreover, even a small scale monetary easing has significant and positive cross-country effects. FED's announcements about the use of unconventional monetary policy lead reductions in interbank credit and liquidity risk in the U.S. and have positive international impacts on Japan and the Euro Area.

Fratzscher et al. (2012) use a factor model which includes two types of factors. These factors are a set of global factors and a set of domestic factors in order to measure both the global dynamics of capital flows and the heterogeneity in capital flows across countries during and around the 2007–08 financial crisis. They use a weekly dataset for 50 countries for the period of 12 October 2005–22 November 2010. Fratzscher et al. (2012) define equity and bond flows; policy announcements of FED; and VIX, U.S. 10 year Treasury yields and growth rates as dependent, main independent and control variables, respectively. Fratzscher et al. (2012) do not use directly FED's asset purchases; instead they prefer other factors thought to be effected by FED's policy actions. The results indicate that FED's asset purchases are effective in raising equity prices and lowering Treasury yields. During the crises, global factors are main determinants of the global capital flow pattern and are primarily driven by risk-on flows. Moreover, according to Fratzscher et al. (2012), there is a large degree of heterogeneity among countries regarding the sensitivity to the same global shocks during and after crisis. The heterogeneity is largely explained by the institutional quality, country risk, the strength of macroeconomic fundamentals and policies in the model.

Bruno and Shin (2013) measure the effects of FED's unconventional monetary policy on both domestic and international markets through risk-taking channel. They prefer to use Vector Autoregressive (VAR) model in their empirical analysis with a quarterly data set for

the period of 1995-2012. When measuring the effects of FED's unconventional policy actions on both domestic and international markets, the authors prefer to use the real Federal Funds Rates as an indicator for FED's monetary policies. Moreover, VIX, leverage of banks and effective exchange rate of U.S. are used as control variables. According to the results, a decrease in the FED Fund Rates causes depreciation in the U.S. dollar after about 14 quarters, while an increase in leverage is followed by a depreciation in the U.S. dollar with a lag of 3 quarters. They indicate that the effect on the exchange rates works through leverage and VIX. In international context, cross-border capital inflows to the banking sector is decreased by a contractionary shock to FED's monetary policy. Moreover, if there is an expected appreciation in a local currency, leverage level of the banks is expected to increase.

Moore et al. (2013) evaluate how FED's unconventional monetary policy program reallocates liquidity from U.S. towards Treasury bonds of 10 developing countries including Turkey. They use event study, VAR and panel regression analysis with daily and quarterly dataset for the period of January 2004-November 2011. Domestic Treasury bond yields, foreign exchange rates against U.S. dollar, the differences in one-year interest rates and the difference between foreign exchange swap-implied interest rates are selected as yield related variables. The results suggest that a 10 bps decline in the 10-year U.S. Treasury yields associates with an increase in the foreign share in Treasury bond markets of the selected emerging countries by an average of 0.4%. However, the impacts of the FED's unconventional monetary policy depends heavily on country specific conditions. These conditions are foreign exchange rate regime, degree of financial openness and financial linkage with the U.S. and the size of the local bond market. For example, the impacts on the countries with large bond markets are small. Therefore, Moore et al. (2013) conclude that the FED's unconventional monetary policy has significant effects on the portfolio inflows to emerging countries mainly via Treasury bond markets.

IMF (2013a, 2013b) claims that in its early stage, FED's unconventional monetary policy actions had beneficiary effects on the selected asset classes of many emerging countries. According to general equilibrium models, aggressive unconventional monetary policies used for mitigating the impact of negative shocks lead to higher global growth and

induce capital flows into high yielding emerging countries. Therefore, IMF (2013a, 2013b) employs a standard multi-country Dynamic Stochastic General Equilibrium (DSGE) model and an event study to see the spillover effects of unconventional monetary policy actions on 13 emerging countries plus the US, the EU and Japan. Although quantitative easing policy presented some financial instability, the effects were not significant or wide-spread. On the other hand, asset prices, corporate leverage ratio and foreign exchange exposure increased rapidly in many emerging countries due to FED's unconventional monetary policy actions. More specifically, stock prices increased in China, Indonesia, Mexico, Russia, Thailand, and Turkey; credit level expanded in Brazil, China, and Turkey. Moreover, GDP in emerging countries returned to their potential levels faster than that of G3 countries. If fund inflows to emerging countries caused a reduction in corporate risk premium and cost of capital, effects of the firms in these countries on GDP are larger. Furthermore, capital inflows led borrowing costs to decrease, currencies to become stronger and asset prices to increase.

Ahmed and Zlate (2013) try to reveal the main determining factors of the net private capital inflows to emerging countries. The authors prefer to use event study and a time series regression model with a quarterly dataset of 12 countries for the period of 2002-2013. They indicate that the behavior pattern of capital inflows are influenced by financial crises. Ahmed and Zlate (2013) firstly isolate the FED's asset purchases and then examine its effects on the capital inflows to emerging markets. Authors indicate that since financial crises the banking lending and other investment have decreased in these countries. Ahmed and Zlate (2013) show that the main drivers to the capital inflows to emerging countries are the growth rate differentials, interest rate differences and global risk aversion in both pre- and post-crises periods. Since some countries had took several measures to limit the negative impacts of portfolio inflows to their countries in 2009, the model includes capital control measures as well. According to the results, capital controls have a negative and statistically significant impact on inflows to emerging countries. Moreover, Ahmed and Zlate (2013) indicate that before the global financial crisis the behavior of net inflows, especially portfolio inflows, show significant change due to the increasing sensitivity of such flows to interest rate differences compared to the post-crisis period. To measure the effects of FED's unconventional policy actions on the capital inflows, Ahmed and Zlate (2014) use three

different dependent variables; policy announcements, 10 year U.S. Treasury bond yields and FED's asset purchases. According to the regression results, although FED's monetary policy related announcements have positive effects on net capital inflows to other countries, only portfolio flows are significantly affected. Moreover, when 10-year U.S. Treasury bond yields decrease, emerging countries receive more capital inflows but with certain lags.

Glick and Leduc (2013) examine how FED's monetary policy announcements affect the value of the U.S. dollar against euro, Japanese yen, Canadian dollar, British pound. Authors use one minute high-frequency intraday data in their event study model. They identify monetary policy surprises from the changes in Federal Funds Rate futures around Federal Open Market Committee (FOMC) announcements to measure conventional policy surprises and 2, 5, 10 and 30-year U.S. Treasury bond interest rate futures to measure FED's unconventional monetary policy surprises. The results indicate that monetary policy surprises have significant effects on the value of the U.S. dollar. During the unconventional monetary policy period, a one standard deviation surprise easing in monetary policy leads to around a 40 bps decline in the value of the U.S. dollar within 60 minutes. On the other hand, during the conventional monetary policy period, a roughly 6 bps decline in the value of the U.S. dollar within 60 minutes. Therefore, the results indicate that the currencies of other countries appreciate against U.S. dollar during the FED's unconventional monetary policy period.

Dedola et al. (2013) focus on international effects of unconventional monetary policies of developed countries' central banks. FED's asset purchases is considered as a proxy for liquidity facility, which is described as loans that government providing directly to banks at FED's policy rates. The credit condition of FED aggressively lower the fluctuations in spreads, which improves welfare and therefore capital stock. Dedola et al. (2013) argue that the more financial integration to global markets, the more powerful international transmission of a country specific shocks exists. Therefore, central banks who do not notice these transmission channels and their international effects may face an insufficient degree of stabilization in the face of adverse shocks.

Bauer and Neely (2014) investigate how FED's large scale asset purchases during unconventional monetary policy period affect domestic and international bond yields through signaling and portfolio balance channels. For evaluating the international effects of the FED's unconventional monetary policy, Dynamic Term Structure Models (DTSM) with a daily dataset for the period of 2 January 1995 - 30 September 2013 is used. In addition to the DTSM model, event study and regression analysis are employed as well. Bauer and Neely (2014) select U.S. Treasury bond yields with maturities of three and six months, 1 through 10 years, 15 years, and 20 years to demonstrate how signaling channel works. Moreover, to see international portfolio balance channel, Bauer and Neely (2014) use exchange rates of selected countries. The study can be considered as an augmented version of Neely (2010) by including relative importance of signaling and portfolio channels for international bond yields to the early research. According to the results, FED's announcements related to asset purchases are interpreted as the future short-term interest rates would decrease by investors, which reduces the expectation component of the long-term interest rates through signaling channel. However, prices of imperfectly substitutable assets would be affected by asset purchases through the portfolio balance channel. Results indicate a significant decline in the Treasury bond yields of selected countries', which is led by both signaling and portfolio balance channels. Although Treasury bond yields of the U.S. and Canada show significant signaling effects, it is not the case for Australian and German Treasury bond yields. The results suggest that a change in the U.S. portfolio weight has the strongest portfolio balance effects on German and Australian Treasury bond yields and the weakest effects on Japanese Treasury yields. Therefore, in terms of portfolio balance effects Australian and German Treasury bond yields show more substantial effects. Generally, Bauer and Neely (2014) indicate that the asset purchase announcements related to FED's asset purchases lead a reduction in Treasury bond yields both in the U.S. and in selected developed countries.

Wei Ho et al (2014) measure the spillover effects of unexpected changes in FED's monetary policy uncertainties on Chinese economy. Authors employ a Factor-Augmented Vector Autoregressive (FA-VAR) model with a monthly dataset of China's housing, equity, and loan market data for the period of January 2000 to February 2014. Wei Ho et al (2014)

indicate that real estate investment in China significantly increased due to FED's unconventional monetary policy shocks. One possible reason for this effect, according to Wei Ho et al (2014), is the substantial increase in the inflow of "hot money" into China. The responses of Chinese financial markets to shocks stemmed from FED's unconventional monetary policy are different from those responses in normal times.

Chen et al. (2014) try to find answers to three main questions, (i) whether U.S. monetary policy shocks affect capital flows and asset prices in emerging countries; (ii) whether these effects are different during different phases of the quantitative easing programs and (iii) these effects are related to emerging markets' specific conditions. The study can be considered as a modified version of Chen et al. (2011). Chen et al. (2014) use event study and regression analysis to see the effects of FED's conventional and unconventional monetary policies on the asset prices and capital flows to 21 selected emerging countries⁴. The event days are the days when monetary policy shocks in advance economies happened. Additionally, the impacts of these shocks are assumed to be felt within 2-day window. The results indicate that although they have no significant effects during conventional monetary policy phases, monetary policy surprises are significant during the unconventional monetary phases. According to Chen et al. (2014), FED's monetary policies have absolutely global spillover impacts whereas the impacts are differentiate according to the conventional and unconventional monetary policies. Unconventional monetary policies have larger spillover effects compared to conventional policies. However, the main difference stems from the level of the liquidity supplied and the instruments used by the FED during unconventional monetary periods. Moreover, evidence shows that the conjuncture cycles of emerging countries are one off the main determinants the magnitudes of spillover effects. Financial conditions and fundamentals of emerging countries and the level of excess liquidity caused by FED's unconventional monetary policy together may help to mitigate with the adverse effects of FED's monetary policy shocks. Furthermore, the spillover effects are larger and global if they come through signal channel.

⁴ Brazil, Chile, China, Colombia, Hungary, India, Indonesia, Israel, Korea, Malaysia, Mexico, Peru, Philippines, Poland, Romania, Russia, Singapore, South Africa, Taiwan POC, Thailand, and Turkey

Gilchrist et al. (2014) analyze the spillover effects of FED's monetary policy on Treasury bond yields of selected countries by using event study method with a daily and intraday dataset from January 1992-May 2014. The whole period is divided into as pre-crises and post-crises periods to analyze the effects of FED's conventional and unconventional policies separately. Gilchrist et al. (2014) prefer using 2 year and 10 year Treasury bond yields and sovereign yield spreads. To exclude the effects of policy-induced movements in exchange rates, the authors analyze the response of U.S. dollar denominated Treasury bond yields of selected countries. According to the results, FED's announcements related to unconventional monetary policy lower long-term yields of advanced countries and narrow the spread between long and short term nominal interest rates of other countries. During the conventional monetary policy period; FED's monetary policy announcements affect shorter-term interest rates for advanced countries and lead decline in emerging countries' sovereign bond yields. In contrast, FED's unconventional monetary policy actions are more effective on other countries' longer-term Treasury yields. According to Gilchrist et al. (2014), the decline implies that sovereign credit spreads for riskier countries significantly become narrower. Moreover, the response of emerging countries' sovereign bond yields to FED's unconventional monetary policy shocks is higher.

Lim et al. (2014) investigate how unconventional monetary policy actions of the central banks of developed countries affect financial inflows to developing countries. Lim et al. (2014) use a panel regression model with a dataset of 60 countries for the period from first quarter of 2000 to the second quarter of 2013. Three variables are chosen to show how FED's unconventional monetary policy operates through different channels. The independent variables are interest rate differences from the US, 3 Month U.S. Treasury Bill yields and VIX for portfolio balance channel liquidity channel and confidence channel, respectively. To see the policy effects on emerging countries, Lim et al. (2014) use gross financial inflow⁵ to emerging countries as dependent variable. The results indicate that the quantitative easing have effects on emerging countries through liquidity, portfolio balance and confidence channels. The baseline estimate indicates that the effect of quantitative

⁵ Gross Financial inflow is described as the sum of the loans, portfolio and direct investment inflows

easing is around 5 percent of gross inflows on average per average developing country during unconventional monetary period. Results also suggest that 62 percent increase in gross inflows is due to global monetary conditions and least 13 percent of that can be attributable to FED's unconventional monetary policy. However, there are heterogeneity among different types of flows for example portfolio flows are more sensitive to FED's unconventional monetary policy than foreign direct investment inflows.

Rhee and Yang (2014) investigate the effects of global liquidity stemmed from monetary policies of developed countries' central banks on liquidity receiving emerging countries. When including 34 countries in their panel VAR system, authors use quarterly data for the period from the first quarter of 1995 to the first quarter of 2013. According to the empirical analysis; GDP, value of domestic currency and equity prices of receiving country positively affected by global liquidity increases. However, the effects differ among countries. The effects of global liquidity on GDP and stock prices are greater and more persistent in emerging economies than advanced economies. Additionally, currencies of liquidity receiving emerging countries appreciate more persistently than those of advanced countries. Furthermore, although global liquidity expansion does not affect portfolio inflows to Latin American countries, Asian countries and liquidity recipient advanced economies are highly affected.

Rogers et al. (2014) measure the impacts of FED's unconventional monetary policy on U.S. dollar and financial conditions abroad. Rogers et al. (2014) use event study method with an intraday dataset of November 2008 to April 2014. Two types of event windows; narrow (-15minutes to +15 minutes) and wide (-15 minutes to +105 minutes) are chosen to measure asset price changes in both event windows. Moreover, unconventional monetary policy announcement days are chosen as monetary policy surprises. Rogers et al. (2014) select the following variables; bond futures, benchmark equity index, exchange rate futures, 10 year Treasury bond yields and corporate bond yields. According to the results, FED's unconventional monetary policy surprises cause depreciation in U.S. dollar and stimulate financial conditions abroad. Rogers et al. (2014) indicate that the FED's unconventional monetary policy surprises significantly affect both domestic and international sovereign and

corporate yields, equity indices and exchange rates respect to U.S. dollar. However, the effects are asymmetric across countries and asset classes. According to the results, FED's monetary policy surprises lead to decrease in 10 year U.S. Treasury yields and German Treasury yields.

Bowman et al (2015) investigate how FED's conventional and unconventional monetary policies affect sovereign bond yields, foreign exchange rates and equity prices in emerging countries. VAR model and event study method are employed with monthly and daily data set for the period of January 2006 to December 2013. FED's unconventional monetary policy announcements, domestic currency denominated 10 year Treasury bond yields, exchange rates with respect to the U.S. dollar and headline equity indexes of 17 emerging countries⁶ including Turkey are selected as variables. When measuring the unexpected component of FED's monetary policy, they focus on interest rate and risk channel by using the change in 10 year U.S. Treasury yields and high yielding bond spreads, respectively. The results indicate that although many countries are significantly affected by FED's monetary policy shocks, the magnitude and the persistence of these effects change according to the country specific conditions. Bowman et al (2015) claim that FED's monetary policy shocks lead Treasury yields of the U.S. and most of the emerging countries to decrease. According to the results, the effects highly depend on those countries' financial and economic conditions. More specifically, if the financial conditions of an emerging country worsen, domestic asset prices are adversely affected by the FED's unconventional monetary policy actions.

Korniyenko and Loukoianova (2015) examine the effects of unconventional monetary policy actions implemented by FED, Bank of England (BoE), European Central Bank (ECB) and Bank of Japan (BoJ) on global monetary and liquidity conditions. To assess the international effects of monetary policy conditions, the following variables are used in the model; global money supply, VIX, real global GDP growth, U.S. Banks' positions abroad, global CPI, Real Effective Exchange Rate (REER) for U.S. and long term sovereign

⁶ Brazil, China, the Czech Republic, Hong Kong, Hungary, India, Indonesia, Korea, Malaysia, Mexico, the Philippines, Poland, Singapore, South Africa, Taiwan, Thailand, and Turkey.

bond yields. By using these variables, Korniyenko and Loukoianova (2015) intend to cover the unconventional monetary policy effects on international markets through liquidity, interest rates, portfolio balancing and exchange rate channels. They employ regression analysis to measure these effects with a data set covering 131 countries for the period of first quarter of 2002 to second quarter of 2014. According to Korniyenko and Loukoianova (2015), FED's asset purchases have mixed effects on selected asset classes of emerging countries. Moreover, results indicate statistically significant positive relationship between central banks' unconventional policy actions and global liquidity conditions in terms of global corporate deposit growth, cross-border flows of banks and security issuances in emerging countries. However, there are significant differences regarding the impact of the unconventional monetary policies of individual central banks on broad money, corporate deposit levels and security issuances in emerging countries. For example, the BoJ's asset purchases have a positive impact on global liquidity conditions, while a negative impact on issuance of securities. On the other hand, BoE's asset purchase program has strong negative relations with global liquidity level. According to the generalized results of Korniyenko and Loukoianova (2015), unconventional monetary policy actions of the central banks of developed countries have positive impacts on credit growth, extension of long term maturity loans in other countries. However, which central bank has the most effects on other countries is not distinguishable in the model. On the other hand, FED's unconventional monetary actions during near zero policy rates have significant and positive effects on the growth rate of broad money in other advanced economies.

Bhattarai et al. (2015) quantify the international effects of FED's unconventional monetary policies. A Bayesian VAR model is decided to measure the effects by using monthly data. Bhattarai et al. (2015) use FED's all outright asset purchases and money base (M2) as the quantitative easing policy indicator. Industrial production, nominal exchange rates against U.S. dollar, long-term interest rates, stock prices and capital flows are chosen to measure the international effects. The results indicate that the FED's unconventional monetary policy shocks have significant and economic effects on exchange rates, long-term bond yields and stock prices of selected emerging countries. More specifically, FED's large scale asset purchases cause (on average); a 25 bps appreciation in the local currency of

emerging countries; a 100 bps increase in stock prices; and a 3 bps decrease in long-term Treasury yields. On the other hand, opposite to the financial effects, the results do not indicate any significant effects on the real economic indicators. Moreover, Fragile Five is composed by Turkey, Brazil, India, Indonesia and South Africa to see if there are any differences among these emerging countries. The responses of Fragile Five countries to the monetary shocks are stronger and distinct from other emerging countries. Bhattarai et al. (2015) indicate that the effects on capital flows, foreign exchange rates and long-term interest rates are stronger compared to that of stock prices.

Chen et al. (2015) evaluate domestic and international effects of FED's unconventional monetary policy on the real and financial activities. A GVECM is selected with a monthly dataset of 17⁷ countries' for the period from July 2007 to February 2013. Chen et al. (2015) separate variables into domestic and international categories. Real growth rate, CPI, credit growth, equity price index and foreign exchange pressure index are defined as domestic variables; foreign growth rate and VIX as foreign endogenous variables. Term Spread⁸ and Corporate Spread⁹ are used as proxies to the FED's unconventional monetary policy actions. Chen et al. (2015) estimate GVECM for Term and Corporate spreads and their domestic and global effects separately. According to the model, when the Term Spread declines, no significant change occurs in credit growth, but VIX increases. Moreover, a decrease in the Corporate Spread results in strong and significant effects on U.S. growth rate, equity prices and CPI. Moreover, Chen et al. (2015) use both financial and trade linkages to measure the interdependence across countries by taking into account cross border bank lending and capital inflow and outflow data. Although the magnitudes of the monetary policy effects on emerging countries vary depending on their economic and financial conditions, the effects are greater comparing to that of the US. Moreover, FED's asset purchases have substantial effects on credit growth, equity prices, and foreign exchange rates on Chinese economy. In addition to GVECM analysis, Chen et al. (2015) use counterfactual analysis

⁷ The US, the Euro Area, Japan, the UK, China, Hong Kong SAR, India, Indonesia, South Korea, Malaysia, the Philippines, Singapore, Thailand, Argentina, Brazil, Chile and Mexico.

⁸ Term Spread which is a spread between 10-year US Treasury and 3-month US Treasury yields

⁹ Corporate Spread which is a spread between the Bank of America Merrill Lynch US corporate AAA bond yield and Federal Fund Rate

with constant and jump scenarios. Corporate Spread is kept constant during the period and make 200 basis point jump at the beginning of each phases of FED's unconventional monetary policy. Their counterfactual GVECM results indicate that without FED's asset purchases, the recession with deflation would have remain in the US.

Fratzscher et al. (2016) analyze how FED's three different quantitative easing phases affect the portfolio flows in selected countries. A panel regression analysis is employed with a daily dataset from January 2008 to December 2012. 10 Year U.S. Treasury yields, portfolio bond and equity flows and VIX are selected variables. Fratzscher et al. (2016) measure not only the announcement effects but also the FED's actual monetary policy operations. The model results indicate a heterogeneous response to different phases, for example the asset purchases and policy announcements mainly cause a portfolio rebalancing into more risky segments in the U.S. during the first phase. On the other hand, FED's asset purchases strongly affect inflows to other countries during the second and third phases. Fratzscher et al. (2016) explain these heterogeneous responses by the variation in macro-financial uncertainty in selected countries. During the phases when the outlook is positive and the macroeconomic uncertainty is low in the U.S., the asset purchases and announcements results in portfolio inflows to other countries from U.S.

Tillman (2016) aims to demonstrate the effects of FED's unconventional monetary policies on capital flows, interest rates and equity prices in emerging countries. A monthly dataset from August 2007 to March 2013 is employed in Qual VAR. According to the authors, Qual VAR is preferred over VAR in order to take into account the endogeneity and forecast ability of FED's asset purchase announcements. FED's monetary policy announcements are included into the model as a binary variable, which is "1" for a month when FED makes a monetary policy announcement and "0" otherwise. Tillman (2016) also include industrial production, 10 year U.S. Treasury yields, total capital flows and portfolio flows from U.S. to each country. To demonstrate the effects, foreign exchange rates, EMBI spread and Morgan Stanley Capital International (MSCI) index are also included into the model. According to model results, FED's unconventional monetary policy significantly affect the foreign exchange rates, bond yields and equity prices in emerging countries.

Moreover, portfolio flows are affected more strongly by a monetary policy shock than sum of the flows.

Lo Duca et al. (2016) measure how FED's asset purchases affect global bond issuance through portfolio balance channel. Moreover, they analyze the effects of FED's MBS and Treasury bond purchases on global bond issuance separately. For quantifying both stock and flow effects of FED's asset purchases, panel data analysis is employed with a dataset of 38 countries with the period from 1st quarter 2000 to 1st quarter 2013. Although preferring a Tobit equation in their main empirical analysis, Lo Duca et al. (2016) also use regression analysis in their robustness section. Gross non-financial corporate bond issuance is defined as the dependent variable and several global and domestic factors as explanatory variables. According to the empirical results, FED's unconventional monetary policy purchases lead issuance of the non-financial corporate bond segment increase globally by flow and stock effects. However, the flow effect is more significant for MBS purchases, which may be due to their similarities with corporate bonds according to the risk profile. As a result, Lo Duca et al. (2016) indicate that FED's asset purchases are crowded out investors from these markets and forces them to rebalance their portfolios across other countries.

Barroso et al. (2016) investigate the effects of FED's unconventional policies on Brazilian overall economic outlook and financial stability through capital flows. Both event study method and structural VAR analysis are employed to evaluate these effects with a data set from January 2000 to June 2012. The model includes two sets of variables containing domestic and international indicators. Central banks' policy rates, accumulated gross capital inflows to Brazil, Brazilian real's foreign exchange rate respect to U.S. dollar, monthly GDP are the domestic variables; Term Spread, an international trade volume index and the EMBI+ spread of emerging market bonds are the international variables. The results indicate that there are an increase in accumulated gross capital inflows (between 2.1% to 4.2%); an appreciation of the nominal exchange rates (between 3.9% to 8.1%); an increase in economic activity (between 0.3% to 0.7%) and a reduction in the policy rate (between 73 bps to 144 bps) as a result of FED's monetary policy. Therefore, Barroso et al. (2016) indicate that

FED's unconventional monetary policy has significant and positive effects on Brazilian economy, particularly; exchange rates, equities and economic activity.

Lim and Mohapatra (2016) measure the effects of quantitative easing policies on the gross financial inflows to emerging countries. The study would be considered as an updated version of Lim et al. (2014). Lim and Mohapatra (2016) run a panel regression model for 60 developing countries with quarterly data set for the period of first quarter 2001 to second quarter of 2013. Various country specific variables are included into the model. The independent variables are interest rate differences respect to FED, 3 month Treasury bill yields and VIX, for portfolio balance, liquidity and confidence channels, respectively. To see the policy effects on emerging countries, Lim and Mohapatra (2016) use the gross financial inflows¹⁰ to emerging countries as dependent variables. Results of the baseline model indicate that a lower bound quantitative easing affects gross inflows about 5 percent of above trend for the average developing economy. Lim and Mohapatra (2016) also report that portfolio flows are more sensitive to quantitative easing than foreign direct investments, which indicates a heterogeneity among different class of capital flows to emerging countries.

All papers that are directly related to FED's unconventional monetary policy and their international effects are presented at Table 2.

¹⁰ The gross financial inflows are calculated as the sum of the loans, portfolio and direct investment inflows.

Table 2 FED's Monetary Policy Actions and International Effects: Selected Literature Review

Authors	Period	Frequency	Method	Main Variables	Countries	Channel	Main Results
Neely (2010)	Jan 1985- May 2010	Daily Intraday Monthly	Event Study Portfolio Balance and UIP-PPP Models	FX Rates Bond Yields	US, UK, Australia, Canada, Germany, Japan	Portfolio Balance	FED's large scale asset purchases have significant impacts on foreign exchange and bond markets of selected countries. The currencies depreciate against US dollar and bond yields decrease significantly.
Ammer et al. (2010)	Feb 1994- Dec 2006	Intraday	Panel Regression	Stock Prices	US, UK, Argentina, Korea, Australia, Luxembourg, Austria, Mexico, Belgium, Netherlands, Brazil, New, Zealand, Canada, Norway, Chile, Peru, China, Philippines, Colombia, Poland, Denmark, Portugal, Finland, Russia, France, Singapore, Germany, South, Africa, Greece, Spain, Hong, Kong, Sweden, Hungary, Switzerland, India, Taiwan, Indonesia, Thailand, Ireland, Turkey, Israel, Italy, Japan, Venezuela	Demand, Credit, Interest Rate	The foreign firms which operate in a more cyclically sensitive industries and export their majority of products; the foreign firms which are not able to finance their capital expenditures by their operating cash flows and to pay dividends; the foreign firms which are based in countries with exchange rates pegged to US dollar are more sensitive to FED's unconventional monetary policy actions.
Chen et al. (2011)	Feb 1990 – Dec 2010	Monthly	Event Study VAR GVECM	US Term Spread CDS FX Pressure Index Capital Flows	US, the Euro Area, Japan, UK, China, Hong Kong SAR, India, Indonesia, South Korea, Malaysia, the Philippines, Singapore, Thailand, Argentina, Brazil, Chile, Mexico	Portfolio Balance, Liquidity, Asset Price, Risk, Exchange Rate	FED's monetary policy shocks affect capital inflows and asset prices in emerging countries. Spillover effects are stronger during unconventional monetary policy phase. However, the spillover effects are relatively smaller for the countries with stronger fundamentals.
Hausman and Wongswan (2011)	Feb 1994- Mar 2005	Intraday Daily	Event Study Panel Regression OLS	FED's Target and Path Surprises, Equity Indexes, Interest Rates, FX Rates, US bank lending to foreign banks	Canada, Argentina, Brazil, Chile, Mexico, Peru, Venezuela, Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United, Australia, China, Hong, Indonesia, Japan, Korea, Malaysia, New, Philippines, Singapore, Taiwan, Thailand, Czech, Estonia, Hungary, India, Israel, Mauritius, Pakistan, Poland, Russia, Slovak, Slovenia, South, Turkey	Portfolio Balance, Risk, Interest Rate	Although global equity indexes are significantly affected by the target surprises; FX rates and long-term interest rates are more exposed to the path surprises.
Morgan (2011)	Nov 2009- Oct 2010	Daily	Event Study	Portfolio Inflows Monetary Base FX Rates Interest rates	China, Hong Kong, India, Indonesia, Korea, Singapore, Malesia,	Portfolio Balance, Liquidity	Although Emerging Asian Countries received portfolio inflows and some of their currencies appreciated during the first and second phases of FED's unconventional monetary era, FED's asset purchases have no significant effect on financial markets of Emerging Asia.

Table 2: FED's Monetary Policy Actions and International Effects: Selected Literature Review²

Authors	Period	Frequency	Method	Main Variables	Countries	Channel	Main Results
Hayo et al. (2012)	Jan 1998- Dec 2009	Daily	GARCH	FED's Unconventional MP Announcements, EMBI, Equity Returns FX Rates	Argentina, Brazil, Chile, China, Egypt, India, Indonesia, Israel, Jordan, Malaysia, Mexico, Pakistan, Peru, the Philippines, Russia, South Africa, Thailand	Portfolio Balance Signaling	FED's monetary policy actions and communications significantly affect equity returns in emerging countries. However, the effects are more significant by informal communications compare to target rate surprises. Moreover, Latin American emerging countries more sensitive to these communications compared to non-Latin American emerging countries.
Glick and Leduc (2012)	Jan 2004- Jul 2011	Daily	Event Study Regression	FED's Unconventional MP Announcements, US Treasury Yields US Treasury Futures, Goldman Sachs Commodity Index FX Rates VIX	US, UK, EU, Canada, Japan, Australia	Portfolio Balance, Liquidity, Signaling	As a result of FED's large scale asset purchase announcements, US dollar depreciates, the long term interest rates and commodity prices decrease. On the other hand, the magnitude of these effects vary according to the phases of FED's asset purchase programs. The second phase of quantitative easing have larger effects on 10 year Treasury yields than that of first phase.
Aït-Sahalia et al. (2012)	Jun 2007- Mar 2009	Daily	Event Study	FED's Unconventional MP Announcements, Risk premia (spread of LIBOR and OIS) FX Rates CDS VIX	US, UK, EU, Japan	Credit, Liquidity, Risk	FED's unconventional monetary policy announcements are accompanied by reductions in interbank credit and liquidity risk premia domestically and had positive international impacts on Japan and the Euro Area.
Glick and Leduc (2013)	Feb 1994- Oct 2013 and Nov 2008- Jan 2013	Intraday	Event Study	FED's Unconventional MP Announcements, Federal Funds Rate Futures, 2,5,10,30 Year US Treasury Rate Futures, FX Rates	US, UK, EU Canada, Japan	Foreign Exchange	As a result of monetary policy surprises of FED, US dollar generally depreciate against other currencies.
IMF (2013a,b)	2003- 2013	Daily Quarterly	Event Study Case Study Standard Multi-Country Dynamic Stochastic General Equilibrium Model	Government Bond Yields, Corporate Bond Yields Equity Returns, CDS FX Rates	Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Korea, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, UK, US, Brazil, China, India, Indonesia, Malaysia, Mexico, Poland, Russia, South Africa, Thailand, Turkey	Portfolio Balance. Interest Rates, Foreign Exchange	Asset prices, corporate leverage and foreign exchange rate exposure increase rapidly in many emerging countries as a result of unconventional monetary policies of developed countries' central banks. Spillover effects of quantitative easing differ among phases of these programs suggesting that global macroeconomic and market conditions are matter.
Bruno and Shin (2013)	Q4:1995- Q4: 2012	Quarterly	Recursive VAR	Real FED Funds Rates, Capital Flows, REER, VIX	Trade partners of US	Risk	International capital flows into the banking sector is decreased by a contractionary shock to FED's unconventional monetary policy.

Table 2: FED's Monetary Policy Actions and International Effects: Selected Literature Review 3

Authors	Period	Frequency	Method	Main Variables	Countries	Channel	Main Results
Moore et al. (2013)	Jan 2004-Nov 2011	Daily, Quarterly	Event Study Panel Regression VAR	10 Year US Treasury Bond Yields, Domestic Bond Yields, FX rates, Central Banks's Policy Rates, VIX	Brazil, Czech Republic, Hong Kong, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Peru, Poland, Singapore, South Africa, Thailand, Turkey	Portfolio Balance Liquidity Interest Rates	FED's asset purchases have significant effects on the portfolio inflows into emerging countries mainly via bond markets. Moreover, FED's large scale asset purchases reduce US Treasury bond yields as expected and long term Treasury bond yields of emerging countries.
Lim et al. (2014)	Q1 2000-Q2 2013	Quarterly	Panel Regression VAR	Gross Financial Inflows, Interest Rate Differences, 3 Month Treasury Bill Yields, VIX Country Ratings	Guatemala, Georgia, El Salvador, Egypt, Ecuador, Dominic, Costa Rica, Colombia, China, Chile, Cape Verde, Bulgaria, Brazil, Belize, Belarus, Bangladesh, Azerbaijan, Armenia, Argentina, Albania, Namibia, Mozambique, Morocco, Mongolia, Moldova, Mexico, Mauritius, Malaysia, Macedonia, Lithuania, Lesotho, Lebanon, Latvia, Lao, Kyrgyz Rep., Kazakhstan, Jordan, Indonesia, India, Honduras, Vietnam, Venezuela, Uruguay, Ukraine, Uganda, Turkey, Thailand, Suriname, Sri Lanka, South Africa, Seychelles, Russian Fed., Romania, Philippines, Peru, Paraguay, Panama, Pakistan, Nigeria, Nicaragua,	Portfolio Balance, Liquidity, Confidence	The quantitative easing stemming from FED's unconventional monetary policy positively affect loan, portfolio and direct investment inflows into emerging countries through liquidity, portfolio balance and confidence channels.
Chen et al. (2014)	Jan 2000-Mar 2014	Monthly	Event Study Regression	US Treasury Bond Prices, Asset prices Capital flows FX Rates VIX	Brazil, Chile, China, Colombia, Hungary, India, Indonesia, Israel, Korea, Malaysia, Mexico, Peru, Philippines, Poland, Romania, Russia, Singapore, South Africa, Taiwan, Thailand, Turkey	Portfolio Balance, Signaling Foreign Exchange	FED's monetary policy shocks significantly affect capital inflows and asset prices in emerging countries. Spillover effects of FED's monetary shocks are stronger during unconventional monetary policy phases. However, the effects are relatively smaller for the countries with stronger fundamentals.
Bauer and Neely (2014)	Jan 1995-Sep 2013	Daily	Event Study Regression VAR	FED Funds Rates, Governments Bond Yields, FX Rates	US, Canada, Japan, Germany and Australia.	Portfolio Balance, Signaling	As a result of FED monetary policy surprises, a significant decline in bond yields in most of the other countries is measured, which is contributed by both signaling and portfolio balance channels.
Ahmed and Zlate (2014)	Q1 2002-Q3 2013	Quarterly	Event Study Panel Regression	FED's Unconventional MP Announcements, Total and Portfolio Net Private Inflows, Growth Differentials, Interest Rates Differences	Argentina, Brazil, Chile, Colombia, India, Indonesia, Korea, Malaysia, Mexico, the Philippines, Taiwan, Thailand	Portfolio Balance	Main drivers of the capital inflows to emerging countries are the growth rate differentials, interest rate differences and global risk aversion during FED's unconventional monetary policy. Capital controls have a negative and statistically significant impact on these inflows. There is a positive relation between FED's asset purchases and capital inflows to emerging countries.

Table 2: FED's Monetary Policy Actions and International Effects: Selected Literature Review 4

Authors	Period	Frequency	Method	Main Variables	Countries	Channel	Main Results
Rogers et al. (2014)	Nov 2008-Apr 2014	Intraday	Event Study	FED's Unconventional MP Announcements, Corporate Bond Yields, Sovereign Bond Yields, FX Rates, MOVE Index Stock Return	US, UK, EU, Japan, Italy	Interest Rates	Although FED's monetary policy shocks have important spillover effects on other countries, the effects are asymmetric. FED's asset purchases result US dollar to depreciate and long term Treasury yields of other countries to decrease.
Gilchrist et al. (2014)	Jan 1992-May 2014	Intraday Daily	Event Study	2 Year US Treasury Yields, 2 and 10 Year Sovereign Yields	Australia, Canada, Switzerland, Germany, Spain, France, Italy, Japan, Sweden, the UK, Brazil, India, Korea, Mexico, Singapore, Thailand	Portfolio Balance, Liquidity Risk	FED's unconventional monetary policy announcements lower long-term bond and sovereign yields of other advanced countries.
Korniyenko and Loukoianova (2015)	Q1:2002-Q2:2014	Quarterly	Time Series Regression	Global Money Supply, VIX, Real Global GDP Growth, US Banks Positions Abroad, Global CPI, REER, Long Term Treasury Bond Yields	131 countries, of which 28 are grouped as advanced and 103 emerging countries (including low-income countries)	Portfolio Balance, Interest Rate Liquidity Exchange Rates	Although FED's unconventional monetary policy is mixed effects on emerging countries, it has significant and positive effects on the growth rate of broad money and liquidity in advanced economies.
Bhattarai et al. (2015)	Jan 2008-Nov 2014	Monthly	Bayesian Panel VAR	Industrial Production, Money Base (M2), FX Rates, Long Term Interest Rates, Stock Prices, Capital Flows	Chile, Colombia, Brazil, India, Indonesia, Malaysia, Mexico, Peru, South Africa, South Korea, Taiwan, Thailand, Turkey	Portfolio Interest Rate Exchange Rates	FED's unconventional monetary policy shocks have significant and economic effects on FX rates, long-term bond yields and stock prices of selected emerging countries.
Chen et al. (2015)	Jul 2007-Feb 2013	Monthly	A Global Vector Error Correction Model (GVECM)	Term Spread, Corporate Spread, VIX, Foreign Exchange Pressure Index, Capital Flows	US, UK, EU, Japan, China, Hong Kong SAR, India, Indonesia, South Korea, Malaysia, the Philippines, Singapore and Thailand, Argentina, Brazil, Chile, Mexico	Portfolio Balance, Exchange Rate Confidence	FED's unconventional policies significantly affect financial conditions and economic activity in the US and other countries by reducing corporate spread (spread between the Bank of America Merrill Lynch US corporate AAA bond yield and Federal Funds Rate) and term spread (the spread between 10-year and 3-month US Treasury yields). Although the magnitudes of these effects of FED's monetary policy actions on emerging countries vary depending on countries' economic and financial variables, the effects are greater comparing to that of the US.

Table 2: FED's Monetary Policy Actions and International Effects: Selected Literature Review 5

Authors	Period	Frequency	Method	Main Variables	Countries	Channel	Main Results
Bowman et al. (2015)	Jan 2006-Dec 2013	Daily Monthly	Event Study, VAR analysis	FED's Unconventional MP Announcements, Sovereign Bond Yields, FX Rates, Equity Returns, CDS, Interest Rates Differences, VIX	Brazil, China, the Czech Republic, Hong Kong, Hungary, India, Indonesia, Korea, Malaysia, Mexico, the Philippines, Poland, Singapore, South Africa, Taiwan, Thailand, Turkey.	Interest Rate Risk	There are significant effects of FED's monetary policy announcements on emerging countries assets. If the financial conditions of an emerging country worsen, the domestic asset prices adversely affected by FED's unconventional monetary policies.
Fratzscher et al. (2016)	Jan 2008-Dec 2012	Daily	Panel Regression	10 Year US Treasury Yields Portfolio Bond Flows, Equity Flows, VIX	US, UK, Japan, Lithuania, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Argentina, Brazil, Bulgaria, Chile, China, Colombia, Czech Republic, Egypt, Hong, Hungary, India, Indonesia, Kazakhstan, Korea, Kuwait, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland, Romania, Russia, Saudi, Singapore, South Africa, Thailand, Turkey, Ukraine, Venezuela	Portfolio Balance, Liquidity	First and second phases of (QE2, QE2) FED's unconventional monetary policy announcements cause a portfolio rebalancing in the US and emerging countries, respectively.
Tillmann (2016)	Aug 2007-Mar 2013	Monthly	Qual VAR	Capital Flows, Equity Prices, FX Rates, 10 Year US Treasury Yields, MSCI Index, EMBI Spread, VIX	US, Brazil, India, Korea, Mexico, Thailand, and South Africa	Portfolio Balance, Interest Rate, Exchange Rates	FED's unconventional monetary policy actions and announcements significantly affect FX rates, Treasury bond yields and equity prices in emerging countries.
Lim and Mohapatra (2016)	2000:Q1 2013:Q2	Quarterly	Panel Regression	Gross Capital Inflows to Emerging Countries, 3 month T-Bill Rates, Interest Rates Difference, VIX, Credit Ratings	60 Developing Countries	Portfolio Balance, Liquidity Confidence	A lower bound quantitative easing of FED affects gross inflows about 5% above trend for the average developing economy. Moreover, portfolio flows are more sensitive to FED's asset purchases than foreign direct investments.

Table 2: FED's Monetary Policy Actions and International Effects: Selected Literature Review 6

Authors	Period	Frequency	Method	Main Variables	Countries	Channel	Main Results
Lo Duca et al. (2016)	2000:Q1 2013:Q1.	Quarterly	Panel Tobit Equation OLS	10 Year US Treasury Yields, FED's Unconventional MP Purchases, Gross non-Financial Corporate Bond Issues, VIX, Central Bank Policy Rates	US, UK, Argentina, Australia, Brazil, Austria, Chile, Belgium, China, Canada, Hong Kong, Finland, Hungary, France, India, Germany, Indonesia, Greece, Korea, Ireland, Malaysia, Italy, Mexico, Japan, Poland, Luxembourg, Russia, Netherlands, Singapore, Norway, South, Portugal, Taiwan, Spain, Thailand, Swede, Turkey, Switzerland	Portfolio Balance	FED's unconventional monetary policy asset purchases play an important role in increasing bond issuance in the non-financial corporate bond segment in both emerging and advanced countries.
Barroso et al. (2016)	Jan 2000- June 2012	Monthly	Event Study Structural VAR	Term spread of US (defined as the spread between 10-year and 3-month US Treasury yields), Central Bank's policy rate, Gross capital inflows, BRLUSD foreign exchange rates, GDP, the international trade volume index, the EMBI+ spread of emerging market bonds	US, Brazil	Portfolio Balance, Exchange Rate	FED's unconventional monetary policy have significant and positive effects on Brazilian economy particularly through FX rates, equity prices and economic activity in Brazil

5 DO FED’S UNCONVENTIONAL MONETARY POLICY AND CBRT’S ROM FACILITY AFFECT EXTERNAL BORROWING OF TURKISH BANKS?

As stated in previous parts, it is assumed that the external borrowings of Turkish Banks is affected by FED’s unconventional monetary policy and CBRT’s ROM facility. Before setting up the empirical studies, related literature is reviewed as presented Table 2. There are several types of analyzes to measure the impact of FED’s unconventional monetary policy on selected assets of emerging countries. Among them, event study can be considered as the most widely used one. However, as ROM facility has only one event (the day when ROM facility was launched by CBRT), it is not suitable for the event study. Therefore, FED's monetary policy can be studied only by event study. The second approach is a linear regression model, OLS. As OLS requires some specific rules for the residuals and the selected variables, some of the variables that are used in the event study are excluded in the OLS. Finally, VAR systems have been started to be preferred for this topic recently. Therefore, a VAR system is set to measure FED’s and CBRT’s policy effects on external borrowings of Turkish banks.

Before running empirical analyses, some detailed information regarding the variables is explained in this part with the reference to their previous usages.

5.1 DATA SOURCES, DEFINITIONS AND USED STUDIES

The empirical methods used in this study are based on monthly data set for the period of December 2005 to December 2016. The data set covers both FED’s unconventional monetary policy and CBRT’s ROM facility periods. Moreover, the dataset covers the global capital flow period before 2008 Financial Crises and normalization period after mid-2013.

For the ROM data, be-weekly data is available at the CBRT’s web site. In addition, the FED’s balance sheet data can be reached by weekly from FED’s web site. The foreign exchange rates of USDTRY are collected from CBRT’s web site on a daily. VIX, EMBI and Credit Default Swaps (CDS) can be reached as tick data via Bloomberg LP. For the credit ratings of Turkey, the big three credit agencies' information can be reached their web sites on a daily basis.

As the dependent variable, we prefer to use only Turkish banks' external borrowings derived from balance sheets obtained from Banking Regulation and Supervision Agency of Turkey (BRSA)'s and CBRT's official web sites. Although most of the data can be obtained daily, the dependent variable is available only in monthly bases. Therefore, monthly data is used in all empirical methods employed in this study.

5.1.1 External Barrowing

External borrowing of Turkish banks covers total external borrowing of all banks that are accredited by the BRSA regardless of their types. Moreover, the majority of the banking system is dominated by the commercial banks in terms of balance sheet size. In addition to level, leverage ratio calculated by external borrowing as a percentage of total assets, is also used at the event study model.

In the literature, when it comes to analyze FED's monetary policy spillover effects on other countries, authors generally prefer to focus only on the total capital or portfolio inflows such as bond and equity inflows to emerging countries. For example, Korniyenko and Loukoianova (2015) use banking system total liabilities to examine the effects of unconventional monetary policies implemented by FED, BoE, ECB and BoJ on global monetary and liquidity conditions. Korniyenko and Loukoianova (2015) indicate that FED's unconventional monetary policy results in deleveraging in banks' balance sheets. Ahmed and Zlate (2014) use net private inflows as a percentage of country's nominal GDP to explain the capital private inflows to emerging countries. When investigating the effects of FED's unconventional monetary policy on Brazilian financial markets, Barroso et al (2016) use gross cumulative capital inflows.

Moreover, Barroso et al (2016) use stock of credits borrowed from foreign banks and inflows of foreign exchange direct credits as domestic variables in their models. Lim and Mohapatra (2016) prefer aggregate gross financial inflows (the sum of portfolio inflows, foreign direct investment and loans) to emerging countries as a dependent variable in their panel regression model. Furthermore, Lim and Mohapatra (2016) indicate that the loan flows are more sensitive to quantitative easing policies of developed countries' central banks than

portfolio flows. Lim et al (2014) and Lim and Mohapatra (2016) use the sum of the loans, gross portfolio and foreign direct inflows to emerging countries as dependent variables when investigating the effects of FED's unconventional monetary policies. Hausman and Wongswan (2011) use bank lending as a percentage of GDP from U.S. as a proxy for financial linkage to U.S. when measuring the effects of FED's policy surprises on the asset classes of other countries. Chen et al (2011) include cross border bank lending from U.S. to other countries into their model as an independent variable to measure the effects of unconventional monetary policies of advance economies. Bhattarai et al (2015) quantify the international effects of FED's quantitative easing policies on emerging countries by using capital flows into emerging countries.

However, Chen et al (2015) use cross border bank lending and capital flows to measure the financial and trade linkages to U.S. when evaluating international effects of FED's unconventional monetary policies on other countries. Fratzscher et al. (2016) prefer to exclude debt and use only equity and bond flows when analyzing how FED's asset purchase program affect the portfolio inflows to other countries. Lo Duca et al (2016) measure how FED's asset purchases affect global bond issuance. Tillman (2016) uses total capital flows and portfolio flows to each country from U.S. in his model to demonstrate the effects of FED's unconventional monetary policy on emerging countries. Capital private inflows as a percentage of GDP to emerging countries is used by Ahmed and Zlate (2014) to measure the impacts on emerging countries of FED's unconventional monetary policy actions.

According to the literature review, external borrowing of banks is not preferred as a dependent variable alone. Therefore, measuring the relationship between external borrowing of Turkish banks, and FED's monetary policy and CBRT's ROM facility can be considered as a contribution of this study to the literature.

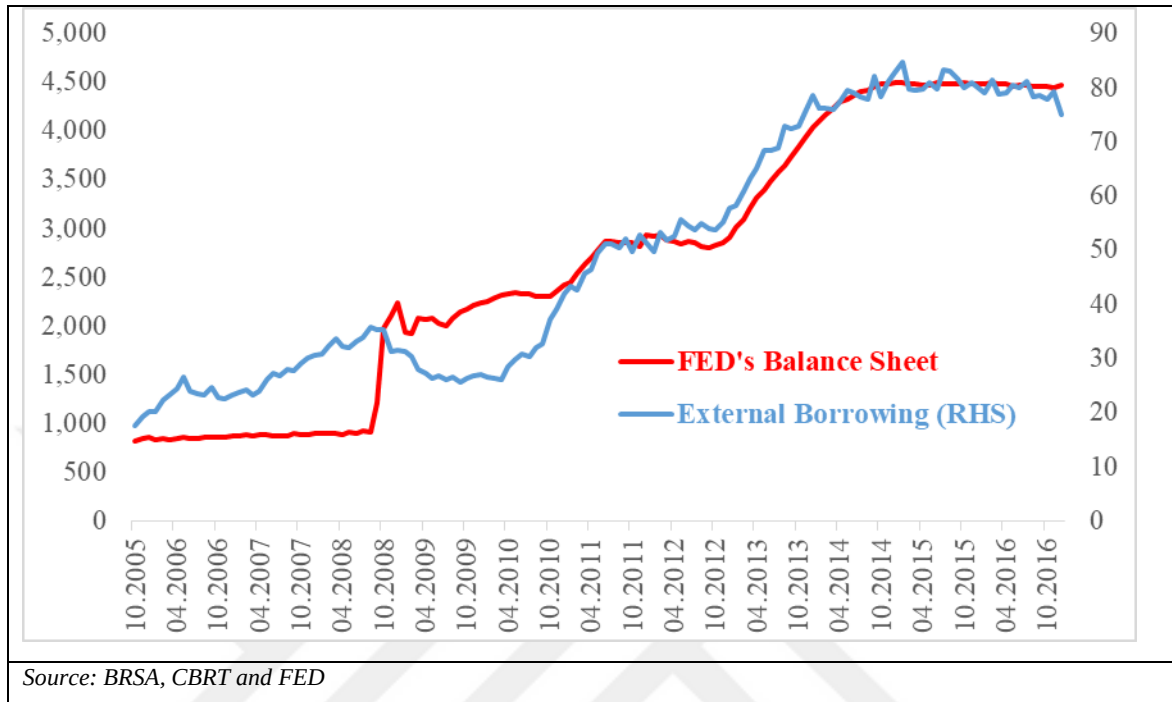


Figure 9 Turkish Banks' External Borrowing and FED's Balance Sheet (billion U.S. dollar)

Total external borrowings of Turkish banks and FED's balance sheet for the period focused in this study are presented at Figure 9. FED's balance sheet and external borrowing of Turkish banks move together since at the end of 2010.

5.1.2 FED's Unconventional Monetary Policy

When measuring the effects of FED's unconventional monetary policy actions on other countries, monetary policy related announcements and speeches are considered as the most common independent variables. For example, Aït-Sahalia et al (2012) prefer to use the announcements related to purchase of Treasury and mortgage related securities as FED's unconventional monetary actions. Similarly, Chen et al (2011) use announcements related to FED's asset purchases as the main variable in their event study. Hausman and Wongswan (2011) define FOMC announcements as a policy surprise indicator of FED when measuring the effects on equity indexes, interest rates and foreign exchange rates in other countries. Glick and Leduc (2012) also use asset purchase announcement dates as FED's unconventional monetary policy indicator. FED's announcements related to monetary policy

decisions are used to assess the effects on equity returns of emerging markets by Hayo et al (2012). Moreover, Rogers et al (2014) use these announcements as policy surprise events when analyzing the effects of FED's unconventional policies on foreign exchange rates and financial conditions abroad. Bowman et al (2015) use the announcements to investigate how FED's conventional and unconventional monetary policy affects the asset prices in emerging countries. To demonstrate the effects of FED's unconventional monetary policy on emerging countries, Tillman (2016) uses monetary policy announcements as a binary indicator, which takes "1" in the month of a quantitative easing announcement and is "0" otherwise.

Another group of variables that is used as proxy to FED's unconventional monetary policy are selected interest rates or spreads that are mainly affected by FED's announcements. For example, Moore et al (2013) define 10 year U.S. Treasury bond yields as an indicator for FED's unconventional monetary policy action when measuring FED's asset purchase programs' impact on developing countries' bond yields and interest rates. On the other hand, when analyzing the spillover effects of FED's monetary policy on bond yields of other countries, Gilchrist et al (2014) prefer to use 2 year U.S. Treasury yield as a proxy for FED's unconventional monetary policy actions. When measuring the effects of FED's unconventional monetary policy, Bruno and Shin (2013) use effective FED Fund Rates as an indicator. Chen et al (2015) use "term spread" and "corporate spread" as FED's unconventional monetary policy indicators to evaluate its international impacts. Barroso et al. (2016) also use "term spread" to define FED's unconventional monetary policy actions. Glick and Leduc (2013) identify monetary policy surprises from the changes in FED Fund Rate futures around FED's announcements.

Another group of scholars prefers to use a mixture of selected indicators. Lim et al (2014) and Lim and Mohapatra (2016) use a mix of variables which includes the size of FED's balance sheet along with other FED policy related variables. On the other hand, Korniyenko and Loukoianova (2015) prefer broad money base to examine impacts of the unconventional monetary policy actions implemented by FED. Fratzscher et al (2016) prefer to use FOMC statements and governors' speeches when analyzing how FED's asset purchase program affect the portfolio flows in selected countries. Bauer and Neely (2014)

use both FED's Fund rates and asset purchase announcements to investigate how FED's large scale asset purchases affect domestic and international Treasury yields through signaling and portfolio balance channels. Bhattarai et al. (2015) also use FED's asset purchases and money base as the baseline measure for the quantitative easing policy.

All in all, the announcement dates, chair's speeches and FED related secondary market interest rates are generally defined as proxies for FED's unconventional monetary policy actions. Therefore, it is not common to use FED's balance sheet items directly in empirical studies. Moreover, balance sheet data is used generally as a ratio of other monetary indicators' such as money base or GDP. On the other hand, FED's unconventional monetary policy announcements is used in "Event Study" and FED's balance sheet is used in "regression analysis" and "VAR system" an indicator for FED's unconventional monetary policy action. The data compiled directly from FED's website and sum of total holdings of agency debt securities, mortgage backed securities and U.S. Treasury securities are defined as FED's balance sheet.

5.1.3 Reserve Option Mechanism

ROM facility is used as one of the main independent variables in all of the empirical studies. ROM utilization levels of Turkish banks is preferred against to maximum ROM utilization limits. As presented before, there are not so much empiric work regarding ROM and its effect on external borrowings of Turkish banks. Therefore, measuring the ROM's effects on the external borrowings of banks will be another contribution of this study to literature.

5.1.4 Interest Rates

According to the literature review, the high level of interest rates of the emerging countries is one of the determinants of the direction of the funds. Therefore, the interest rate levels should be included into the empirical analyses to show how interest rate channel works. However, when it comes to include interest rates channel in the models when explaining the impacts of FED's unconventional monetary policy, there are two type of approaches; interest rate differences with U.S. or interest rate of fund receiving country.

Some scholars prefer using interest rate of receiving country instead of the interest rate differences with U.S. For example, Barroso et al (2016) use only the Banco de Brazil's policy rate (SELIC) as one of the domestic variables when investigating the effects of FED's unconventional monetary policy on Brazilian markets. Wei Ho et al (2014) also use FED's monetary policy rate as a control variable in their FA-VAR model. Fratzscher et al (2016) prefer using 10 year U.S. Treasury yields to demonstrate the impacts of FED's announcements on the portfolio inflows to countries via interest rate channel. Moreover, Lo Duca et al (2016) prefer real domestic policy rates and the spread between domestic policy rates and one year ahead inflation forecast.

It is also common to include several interest rate differences in to the models. For example, Ahmed and Zlate (2014) use the central banks' policy interest rate difference as an explanatory variable. Fratzscher et al. (2012) use interest rate difference as a proxy to capital pull factors in their model when measuring the global dynamics of capital flows in different countries during FED's unconventional monetary policy. Korniyenko and Loukoianova (2015) prefer to use the difference between domestic and global interest rates as one of the control variables. Bowman et al (2015) also use interest rate difference with respect to the U.S. in their empirical model when investigating how FED's conventional and unconventional monetary policy affects the emerging markets' assets classes.

Another approach, which is not common as interest rate difference is to use some indexed returns. Gilchrist et al. (2014) prefer to use sovereign risk spreads when analyzing the effects of FED's monetary actions on developed and emerging countries. To demonstrate the effects of FED's unconventional monetary policies on emerging countries, Tillman (2016) uses EMBI which covers the U.S. dollar-denominated emerging market bond spreads over U.S. Treasury.

As stated above, interest rate channel is one of the most effective channel through which FED's unconventional monetary policy actions work emerging countries. Monetary policy rates, interest rate difference and selected instruments' yields rates are used as proxy for interest rate channel. Among these proxies, a country's monetary policy difference with FED is one of the most widely used proxies for the analysis by other studies. In this study

also, interest rate difference is preferred to demonstrate the interest rate channel, and it is defined as the spread between CBRT and FED's monetary policy interest rates. Moreover, using monetary policy rates for both countries will help us to capture and control for monetary policy component in Turkey.

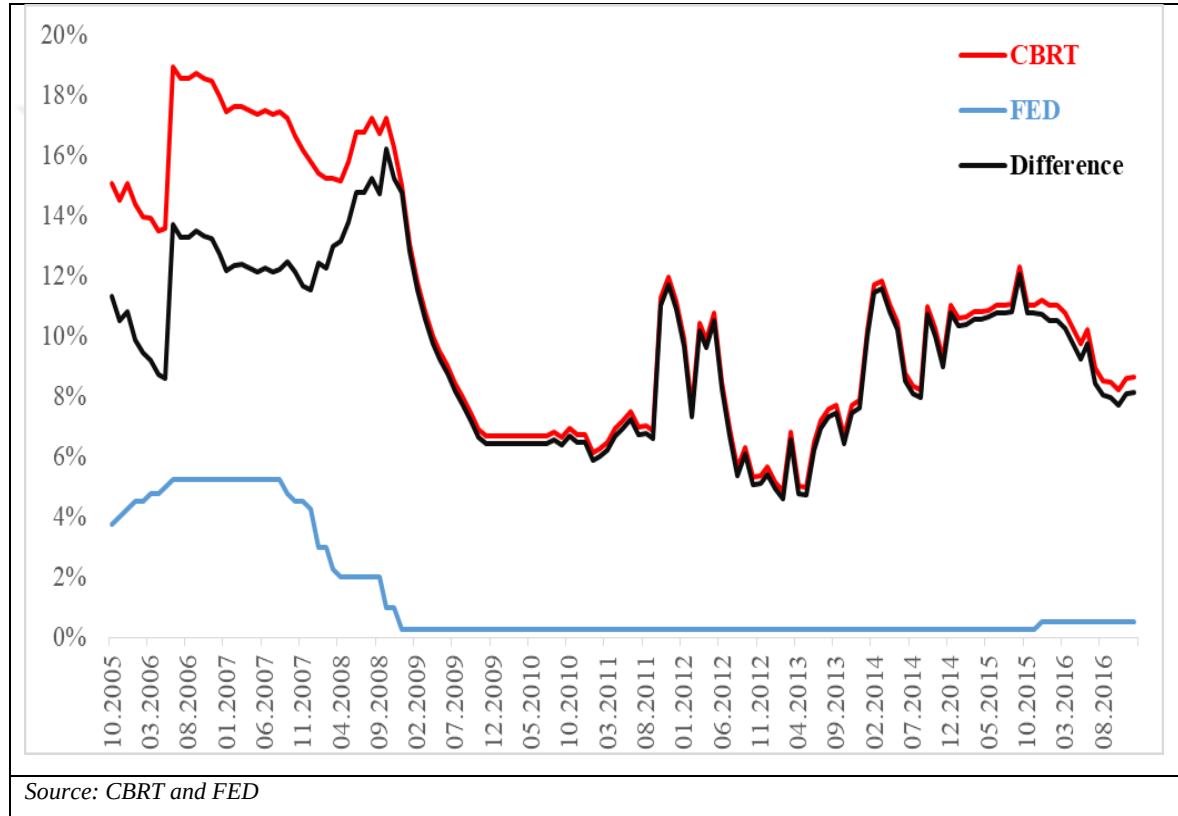


Figure 10 Policy Rates and Differences

Figure 10 demonstrates policy rates of CBRT and FED and the difference between them. On the other hand, as FED's policy rate were near zero between 2009 and 2015, the difference actually very close to CBRT's policy rates. The interest rate dataset is received from respective central bank's websites.

5.1.5 Foreign Exchange Rates

Foreign exchange rates against U.S. dollar is one of the most widely used indicators when measuring the impacts of the FED's unconventional monetary policy on the emerging

countries' financials. Although there are several foreign exchange indicators to verify foreign exchange channel, generally nominal exchange rates against U.S. dollar is used.

For example, Bowman et al (2015) use nominal foreign exchange rates against U.S. dollar in their model. They states that a monetary policy shock lowering yields in the U.S. is followed by an appreciation of emerging market currencies but the effect is not huge and significant. Neely (2010) also uses nominal foreign exchange rates to measure the impacts of FED's policy actions on the economies of selected countries. Moreover, Kamil and Rai (2013) use nominal foreign exchange rates to show how liquidity shortages in global interbank market adversely affect banks' borrowing abilities in other countries through the foreign exchange lending channel. Furthermore, Moore et al (2013) use nominal foreign exchange rates as a proxy for yield related factors. Bauer and Neely (2014) also use nominal foreign exchange rates to demonstrate how FED's announcements work through international portfolio balance effects.

Moreover, Hausman and Wongswan (2011) define nominal foreign exchange rates as a macroeconomic factor to measure the effects of FED's policy surprises. Tillman (2016) uses nominal foreign exchange rates to demonstrate the effects of FED's unconventional policies on emerging countries. Bhattarai et al (2015) use nominal foreign exchange rates to quantify the international effects of FED's quantitative easing policies. Barroso et al (2016) use nominal exchange rate as one of the core domestic variables when measuring the effects of FED's unconventional policies on Brazilian markets. Furthermore, Glick and Leduc (2012) use nominal foreign exchange rates when investigating the effects of FED's asset purchases on long term interest rates, exchange rates and commodity prices. Furthermore, Hayo et al (2012) use nominal exchange rates when studying the effects of FED's monetary policy announcements on equity prices in emerging countries. Chen et al (2011) use nominal foreign exchange rates as a financial indicator of the countries when analyzing how monetary policy actions of developed countries affect emerging countries. Glick and Leduc (2013) prefer to use nominal foreign exchange rates when examining the effects of FED's monetary policy surprises on the value of the U.S. dollar Additionally, Lim et al. (2014) and Lim and

Mohapatra (2016) prefer using nominal foreign exchange rates as an additional variable to check their base model's robustness.

Although nominal exchange rates are used very commonly, several authors prefer to use Real Effective Exchange Rates (REER). For example, Bruno and Shin (2013) use REER derived from trade weighted index of U.S. to see the policy effects on the banks' lending. Moreover, Korniyenko and Loukoianova (2015) prefer REER to examine the effects of unconventional monetary policy measures on global monetary and liquidity. Additionally, Lim et al (2014) and Lim and Mohapatra (2016) also use REER as an additional variable during their robustness check process of their model.

There are some other types of usage of foreign exchange rates in addition to nominal exchange rates and REER. Chen et al (2011) and (2015) prefer an exchange rate pressure index (taking into account nominal effective exchange rates, foreign reserves, exchange rate regimes and policy interventions) to measure the effects of FED's unconventional monetary policy on other countries. Rogers et al (2014) use the value of future contracts of exchange rates when analyzing the international effects of policy surprises.

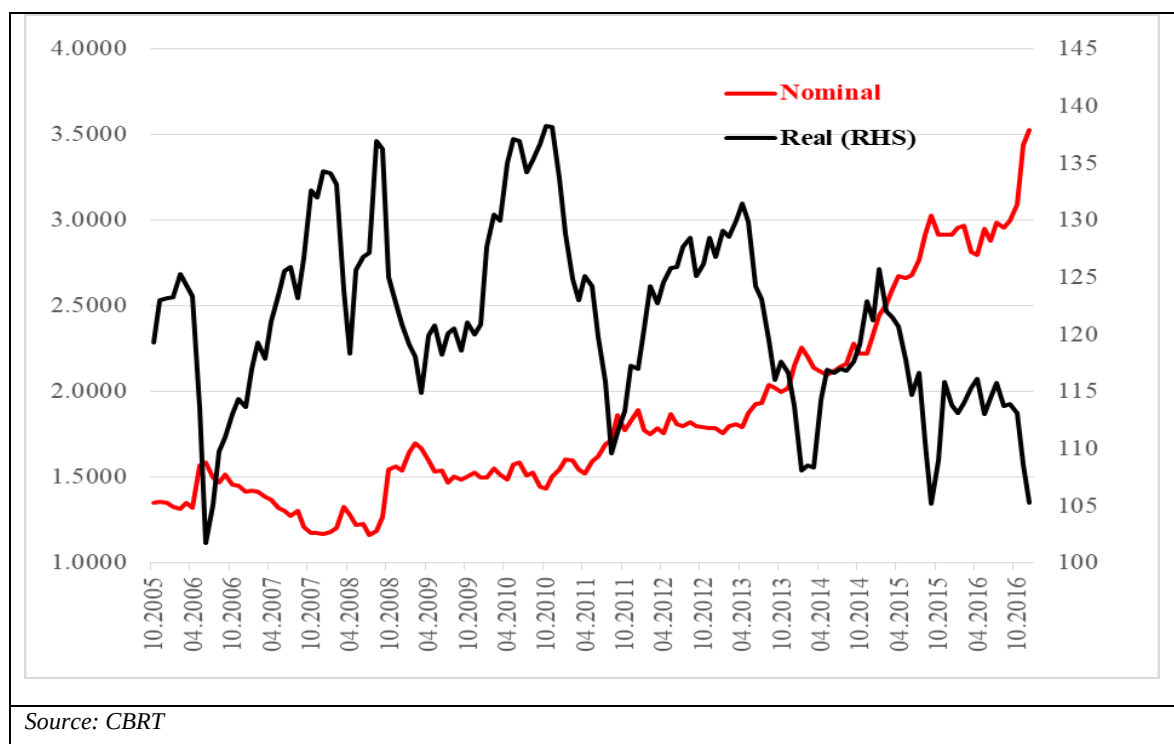


Figure 11 Nominal and REER Exchange Rates

According to the literature; nominal exchange rates, REER, exchange rate baskets or indexes are widely used indicators to show how foreign exchange channel works. As the focus of the study is related to the relation between FED's and CBRT's monetary policies and Turkish banks' external borrowing, REER, which is calculated taking into account a set of different countries, is not suitable. Therefore, nominal exchange rates of Turkish Lira against U.S. dollar is used in the study. Among the nominal exchange rates, daily indicative exchange rates of CBRT is selected as it is calculated by data collected from the foreign exchange market during the day. Nominal foreign exchange rates of USDTRY and REER are presented at Figure 11. Both data series are published by the CBRT. As presented at Figure 11, Turkish lira has been depreciated since at the end of 2008 by both real and nominal terms.

5.1.6 Global Risk Appetite

As indicated by other scholars, the impacts of the FED's unconventional monetary policy on the other countries work through risk and confidence channels as well. Therefore, the global risk appetite can be considered another indicator that may affect the international funds' directions. There are several financial indicators that can be used as proxies for global risk appetite level.

Bruno and Shin (2013) use Chicago Board of Exchange Volatility Index (VIX) as a proxy in their study to show how exchange rates of the selected countries are affected by FED's unconventional monetary policy. Moreover, Fratzscher et al (2012) also use VIX as a control variable in their model to demonstrate the global market conditions. Additionally, Bowman et al.'s (2015) models include VIX as a proxy to global risk aversion. Furthermore, Moore et al (2013) and Ahmed and Zlate (2014) prefer VIX as a proxy for a global risk factor. Fratzscher et al (2016) also use VIX in their model to measure the effects of FED's asset purchases on inflows to other countries. Chen et al (2015) define VIX as an endogenous variable to measure the effects of FED's unconventional monetary policy on global markets. Furthermore, Lo Duca et al (2011) use VIX as a proxy for global factors that affect the supply conditions in global bond market. Chen et al (2014) use VIX as a proxy for the level of volatility in financial markets.

Lim and Mohapatra (2016) use VIX as a confidence channel indicator and a proxy for global market sentiment. Glick and Leduc (2012) use VIX as a controlling variable to identify financial turmoil. Moreover, Lim et al (2014) and Lim and Mohapatra (2016) include VIX into their models as the primary confidence channel indicator. Fratzscher et al (2016) prefer to use VIX to capture risk aversion and uncertainty in the market. Furthermore, Korniyenko and Loukoianova (2015) also employ VIX in their regression analysis.

Although it is not included in their base model, VIX is used in robustness exercise by Tillman (2016) and Bhattarai et al (2015). Moreover, the model of Aït-Sahalia et al (2012) also includes VIX as proxy for financial market volatility in their robustness exercise.

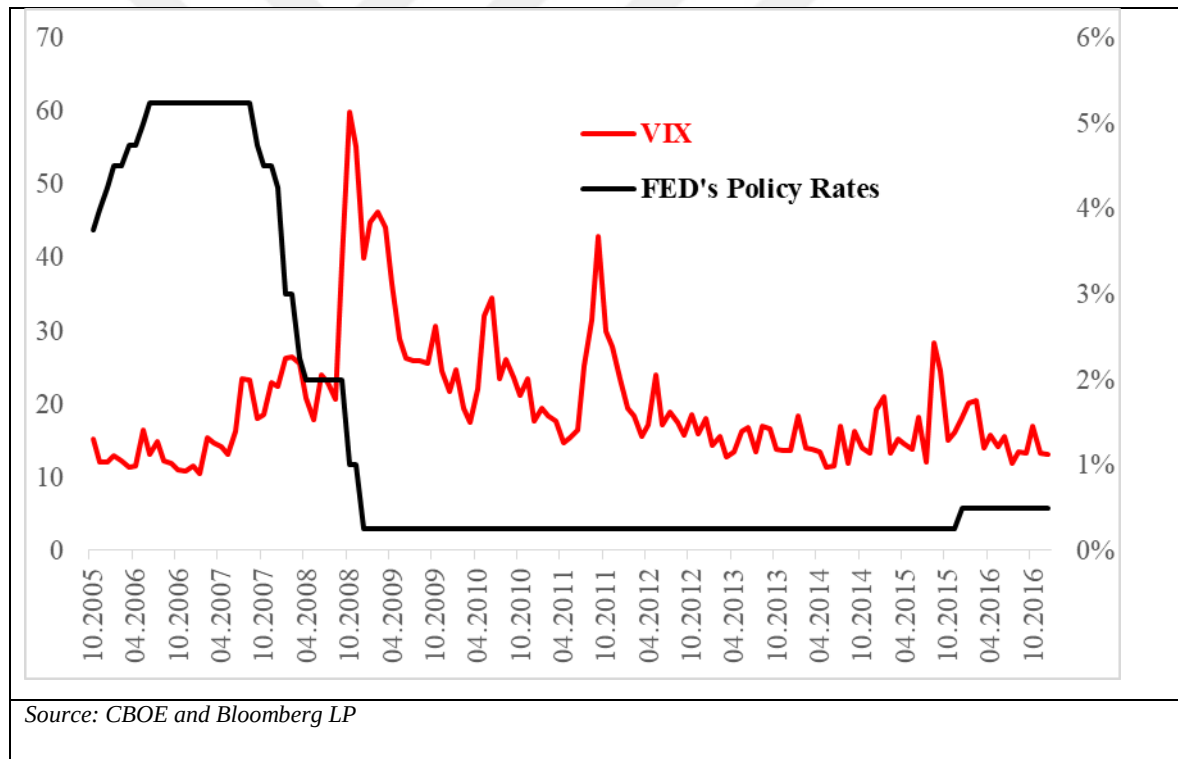


Figure 12 VIX and FED's Policy Rate

On the other hand, Rogers et al (2014) use Merrill Lynch Option Volatility Estimate (MOVE) Index instead of VIX to see the risk component of the FED's announcements when analyzing the effects of FED's unconventional policies. As MOVE index is derived from sovereign papers' volatility, it is not appropriate variable for this study.

As it is generally considered as a prime gauge for financial market risk aversion, financial turmoil, economic risk or financial uncertainty, VIX is used as a proxy for the global risk factor in the study. VIX and FED's policy rates are presented at Figure 12. According to the figure, the risk level and policy rates move the same direction since 2009 and reduction in FED's monetary policy interest rates lead VIX to reduce.

5.1.7 Domestic Risk Appetite

In addition to global risk factors, domestic risk factors are also used to measure the effects of FED's unconventional monetary policy actions on other countries. Although there are several domestic risk factors employed in the studies, CDS, credit rating and EMBI of country are generally used factors for showing domestic risk appetite.

5.1.7.1 CDS

CDS rates is preferred in several studies to demonstrate the FED's unconventional monetary policy' impacts on other countries. Although, one strand literature prefers to use sovereign CDS rates, the other prefers private sector CDS rates. For example, Wright (2012) uses grade-corporate CDS rates when measuring the effects of FED's monetary policy announcements on the real sectors of selected emerging economies. Moreover, Aït-Sahalia et al (2012) use CDS rates of banks to measure bank specific default risks.

On the other hand, Moore et al (2013) use sovereign CDS as a proxy for a country specific risk factor when measuring the impacts of FED's asset purchase program on developing countries' bond yields and on the interest rates. Moreover, Chen et al (2011) include sovereign CDS rates in their model for a proxy to financial indicator of a country. Bowman et al (2015) also use sovereign CDS rates in their empirical model to investigate how FED's conventional and unconventional monetary policies affect the emerging markets' sovereign bond yields, foreign exchange rates, and stock prices.

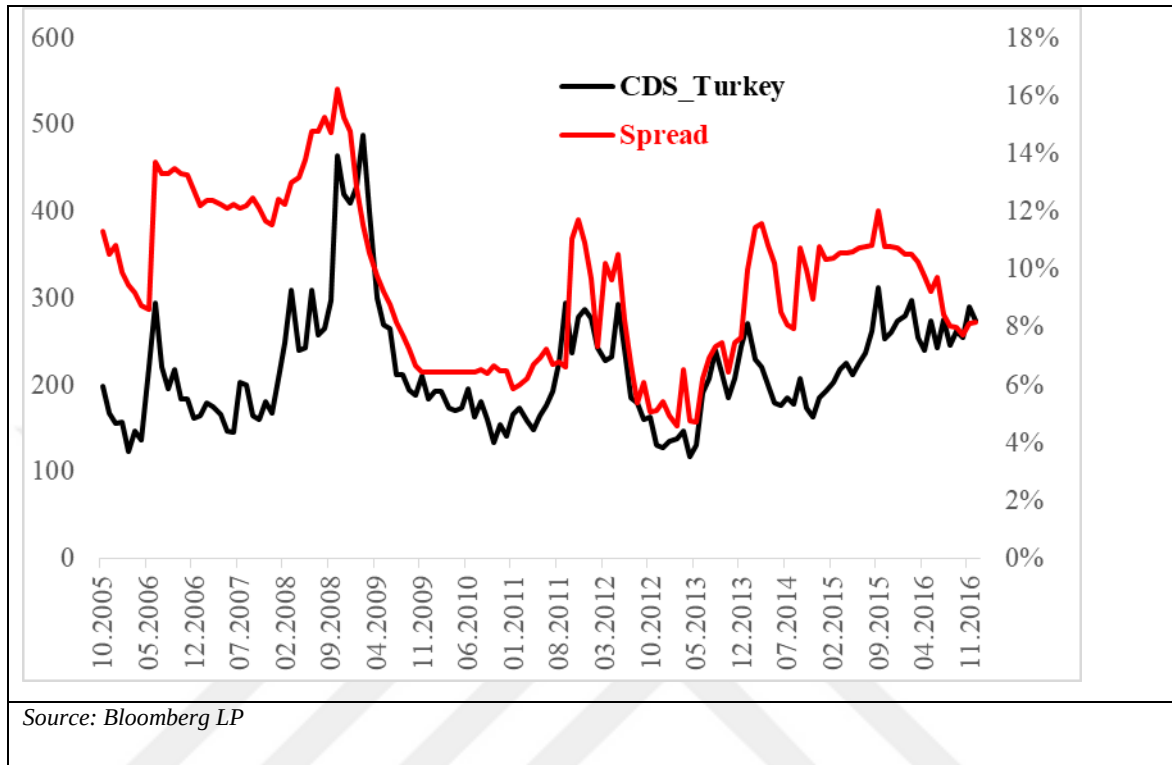


Figure 13 Turkey's 5 Year CDS and Policy Rate Spread to FED

As presented above, some of the authors prefer to use CDS rates in their models. As the country specific risk factors is preferred to be include into the empirical methods of this study, Turkey 5 year CDS is used in the event study analysis. Turkey 5 year CDS is a spread that takes into account yields of 5 year U.S. dollar sovereign bonds of Turkey and U.S., and the policy interest rate difference (spread) is calculated by CBRT's and FED's policy rates. As seen in Figure 13, both Turkey 5 year CDS and policy interest rate difference (spread) behave similarly due to their similarities in calculations.

5.1.7.2 Credit Ratings

Although not one of the widely used variables, credit ratings received from credit rating agencies are included into empirical models when explaining the relation between FED's unconventional monetary policy and its effects on other countries. Similar to CDS, credit ratings received from credit rating agencies are used as domestic risk appetite factors and split into two as private sector and sovereign.

For example, Ammer et al. (2010) use Standard & Poor's (S&P's) long term credit rating as a proxy for credit channel. They use credit ratings as a dummy variable. The variable is defined as "1" if credit rating is higher than "BBB-", is zero if credit rating is lower. Lim and Mohapatra (2016) use credit rating of a country to measure the attractiveness of a country for investors. Moreover, Marsh (2012) uses sovereign credit rating in his model as a proxy for financial risk when investigating to the factors of capital flows. Lim et al (2014) and Lim and Mohapatra (2016) prefer sovereign credit rating as a control variable as well. When analyzing the spillover effects of FED's monetary policy on bond yields of emerging countries, Gilchrist et al (2014) prefer to employ sovereign credit ratings. On the other hand, Lo Duca et al. (2016) use credit ratings of the bond issuing corporates to measure the effects on the global bond issuance levels.

As presented, the sovereign credit ratings are included in the models to identify the effects of FED's monetary policy actions on emerging countries. Generally, sovereign credit ratings are included into the models as a dummy variable with binary systems. Although sovereign credit rating is included as a dummy variable in this study, the calculation is different.

Investors who consider to invest in an emerging country generally check whether the country has investment grades from the Big Three credit rating agencies, which are S&P, Moody's, and Fitch Group. However, as the assessment processes of the Big Three are different, it is not sufficient to have an investment grade from only one of Big Three. In this respect, if Turkey receive more than one investment grades (above BBB- or Baa) from Big Three at the same time, the value of the dummy variable is "1", otherwise it is zero. Turkey received two investment grades from Big Three credit agencies at the same time only between June 2013 and September 2016. Therefore, *the calculation method of the credit rating dummy variable is another contribution of the study to the literature.*

5.1.7.3 EMBI

JP Morgan's Emerging Market Bond Index (EMBI) is an index to measure the total return performance of sovereign securities of selected emerging countries. Selection of the country and its weight in the index is determined according to specific liquidity and structural requirements. An increase in the indexes indicates gain in the market.

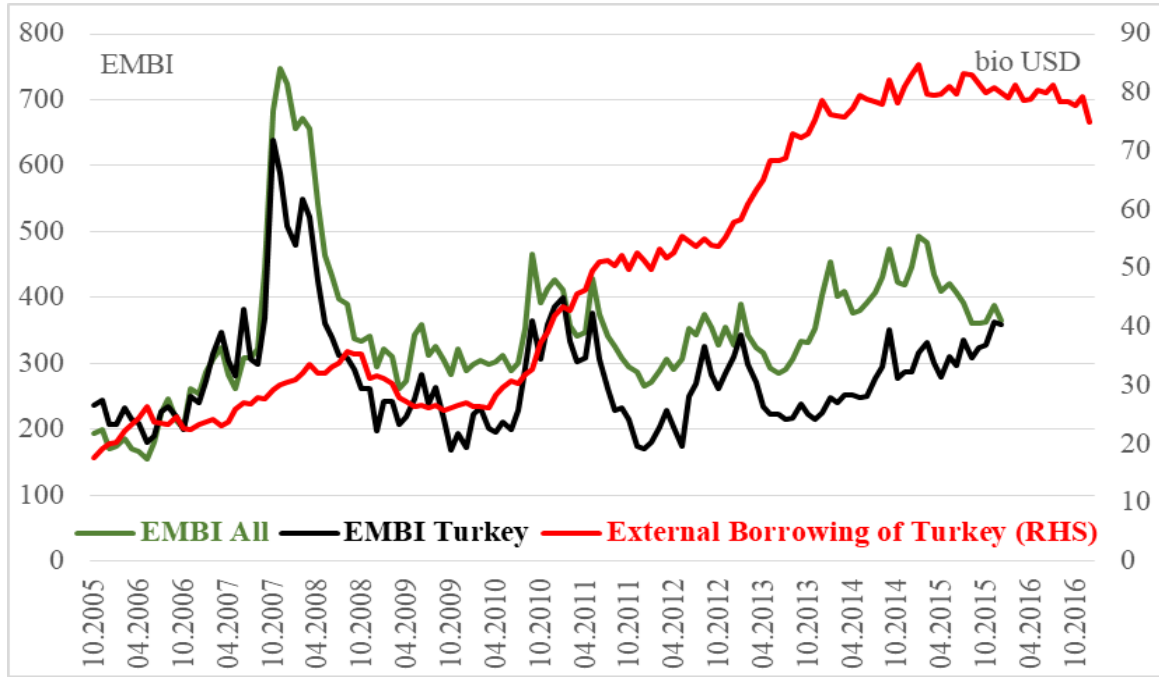


Figure 14 External Borrowing of Turkish Banks and EMBIs

Figure 14 presents EMBI all and Turkey and external borrowing of Turkish banks. In general Turkey performance similar to EMBI all. Since 2011, external borrowing of Turkish banks and EMBI increases together.

5.2 MODEL FREE RESULTS OF THE SELECTED VARIABLES

Before starting empirical analysis, it is worth to demonstrate model free results among the dependent and explanatory variables. Table 3 shows summary statistics of all variables employed in the empirical part of the study. External borrowing of Turkish banks, FED's balance sheet figures and ROM utilization are published as of U.S. dollar.

Table 3 Summary Statistics of All Variables

Variable Name	Source	Unit	Average	STD	Median	Min	Max
External Borrowing	CBRT	Billion USD	50	23	50	18	85
FED's Balance Sheet	FED	Billion USD	2,668	1,352	2,779	823	4,500
ROM	CBRT	Billion USD	15	17	0	0	44
USDTRY	CBRT	Nominal	1.85124	0.5639	1.665	1.1639	3.5249
VIX	CBOE	Nominal	19.96	8.81	17.15	10.42	59.89
Spread	CBRT and FED	Percentage	9.51%	2.77%	9.74%	4.60%	16.23%
CDS	Bloomberg	Basis Points	218	67	203	118	487
EMBI	JP Morgan	Basis Points	275	82	253	169	639
Credit Rating	S&P, Fitch, Moody's	Binary	0	0	0	0	1

Correlation matrixes are used to show the relation levels and signs between all variables that are employed in the empirical models. Table 4 presents the correlation figures between variables. As presented at Table 4, both the FED's balance sheet and ROM utilization have positive and high level of correlation with external borrowing of Turkish banks.

Table 4 Correlation Matrix

	External Borrowing	FED's Balance Sheet	ROM	USDTRY	VIX	Spread	CDS	EMBI	Credit Rating
External Borrowing	1	0.95	0.96	0.87	-0.30	-0.22	0.08	0.02	0.84
FED's Balance Sheet	0.95	1	0.91	0.88	-0.19	-0.36	0.11	0.07	0.79
ROM	0.96	0.91	1	0.92	-0.35	-0.16	0.10	0.04	0.82
USDTRY	0.87	0.88	0.92	1	-0.24	-0.13	0.25	0.16	0.74
VIX	-0.30	-0.19	-0.35	-0.24	1	0.20	0.66	0.73	-0.31
Spread	-0.22	-0.36	-0.16	-0.13	0.20	1	0.49	0.41	0.01
CDS	0.08	0.11	0.10	0.25	0.66	0.49	1	0.95	0.09
EMBI	0.02	0.07	0.04	0.16	0.73	0.41	0.95	1	0.00
Credit Rating	0.84	0.79	0.82	0.74	-0.31	0.01	0.09	0.00	1

5.3 EVENT STUDY

Compared with other econometric studies, "Event Study" has the advantages of being clear and simple. Event studies may be used to measure the effects of specific shocks on selected financial indicators. The specific shocks are defined as "Event" in the event studies. According to Aït-Sahalia et al. (2012), the event study methodology has a number of advantages of which its simplicity, parsimony, and focus on the immediate market response to an event, a policy announcement in this case are the most important ones. Moreover, Aït-Sahalia et al. (2012) indicates that event studies are better designed to work with the limited sample size and avoid specification issues of the underlying spread model. Event studies, however, have restrictions; on lending itself to the analysis of causality, not providing a comprehensive evaluation of policy effectiveness. On the other hand, when analyzing the effects of FED's unconventional policy on other countries' financials, event study method is the most common empirical model compared to regression analysis and VAR models. It would be sometimes difficult to identify the most important "Event" and to choose the "Event Window" enough to avoid confounding effects. However, they are popular as event study is able to include substantial number of events to isolate the impact of those events on selected variables.

The main focus of event studies is generally securities or equities and their impacts on the selected asset classes. However, event studies have been recently applied to monetary policy actions as well. In this frame, event study method is employed in this study to measure the impacts of FED's unconventional monetary policy on Turkish banks' external borrowings and other selected financial indicators. In this chapter, after introducing recent "case studies" on the implications of the non-traditional monetary policy of the FED, an "event structure" is prepared to measure the effects of selected events on the external borrowings of Turkish banks and its results are interpreted.

Chen et al (2014) use event study method when analyzing the effects of FED's monetary policy actions on capital flows and asset prices of emerging countries. Bauer and Neely (2014) prefer event study to measure the FED's policy related announcements on the asset prices in developed countries. Hausman and Wongswan (2011) also measure the effects

of FED's policy surprises on the equity indexes, interest rates and foreign exchange rates in countries by employing event study method. Aït-Sahalia et al (2012) prefer event study method with one day event window to investigate international effects of the monetary policy related announcements of developed countries' central banks. Barroso et al (2016) investigate the effects of FED's unconventional policies on Brazilian markets through capital flows by using event study method.

Moreover, Glick and Leduc (2012 and 2013) use event study method when investigating the effects of asset purchases of FED and BoE on long-term interest rates, exchange rates and commodity prices. Morgan (2011) also measure the impacts of FED's quantitative easing policy on Asian countries by using event study method. Furthermore, Moore et al (2013) use event study method to measure FED's asset purchase program's impact on developing countries' bond yields and interest rates. Rogers et al (2014) use event study method to see the effects of FED's unconventional on exchange rates and financial conditions abroad. Chen et al (2011) use event study method to measure the impact of advanced countries central banks' policies on global financial markets in addition to GVECM. When analyzing the spillover effects of FED's monetary policy on sovereign bond yields, Gilchrist et al (2014) prefer to employ event study method.

In event study method, it is assumed that the causality runs in one direction, therefore, in this study, FED's asset purchases is assumed to affect the external borrowing of Turkish banks.

5.3.1 Events

The announcement and speech days of FED as mentioned by Chodorow-Reich (2014), Bauer and Neely (2014), Chen et al. (2014) and Gilchrist et al. (2014) are defined as events. The selected events related to FED's unconventional monetary policy are presented at Table 5.

Table 5 FED's Unconventional Monetary Policy Related Events

Event	Date	QE Phase	Event Type	Explanation	Asset Purchase
1	25.11.2008	I	FED Announcement	FED indicates purchases of up to 100 bio USD in agency debt and up to 500 bio USD in agency MBS at <u>intermeeting policy announcement</u>	Yes
2	01.12.2008	I	Chairman Speech	FED's Chairman states that "FED could purchase longer term Treasury securities in substantial quantities" <u>intermeeting policy announcement</u>	No
	16.12.2008	I	FED Announcement	FED indicates "exceptionally low level of the federal funds rate for some time"	No
3	18.03.2009	I	FED Announcement	FED indicates purchases of up to additional 100 bio USD in agency debt, up to 750 bio USD in agency MBS and 300 bio USD in Treasury securities.	Yes
4	10.08.2010	II	FED Announcement	FED indicates reinvestment principal payments from first phase of QE purchases in Treasury	No
5	03.11.2010	II	FED Announcement	FED indicates purchases of 600 bio USD in Treasury securities	Yes
6	21.09.2011	II	FED Announcement	FED indicates maturity extension program	No
7	13.09.2012	III	FED Announcement	FED indicates purchases of 40 bio USD per month of agency MBS, maintaining the federal funds rates at zero to mid-2015.	Yes
8	12.12.2012	III	FED Announcement	FED indicates increase of 40 bio USD per month agency MBS purchases to 85 bio USD	Yes
9	22.05.2013	-	Chairman Speech	FED's Chairman indicates tapering in asset purchases.	

As monthly data is used in the study, the announcements of December 1, 2008 and December 16, 2008 are combined in Event 2. After selecting the event dates, the variables that are assumed to be affected by the FED's unconventional monetary policy decisions are tested.

5.3.2 Structure

According to the literature review, although the event study models have been widely used, there are no single methodology to employ event study models in finance. In this search, we prefer to use the general structures of McKinlay (1997) and Brown and Warner (1980, 1985) to see the impacts of FED's unconventional monetary policy announcements on Turkish banks' external borrowings and other selected indicators.

Although there are not a single methodology to employ event study, there are some main components of the event studies. In general, the first step is to define the events to focus during the study. After defining the events, the "*estimation window*" and "*event window*" should be identified. *Estimation window* is the period that is considered normal days during which no surprise in it. On the other hand, *event window* is a time period over which the prices of an asset or financial instruments will be examined.

Later, the expected returns should be calculated. As the first priority of the event study is to test abnormal returns, the abnormal returns should be spotted for which it is critical to identify normal returns. Generally, zero adjustment to returns, constant mean adjusted returns, market adjusted returns and market and risk adjusted models are applied to measure normal returns. As indicated by Brown and Warner (1980, 1985), although constant mean return model can be considered the simplest model to determine, the results very similar to the results of more sophisticated models. As the selected variables in this study are from various markets, it is not entirely applicable to use models based on comparison with the market returns. Therefore, ***constant mean return model*** is chosen in this study.

The timeline of an event study is presented at Figure 15. In this structure, t is the *Event*, the period between T_0 to T_1-1 is *Estimation Window* and the periods of T_1 to T_2 or T_1 to T_3 are *Event Windows*.

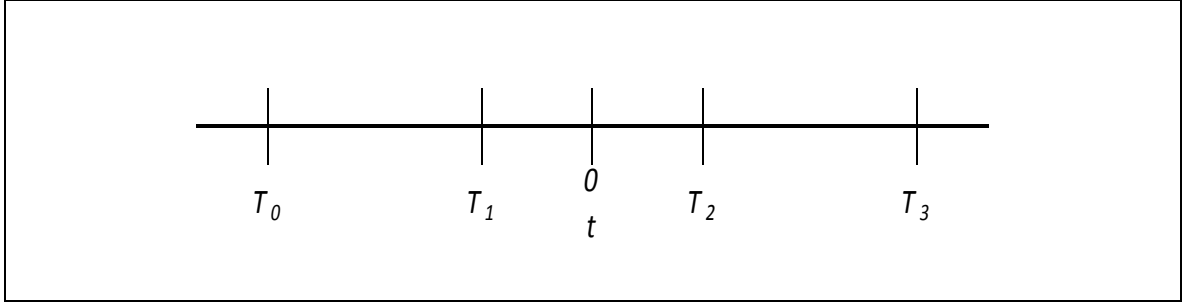


Figure 15 Time Line Structure

In constant mean return models, an asset is assumed to earn average return and any deviation from the normal return is considered as abnormal return. In this regard, normal return is calculated as the average return over an estimation period.

It is important not to overlap estimation window and event window to prevent parameters derived from normal return model influencing from returns around the event. The estimation window is determined as the period between 60 months before the event date and 6 months before the event date, where the event date (time zero) refers to the dates of FED's unconventional monetary policy announcements. Therefore, **(-60,-6) denotes the estimation window and (-5, +5) is the event window.**

According to the constant mean return model, we assume that the mean return over the estimation period is the expected return. Therefore, deviations from the expected return is defined as abnormal returns. The arithmetic, expected and abnormal returns of asset i are demonstrated at Equations 1, 2 and 3 respectively.

$$R_{i,t} = \frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}} \quad \text{Equation 1}$$

$$\bar{R}_i = \frac{1}{55} \sum_{t=-60}^{-6} R_{i,t} \quad \text{Equation 2}$$

$$AR_{i,t} = R_{i,t} - \bar{R}_i \quad \text{Equation 3}$$

Where $\bar{R}_i$ is the average return of the asset class of i for the estimation window which starts 60 months before the event date and ends 6 months before the event date. Therefore, abnormal return (AR_i) of time t is the difference between return of time t and normal return.

After defining abnormal returns, it is important to test the results to compare indicators' significance levels. According to Campbell et al (2009), for the selected event studies, crude dependence adjustment (CDA) developed and defined by Brown and Warner (1995) is one of the widely used parametric test statistics. The test statistic is computed by dividing the mean abnormal returns of event date with the standard deviation of abnormal returns. As long as the abnormal returns are normally, independently and identically distributed, the test statistic will be distributed with Student-T.

The cumulative abnormal return (CAR_i) for a specific indicator over an event window $(-5, +5)$ is defined as:

$$CAR_i(-5, +5) = \sum_{t=-5}^{+5} AR_{i,t} \quad \text{Equation 4}$$

Therefore, CDA's the test statistic over the event window $(-5, +5)$ of an indicator is:

$$t_{CAD} = \frac{CAR}{s(CAR)} \quad \text{Equation 5}$$

After setting up the structure of the event study analysis, the variables reactions to FED's unconventional monetary policy is interpreted.

5.3.3 Event Study Results

In this part, the event study test statistics are demonstrated according to the events. Graphs show the reactions of selected variables to FED's related actions for following 5 months. As stated before, Event 1-3 are considered as QE1, and Event 4-6 are considered as QE2. If the ratio of $CAR/sCAD$ of a variable is higher than ± 2 , the FED's unconventional monetary policy action (Event) has significant effect on the selected variable. Moreover, negative sign of the ratio of $CAR/sCAD$ indicates that the variable decreases as a result of

the Event. The selected variables are External Borrowing Level, External Borrowing Leverage Ratio, USDTRY Rates, Policy Rate Differences, VIX, Turkey CDS Spreads and EMBIs.

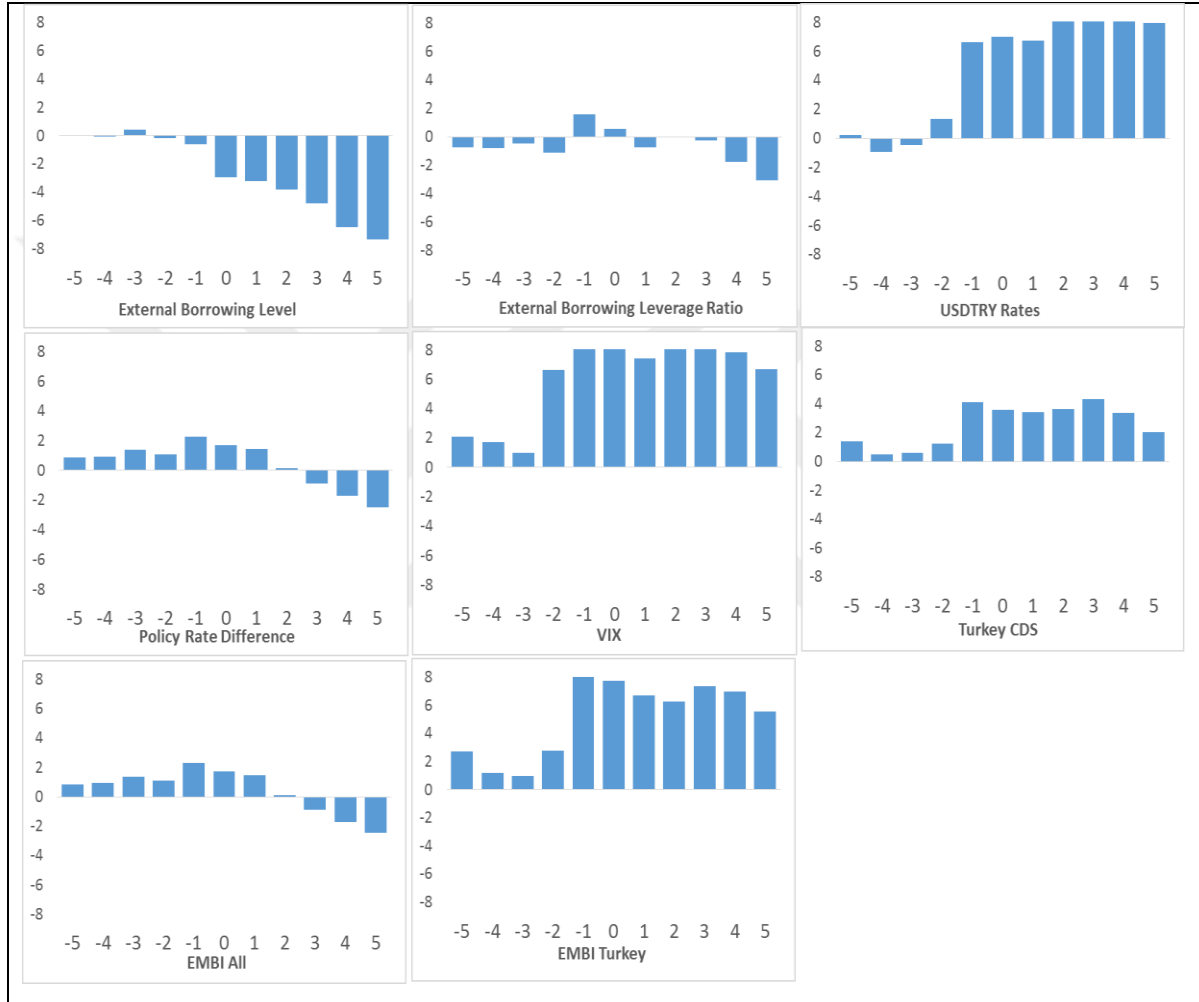


Figure 16 Event 1 (25 11 2008) CAR/s(CAR) Results

Event 1: FED's intermeeting policy announcement held on November 25, 2008 is described as Event 1. FED announced purchasing of up to 100 billion U.S. dollar in agency debt and up to 500 billion U.S. dollar in agency MBS. The external borrowings of Turkish banks are negatively and significantly affected by Event 1. Moreover, USDTRY exchange rates, VIX, Turkey's CDS and EMBI Turkey are increased, but international reserves of CBRT and spread decrease just after Event 1.

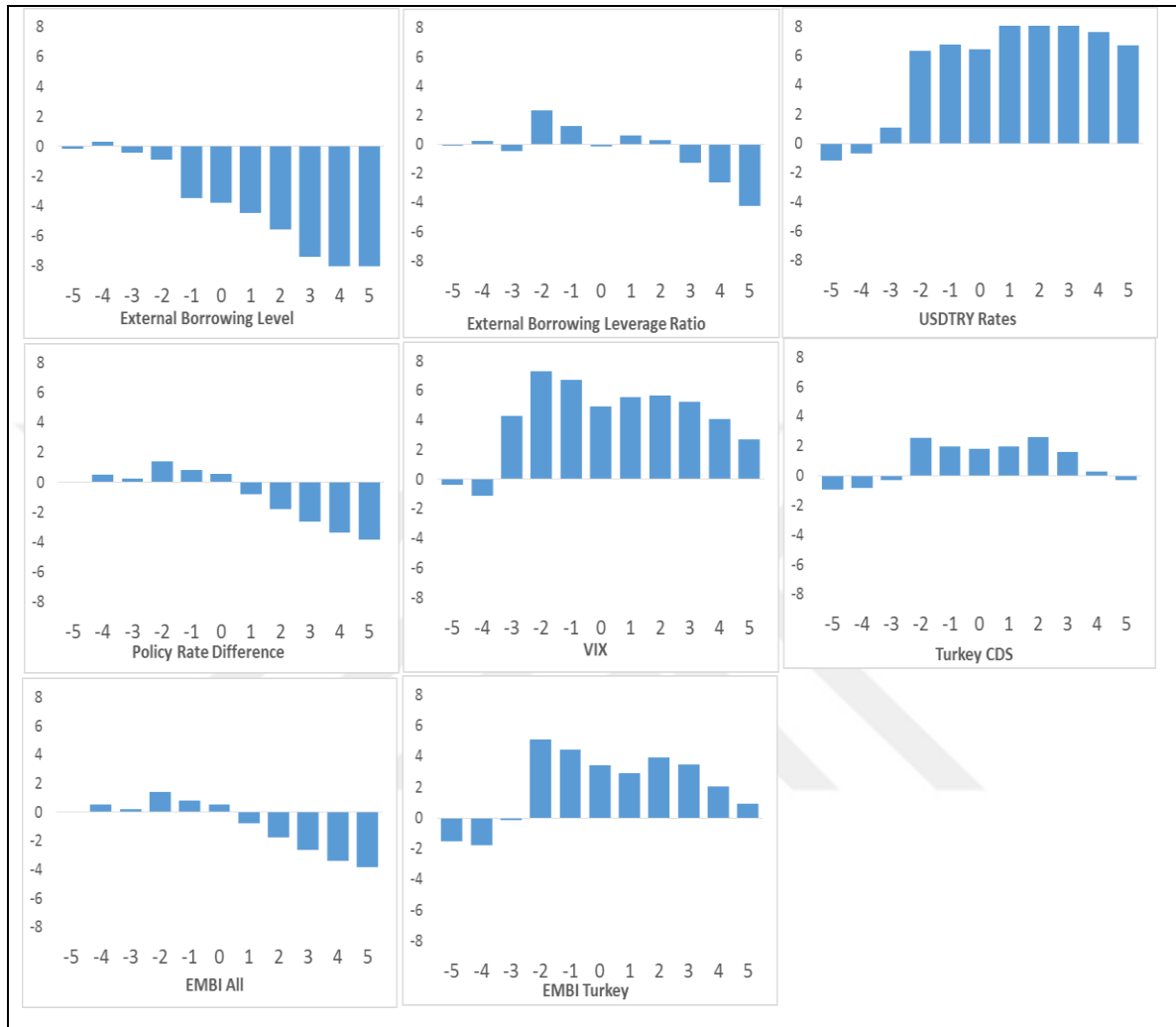


Figure 17 Event 2 (01&16.12.2008) CAR/s(CAR) Results

Event 2. FED's Chairman stated on December 1, 2008 that "FED could purchase longer term Treasury securities in substantial quantities". Moreover, it was indicated in FED Announcement on December 16, 2008 that "exceptionally low level of the federal funds rate for some time". As monthly data is employed in the event study, these two dates are described as Event 2 and their effects are analyzed mutually. As there are just one month time difference between Event 1 and Event 2, the effects of the policy announcements are very similar. The external borrowings of Turkish banks is negatively and significantly affected by Event 2 similar to Event 1. However, the significance levels of all the variables including USDTRY exchange rates are lower in Event 2 compared to Event 1.

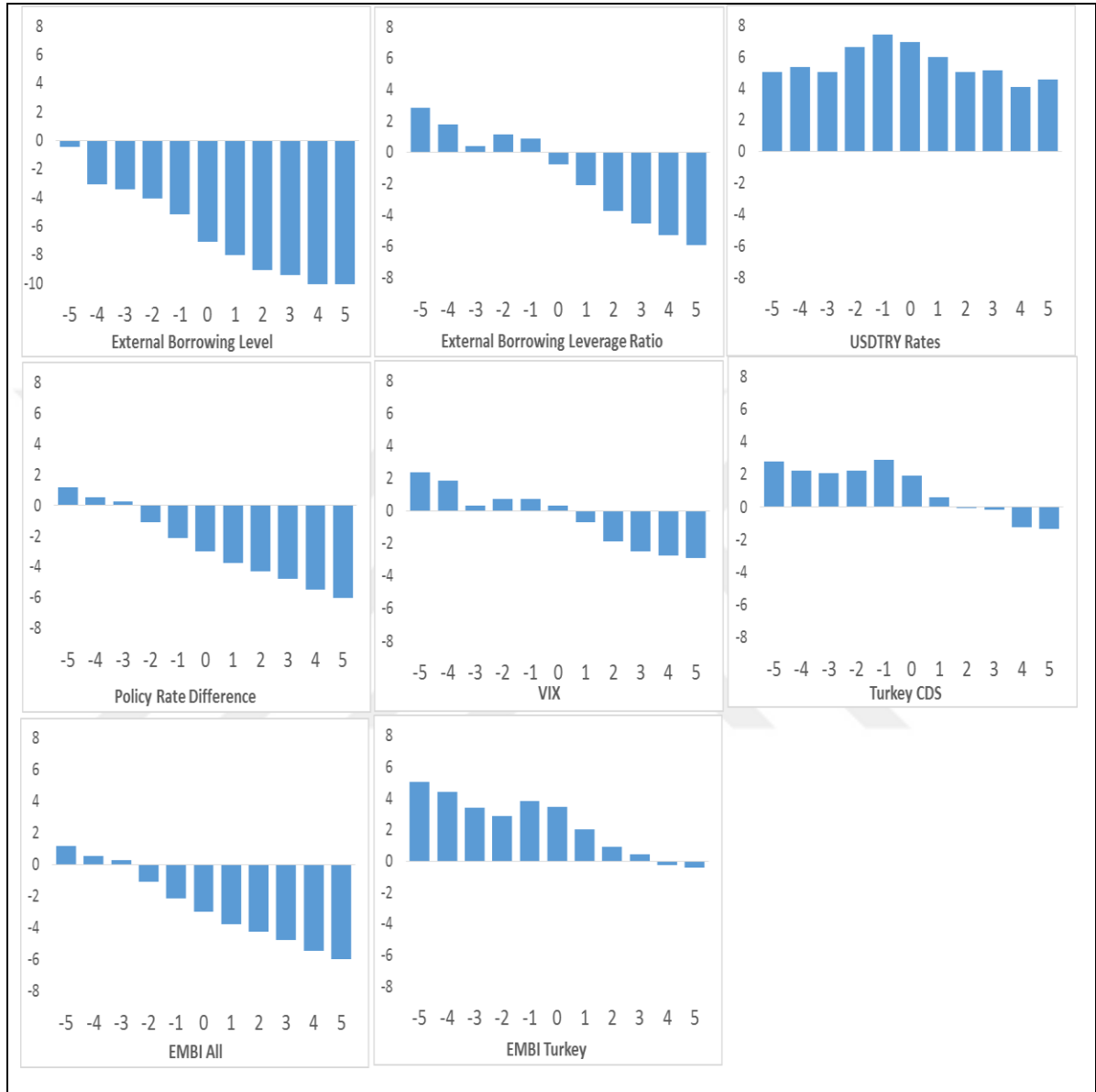


Figure 18 Event 3 (18.03.2009) CAR/s(CAR) Results

Event 3. March 18, 2009 is defined as Event 3. FED announced "purchasing of up to additional 100 billion USD in agency debt, up to 750 billion USD in agency MBS and 300 billion USD in Treasury securities" on that day. The external borrowings in terms of level and ration of Turkish banks are negatively and significantly affected by Event 3 similar to Event 1 and Event 2. However, the significance levels of the Event 3 is generally higher than previous events. On the other hand, EMBI Turkey and Turkey CDS are not significantly affected by Event 3.

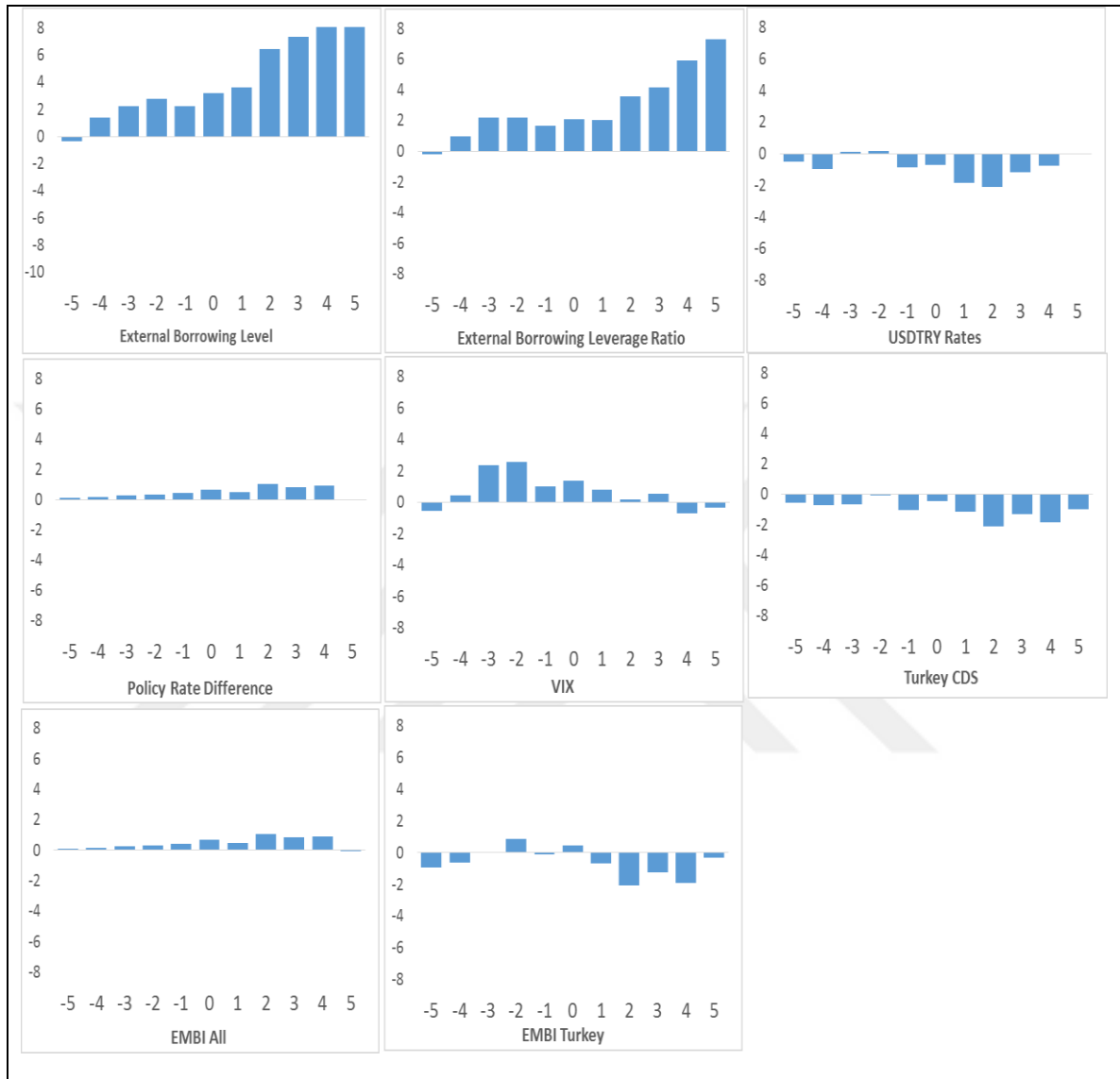


Figure 19 Event 4 (10.08.2010) CAR/s(CAR) Results

Event 4. On August 10, 2010, FED announced that reinvesting principal payments from QE1 purchases in Treasury, which is considered as the start of QE2. As presented in Figure 19, the external borrowings of Turkish banks are positively and significantly affected by Event 4. However, main difference from previous events is the sign of the external borrowing level of Turkish banks. Opposite to the previous events, external borrowing level of Turkish banks increases significantly, which indicates that Turkish Banks started to increase their external borrowings first time since 2008. On the other hand, Event 4 has no significant effects on EMBI All and EMBI Turkey, Spread, VIX and Turkey CDS.

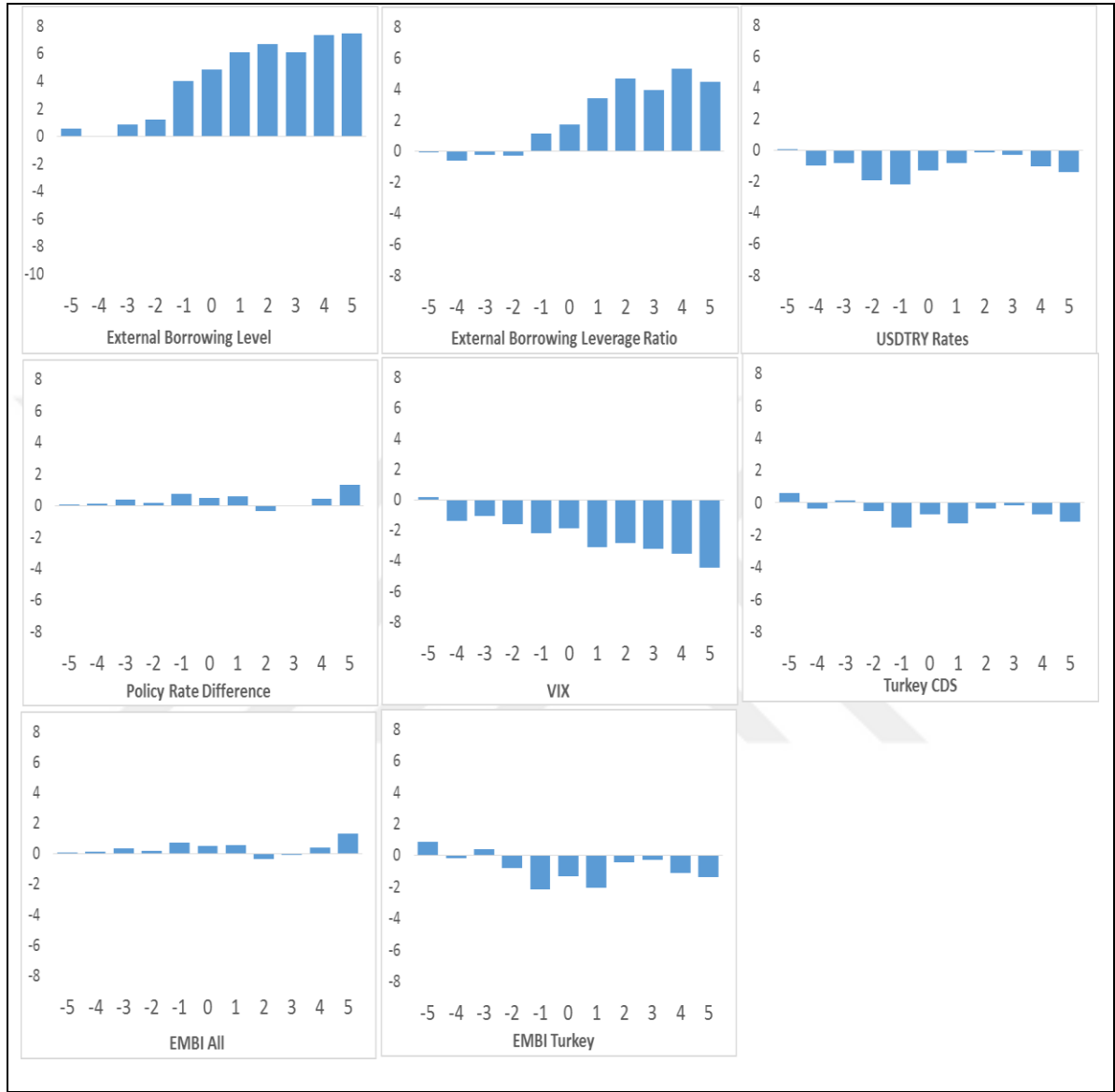


Figure 20 Event 5 (03.11.2010) CAR/s(CAR) Results

Event 5. November 3, 2010 is defined as Event 5 in the study when FED announced additional purchases of 600 billion USD in Treasury securities. The estimation window results are presented at Figure 20. The effects of Event 5 on selected variables are very similar to that of Event 4. However, the other variables are not significantly affected by Event 5 except for external borrowing and VIX. The external borrowings of the Turkish banks and leverage are considerably increased as a result of Event 5.

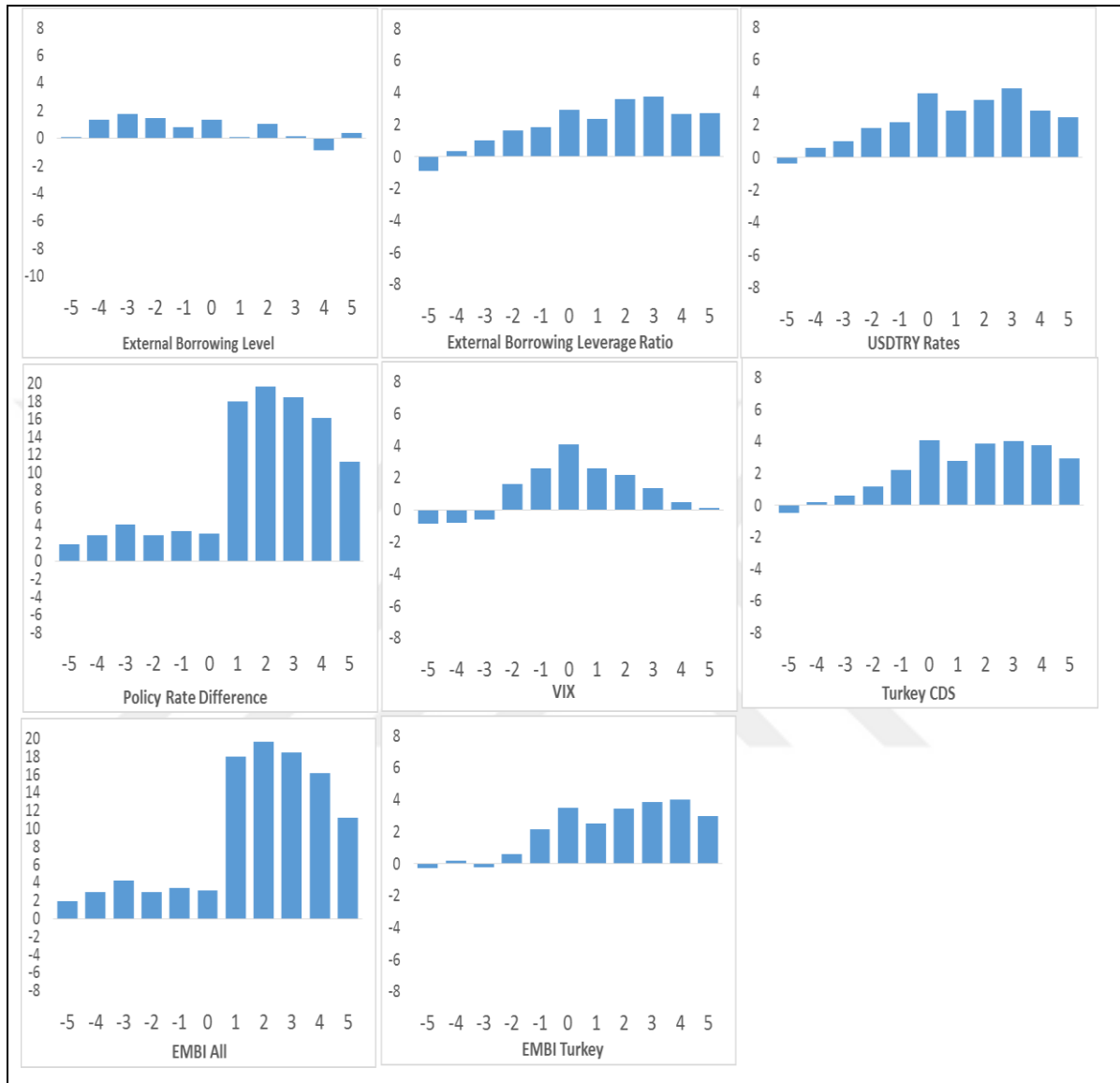


Figure 21 Event 6 (21.09.2011) CAR/s(CAR) Results

Event 6. On September 21, 2011, FED announced that it would start maturity extension program, which is described as Event 6 in the study. External borrowing level of Turkish banks is not significantly affected from Event 6. On the other hand, Event 6 affects other selected indicators more significantly than Event 4 and Event 5. As the maturity extension announcement was considered as a signal that the FED would maintain its low level policy rates, Event 6 generally affected indicators related to interest rates. Turkey related risk indicators such as EMBI Turkey, spread and Turkey CDS increase due to Event 6, which indicates that country specific risks of Turkey are increased.

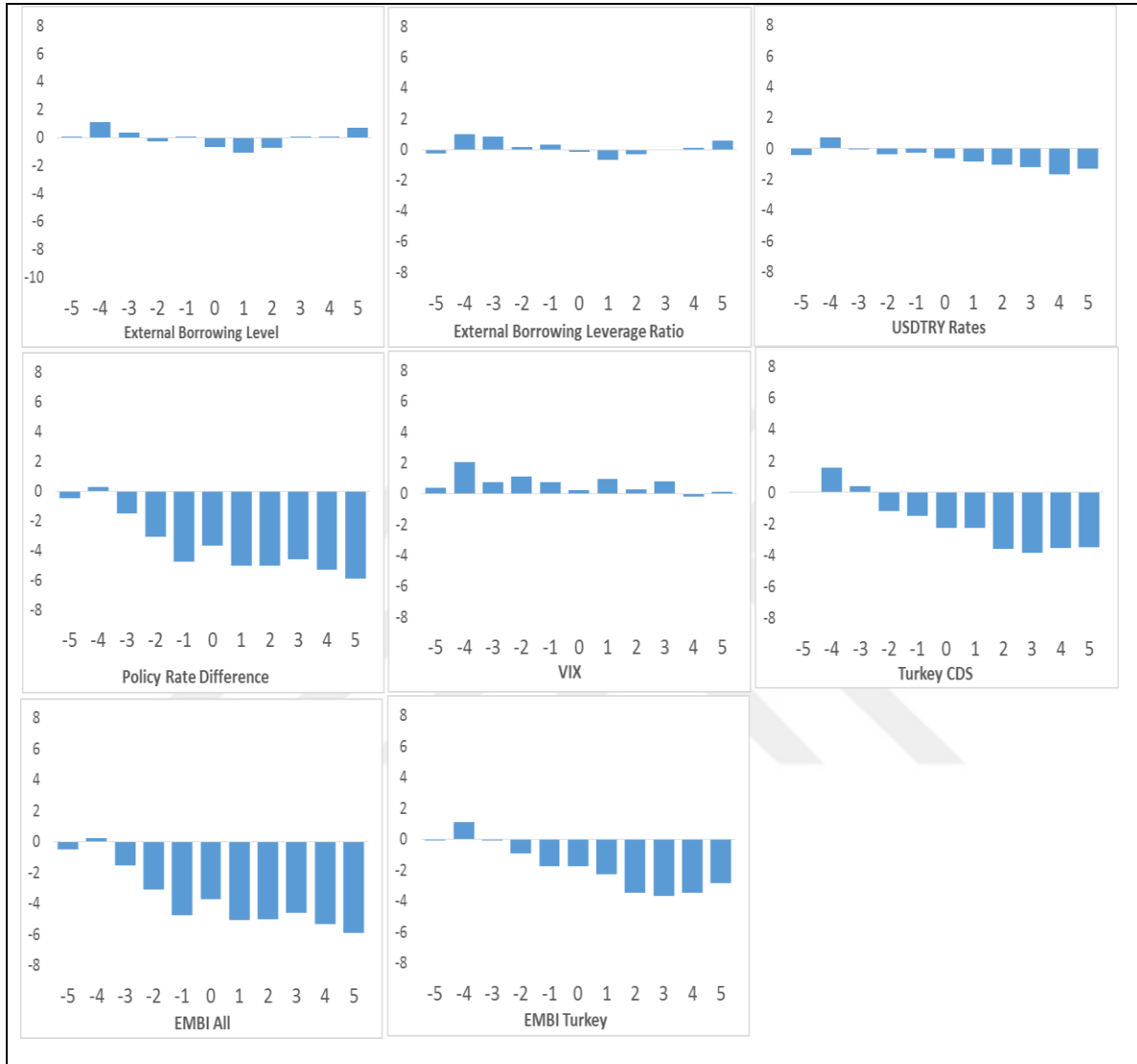


Figure 22 Event 7 (13.09.2012) CAR/s(CAR) Results

Event 7. On September 13, 2012, FED announced additional purchases of 40 billion USD per month of agency MBS and maintaining the Federal fund rates at zero to mid-2015. The date is described as Event 7, which is considered as the starting point of QE3 or as "operational twist". As presented in Figure 22, there are no significant effect on external borrowings of Turkish banks. On the other hand, risk indicators of Turkey such as spread, CDS and EMBI are decreased after Event 7. The results indicate that Turkey specific risks decreased due to Event 7.

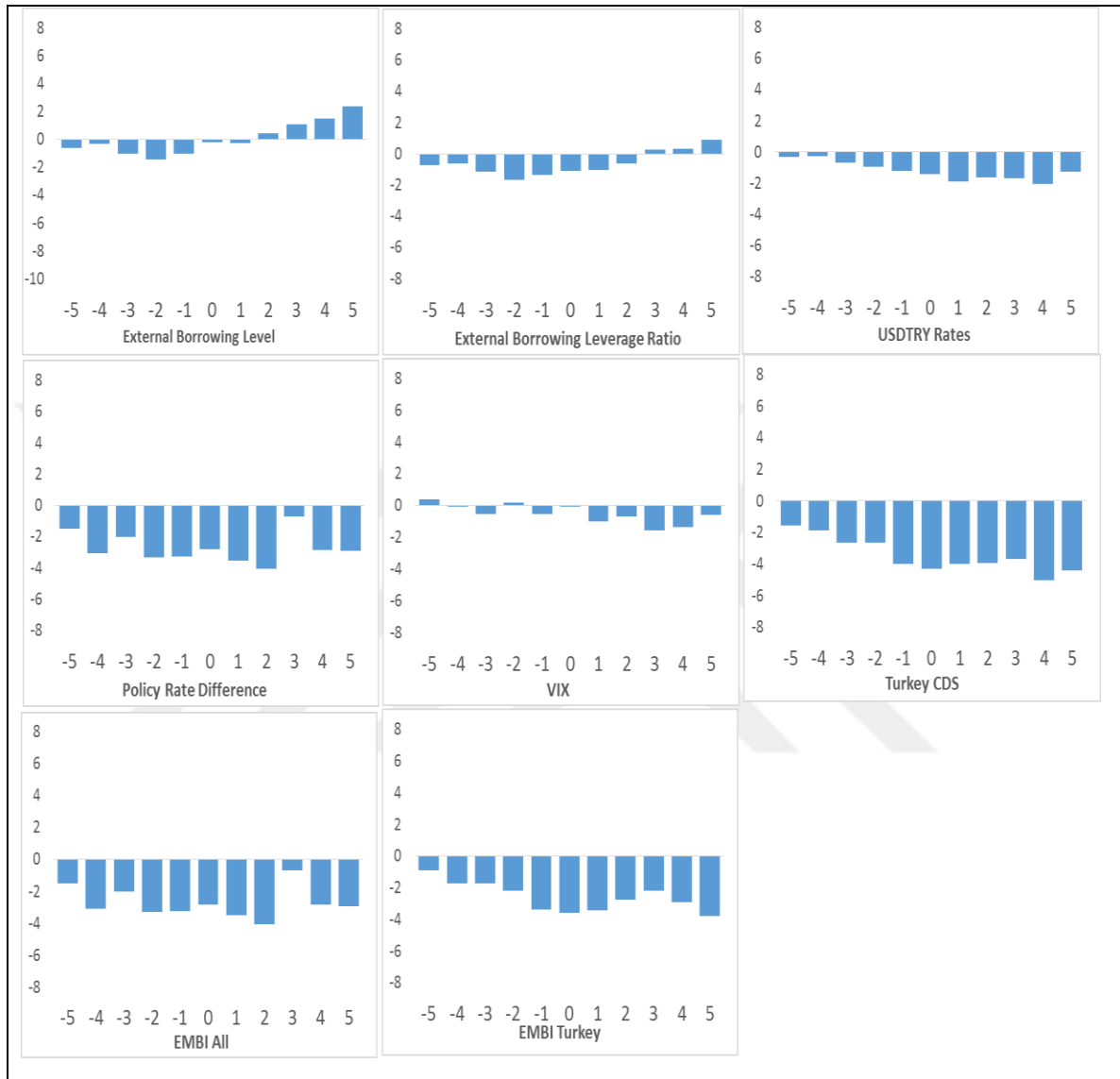


Figure 23 Event 8. (12.12.2012) CAR/s(CAR) Results

Event 8. On December 12, 2012, FED announced increase of 40 billion USD per month agency MBS purchases to 85 billion USD, which is considered the last quantitative increase of FED's unconventional monetary policy and described as Event 8. As seen from Figure 23, Turkish banks' external borrowing starts to increase just after Event 8 and reach critical significance level after 5 months. The signs of the indicators are similar to that of Event 7, however the significance level of the indicators are smaller. Therefore, the impacts of Event 8 on selected indicators are moderate.

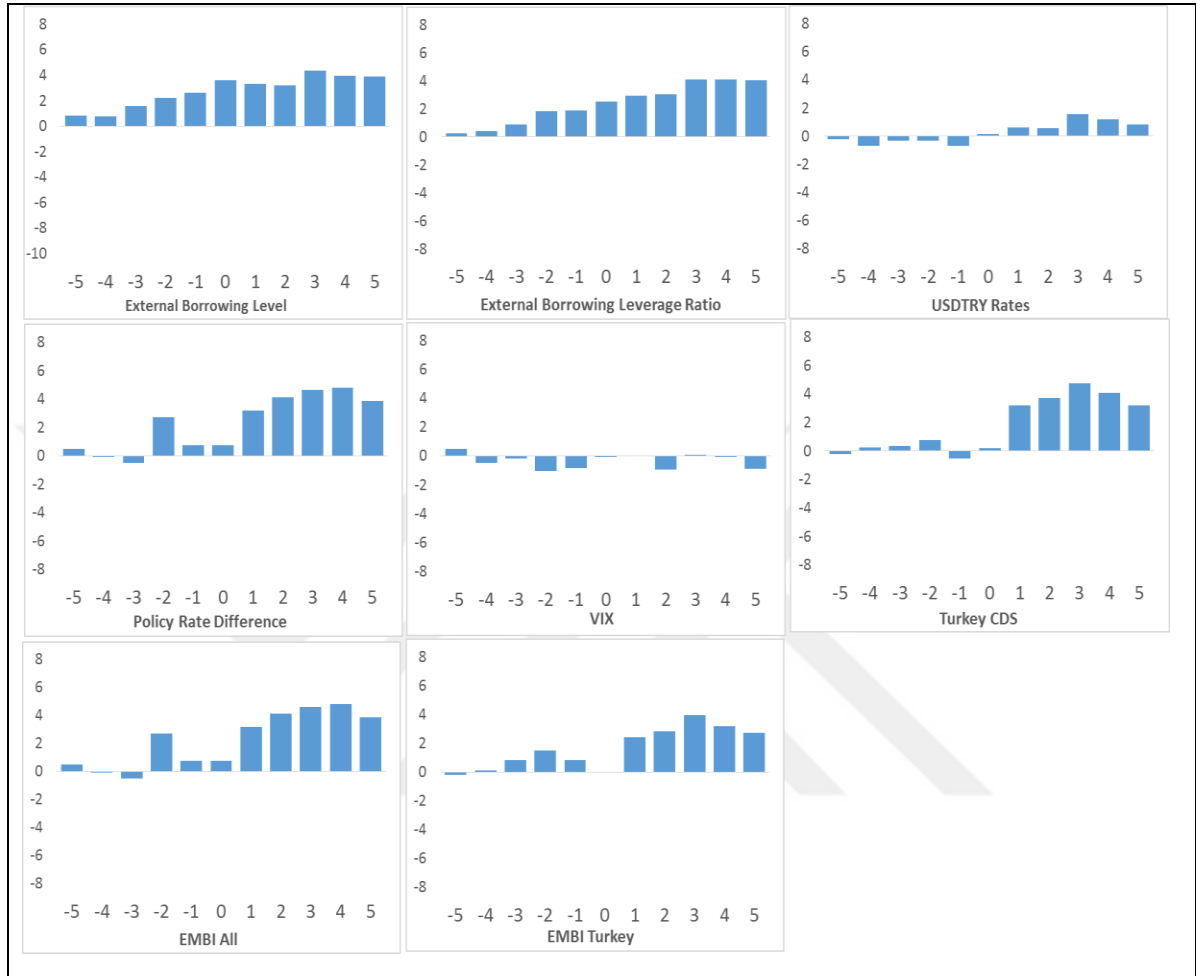


Figure 24 Event 9 (22.05.2013) CAR/s(CAR) Results

Event 9. On May 22, 2013, FED’s Chairman indicated that there would be tapering in asset purchases. Although the event is not considered as an announcement related to unconventional monetary policy, it would be helpful to see the effects of the announcement. The event called as Event 9 results in a significant increase in the external borrowings of Turkish banks. Moreover, Turkey related risk indicators such as spread, EMBI and CDS are positively affected, which shows that country specific risks are increased.

After demonstrating the results Event basis, the results are revealed according to variable basis to separate the effects of different phases of the FED’s unconventional monetary actions. The Figure 25 shows how the selected variables are affected by each Event. All events are compared as follows.

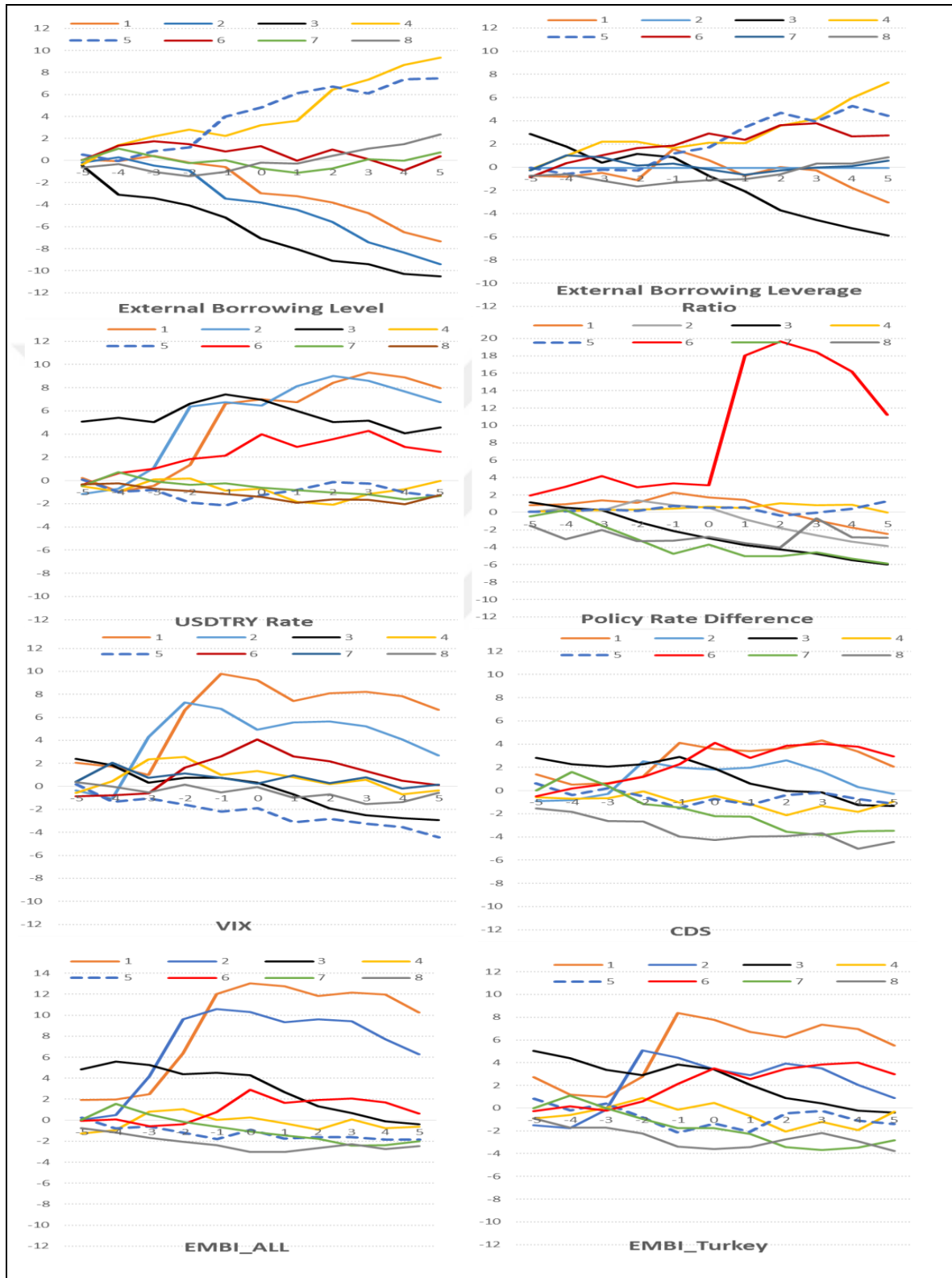


Figure 25 All Event Comparisons per Indicator (CAR/s(CAR) Results)

External Borrowing Level. During the first phase of QE, Turkish banks' external borrowing levels are decreased. However, Turkish banks start to significantly increase their external borrowing levels during second phase of QE. This results are in line with the results of Chen et al (2011) indicating FED's spillover effects on foreign exchange flows to emerging countries; of Lim et al (2014) indicating the quantitative easing of FED positively affect loan inflows to emerging countries; of Chen et al (2014) indicating U.S. policy shocks significantly affect capital flows and asset prices in emerging countries; of Lim and Mohapatra (2016) indicating quantitative easing affects inflows to developing countries. Moreover, the findings are in line with Fratzscher et al (2016) who measure that announcements made during the second phase of QE caused a portfolio rebalancing into emerging countries.

External Borrowing Leverage Ratio, Announcements of the first phase of QE related have negative and significant effects on the leverage (debt ratio) of Turkish banks, which implies that banks external borrowings in terms of total assets decrease during the first phase of QE. On the other hand, the debt ratio was positively and significantly affected during the second phase of QE. Therefore, the structure and thus leverage of the banks' balance sheet is effected by the announcements of QE1 and QE2 differently. *As there are no papers regarding the impact of the QE on the capital structure of banks, one of the contributions of the study is demonstrating the impacts of FED's unconventional monetary policy on banks' leverages.* According to the results, Turkish banks leverage is decreased as a result of the QE1. On the other hand, announcements related to QE2 encourage banks to increase their leverage ratio. This result is in line with our expectations.

USDTRY Exchange Rate. The QE1 announcements significantly and negatively affect the exchange rates. During the first phase of QE, Turkish lira depreciates against U.S. dollar. Although QE2 announcements had positive impacts on the USDTRY exchange rates, its significance level not so high compared to that of QE1. Therefore, the results are not in line with Morgan (2011) indicating some of the Emerging Asian Countries' currencies appreciated during the first and second phases of FED's quantitative easing purchases. Glick and Leduc (2013) also indicate that U.S. dollar depreciate against other currencies due to the

monetary policy surprises of FED. On the other hand, results are supported by Barroso et al (2016) indicating that FED's unconventional monetary policy has significant and positive effects on Brazilian exchange rates.

Policy Rate Difference. The results indicates that policy rate difference decreases generally due to the unconventional monetary policy announcements. However, policy interest rate difference is affected mostly by the final announcement described as Event 8. Although first phase of QE have not significant impacts on the policy rate difference in general, policy rate difference became narrower after QE2. The findings are parallel with the results of Ahmed and Zlate (2014) stating that interest rate differences between central banks explain the capital private inflows to emerging countries.

VIX. When FED announced to start purchasing of mortgage market papers (Event 1) and longer term securities (Event 2) at the first time, VIX responded very significantly. On the other hand, VIX decreased significantly when FED announced to start purchasing of additional securities (Event 5) at the end of 2010. Therefore, it can be stated that FED's unconventional monetary policy announcements result in decrease in the market volatility during the second phase of QE. The results similar to Fratzscher et al (2016) who indicate that policy announcements mainly cause a portfolio rebalancing into more risky segments in the U.S. during the first phase..

CDS of Turkey. When FED announced to start unconventional monetary policy at first time (Event 1), the CDS increased significantly. It is not in line with Chen et al (2011) who indicate that announcements of first phase of QE significantly reduce emerging Asian CDSs. On the other hand, CDS level decreases as a result the third phase announcements of QE, which in line with Chen et al (2011).

EMBI_All. Reactions of EMBI to announcements are very similar to that of VIX. As presented at Figure 25, the first phase QE announcements resulted in increase in the EMBI significantly. On the other hand, EMBI was negatively affected from the announcements of the third phase of QE. The results imply that the EMBI decreases as a result of FED's unconventional monetary announcements. However, results are not similar to Hayo et al

(2012) who indicate an ascending EMBIG spread implies moving capital into equity markets in times of higher bond returns.

EMBI_Turkey. Similar to the EMBI_All, first two (Event 1 and 2) announcements of FED result in increased EMBI_Turkey. The announcements of third phase QE negatively and significantly affect EMBI_Turkey. Therefore, it can be stated that EMBI_Turkey increases as a result of first phase QE announcements and decreases third phase QE announcements. As emerging market financial indicators are expected to be adversely affected by QE1 and positively affected by QE2, the results are not as expected.

The results of the event study support the argument that the FED's unconventional monetary policy announcements have significant effects on the selected indicators of Turkey. On the other hand, the significance levels and the signs of financial indicators vary according to the QE phases. In general, as a result of the announcements during the first phase of FED's unconventional monetary policy, the level of external borrowings and the leverage of Turkish banks decrease. According to the literature, FED's first phase announcements have positive effects on financials of U.S., however negative on emerging countries. On the other hand, Turkish banks' external borrowing level and external borrowing leverage ratio increase during the second phase of QE. The results are also in line with the literature indicating that FED's second phase of QE has positive effects on the financials of emerging countries. On the other hand, the effects on other selected variables are mixed.

5.4 REGRESSION ANALYSIS

Although event study method is one of the most widely used empirical method for analyzing the effects of FED's unconventional monetary policy surprises on various asset classes of emerging countries, regression analysis are employed by several scholars as well. In this respect, we also used regression analysis to measure the effects of the FED's unconventional monetary policy and CBRT's ROM facility on Turkish banks' external borrowings. In this section, after giving a brief information regarding the works in which regression analysis is used, a regression model is set up and its results is presented.

One of the first regression analyzes regarding FED's unconventional monetary policy is done by Valente (2009) who uses regression analysis to investigate how the US, Hong Kong and Singapore interest rates respond to FED's monetary policy announcements. On the other hand, using regression analysis is intensified after 2012. Later, Glick and Leduc (2012) use regression analysis as a supplementary to their event study when investigating the effects of FED's and BoE's asset purchases on long-term interest rates, exchange rates and commodity prices of selected countries. Moreover, Moore et al (2013) measure the impacts of the FED's asset purchases on sovereign yields of selected emerging countries by regression analysis and an event study. Ahmed and Zlate (2013) employ regression analysis when studying the main determinants of net private capital inflows to emerging countries with the focus of central banks' actions.

Lim and Mohapatra (2016) search the effects of the policy actions of developed countries' central banks on developing countries by using regression analysis. Fratzscher et al (2016) work with regression analysis including dummy variables representing surprise component of the FED's announcements when analyzing how FED's asset purchase program does affect the portfolio inflows to selected countries. Lim et al (2014) use a panel regression model to investigate how the quantitative easing policies of the FED and other developed countries' central banks do affect the gross financial inflows to developing countries. Furthermore, Bauer and Neely (2014) prefer to use regression analysis to investigate how FED's large scale asset purchases affected domestic and international bond yields through signaling and portfolio balance channels. Korniyenko and Loukoianova

(2015) employ a time series regression analysis to examine the unconventional monetary policy measures implemented by FED, BoE, ECB and BoJ on global monetary and liquidity.

Moreover, some scholars prefer to use regression analysis for a supplementary analysis to their main empirical models. For example although Lo Duca et al (2016) prefer to use a Tobit equation when quantifying the effects of FED's asset purchases on the global non-financial corporate bond issuance, they use regression analysis to support their main findings. Chen et al (2014) work with regression analysis in addition to event study to demonstrate the effects of U.S. monetary policy shocks on capital flows and asset prices in emerging countries.

Therefore, it is very clear that when it comes to measure the effects of the central banks' policy changes on other countries' selected asset classes, regression analysis is used as supplementary tool. In this subsection, after constructing linear regression model to test the relationship between Turkish banks' external borrowings with FED's unconventional monetary policy asset purchases and CBRT's ROM facility and, test results are interpreted.

5.4.1 Regression Model

To conduct empirical analysis, a linear regression model is set up similar to Ahmed and Zlate (2013), Cerutti et al (2014), Chung et al (2014), Korniyenko and Loukianova (2015)) The baseline model is;

$$DEBT_t = \alpha + \beta FED + \gamma ROM + \delta X + \varepsilon \quad \text{Equation 6}$$

where *Debt* stands for external borrowing level of Turkish banks in billions of the U.S. dollar, *ROM* denotes ROM utilization level of Turkish banks in billions of the U.S. dollar. α , β , γ , and δ are the parameters to be estimated and ε represents the residual component of the model.

Moreover, *X* denotes a vector of control variables. The *X* vector is composed according to the literature review stated above. The variables are;

$$X = \begin{pmatrix} X_1 \\ X_2 \\ X_3 \\ X_4 \end{pmatrix} = \begin{pmatrix} DIF \\ VIX \\ FX \\ GR \end{pmatrix}$$

Equation 7

where interest rate differences respect to US is *DIF*; volatility index is *VIX*; USDTRY exchange rates is *FX*; and the dummy variable that represent investment grade criterion of Turkey is *GR*. While investors invest in a country, they prefer that the country receives investment grade from at least one credit rating agency. Generally, if a country has investment grades from two of the three credit rating agencies, that country will be placed on investment radars of the most of the investors and funds managements globally. Therefore, investment grade criterion is included to the model as a dummy variable. The dummy variable's value is "1" if Turkey receives at least two investment grades from the three rating agencies at a given month, otherwise zero. *Using investment grade or credit rating of country such a way as one of the explanatory variables in the model when analyzing policy effects is one of the contributions of this work.*

The empirical model is formulized as Equation 8 based on Equations 6 and Equation 7.

$$DEBT_t = \alpha + \beta FED_{t-2} + \gamma ROM_{t-2} + \delta_1 DIF_{t-2} + \delta_2 VIX + \delta_3 USDTRY + \delta_4 GR_{t-2}$$

Equation 8

According to literature, it is expected that there are positive and significant relationships between FED's unconventional monetary policy asset purchases and ROM utilization, and the external borrowings of Turkish banks. On the other hand, we expect negative relationship between VIX and the level of the external borrowing of Turkish banks. If global risk appetite decreases (higher VIX), investors become less willing to lend abroad. Therefore, the external borrowing level of Turkish banks is expected to be adversely affected by the increase of the VIX.

On the other hand, the results regarding to exchange rates and interest rate difference are contradictory. USDTRY exchange rate may increase the cost of external borrowing becomes more costly, which force Turkish banks to decrease their external borrowing limits. However, depreciation in a currency may encourage lenders abroad to lend as well. As the interest rate difference increases, the cost of the external borrowing increases, which makes the external borrowing more costly and discourages banks to borrow externally. On the other hand, higher interest rate difference offer higher returns to the foreign investors. Domestic banks may increase their external borrowings by borrowing from risk taker investors seeking higher returns.

5.4.2 Regression Results

At the first stage of the regression analysis, the base model presented in Equation 8 is run and its empirical statistics interpreted. Later, the residuals and the variables of the base model is checked.

5.4.2.1 Base Model

The regression results of the base model explains the 96% of the external borrowing of Turkish banks, which is very high. Moreover, except for the CDS, all of the independent variables are statistically significant according to the t-values with 5% significance level. The model results are presented at Table 6 below.

As the FED's balance sheet grows as a result of its asset purchases, the level of the Turkish Banks' external borrowing increases due to the increased level of U.S. dollar liquidity in global market. As indicated before, it is assumed that there is a relationship exists between CBRT's ROM facility and Turkish banks' external borrowings, which is supported by the model results with high level of t-statistics. As interest rate difference between Turkey vis-a-vis the U.S. increases the external borrowing of Turkish Banks decreases. Wider difference indicates higher level of risk and borrowing costs. The coefficient of the USDTRY foreign exchange rate is negative, which indicates that as Turkish lira depreciates the external borrowing of the banks decreases. When Turkey's investment grade criterion equals to one, the cost of the external borrowing decreases and the external borrowing level

of Turkish banks increases. As higher level of VIX indicates lower level of global risk appetite, the external borrowing of Turkish banks is expected to decrease. However, the results do not support expectation.

Table 6 Test Results of the Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	32.98513	3.937423	8.377341	0.0000
FED's Balance Sheet*	0.008037	0.001217	6.604823	0.0000
Reserve Option Mechanism*	0.904421	0.095750	9.445599	0.0000
Interest Rate Difference*	-16.21388	24.17262	-0.670754	0.5036
VIX	0.082526	0.065959	1.251161	0.2132
USDTRY Rates	-10.22061	2.241694	-4.559324	0.0000
Investment Grade Criterion*	5.148278	2.186337	2.354751	0.0201
R-squared	0.950919	Mean dependent var.		50.01258
Adjusted R-squared	0.948582	S.D. dependent var.		22.48117
S.E. of regression	5.097721	Akaike info criterion		6.146660
Log likelihood	-401.7529	Schwarz criterion		6.298784
F-statistic	406.8665	Hannan-Quinn criterion		6.208478
Prob(F-statistic)	0.000000	Durbin-Watson stat.		0.221892

*with two lags

The fitted derived from Equation 8 and actual external borrowing levels of Turkish banks are compared at the Figure 26 below. Before 2011, the model does not explain the external borrowing level of the Turkish banks very well. However, after the introduction of the ROM facility at the middle of 2011, the base model explains better the external borrowings.

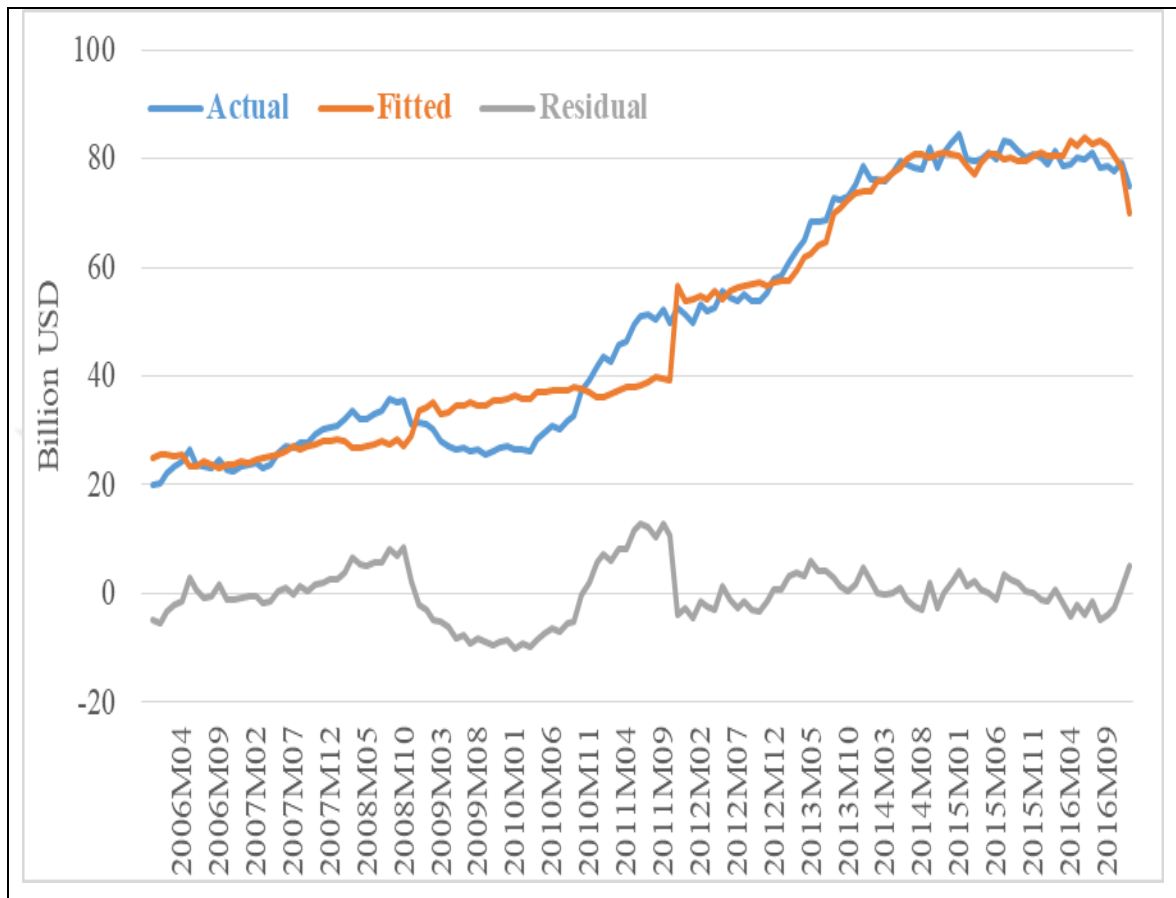


Figure 26 Actual, OLS Fitted and Residuals

On the other hand, the high level of adjusted R^2 and near zero Durbin Watson create necessity to control the residuals for normality, correlation and heteroscedasticity, and variables for stationarity.

According to the Jarque-Bera test, the model residuals are normally distributed as presented Figure 27 below. Therefore, there is no need to modify the model setup in regards to normality.

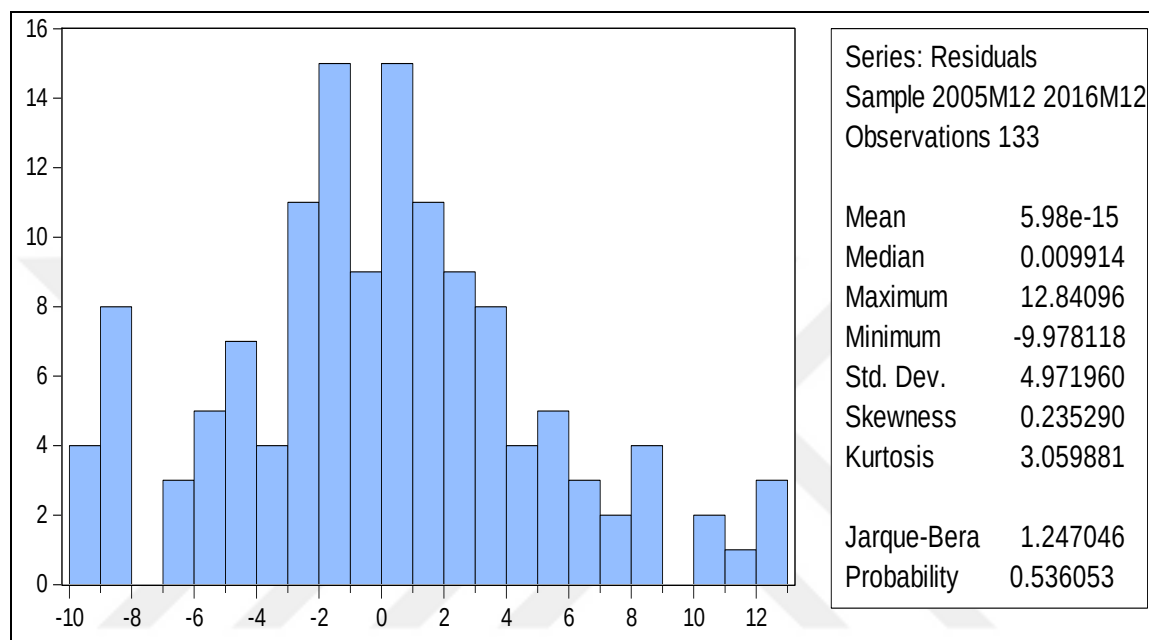


Figure 27 Residuals' Jarque-Bera Test Results

Secondly, we employ Breusch-Godfrey Serial Correlation LM test to investigate whether there is the serial correlation within the model. The test results are presented at the Table 7 below. The test results indicate that serial correlation exists with the reference numbers of p-stats.

Table 7 Breusch-Godfrey Serial Correlation LM Test Results

F-statistic	246.3232	Prob. F(2,123)	0.0000
Obs*R-squared	106.4279	Prob. Chi-Square(2)	0.0000

Finally, to test the heteroscedasticity, Breusch-Pagan-Godfrey test with two lags is employed. According to the results presented Table 8, the residuals are not homoscedastic.

Table 8 Heteroscedasticity Test: Breusch-Pagan-Godfrey

F-statistic	26.58109	Prob. F(7,125)	0.0000
Obs*R-squared	79.55503	Prob. Chi-Square(7)	0.0000
Scaled explained SS	72.37633	Prob. Chi-Square(7)	0.0000

After testing the residuals for normality, correlation and heteroscedasticity, it is necessary to test all of the variables for stationarity. As it is presented at Table 9, almost all of the variables have unit root according to Augmented Dicey-Fuller test statistics at the first differences.

Table 9 Augmented Dickey-Fuller Test Statistics of Variables

	Probability*	First Diff
FED's Balance Sheet	0.8645	0.0000
Reserve Option Mechanism	0.9426	0.0000
Interest Rate Difference	0.2234	0.0000
VIX	0.0141	0.0000
USDTRY Rates	0.9999	0.0000
Investment Grade Criterion	0.5066	0.0000
Residuals	0.0657	0.0000

*MacKinnon (1996) one sided p-values.

As a result of the tests of the residuals and variables, the residuals are normally distributed. However, when the residuals are checked for correlation and heteroscedasticity, the results show that there is serial correlation and heteroscedasticity among residuals. Having heteroscedasticity and correlation among the residuals do not affect being of the estimators unbiased. However, they affect the t and F tests and standard errors of the OLS model, respectively. Eventually, the standard errors of the variables may be lower and the t and F statistics may be higher. Those in turn artificially make the significance level of coefficients of the independent variables higher and may adversely affect the hypothesis tests. Moreover, most of the variables of the model has unit root problem. The test results indicate that the base model is not suitable to explain Turkish banks' external borrowings.

5.4.2.2 Modified Model

To have a model that is not has any issues regarding its residuals and variables is the prerequisite to show the relationship between FED's and CBRT's policy actions and Turkish banks external borrowings. Therefore, the base model is modified by using first differences of all the variables to imply regression analysis. The modified model is presented at Equation 9 below. Before demonstrating modified model's statistic results, it is critical to test the residuals against normality, correlation and heteroscedasticity.

$$\Delta(DEBT_t) = \alpha + \beta\Delta(FED_{t-2}) + \gamma\Delta(ROM_{t-2}) + \delta_1\Delta(DIF_{t-2}) + \delta_2\Delta VIX + \delta_3\Delta FX + \delta_4\Delta(GR_{t-2}) + \varepsilon$$

Equation 9

Jarque-Bera Test is preferred to test the normality of the residuals of the modified model presented at Equation 9. As depicted at the Figure 28, the residuals of the modified model are normally distributed.

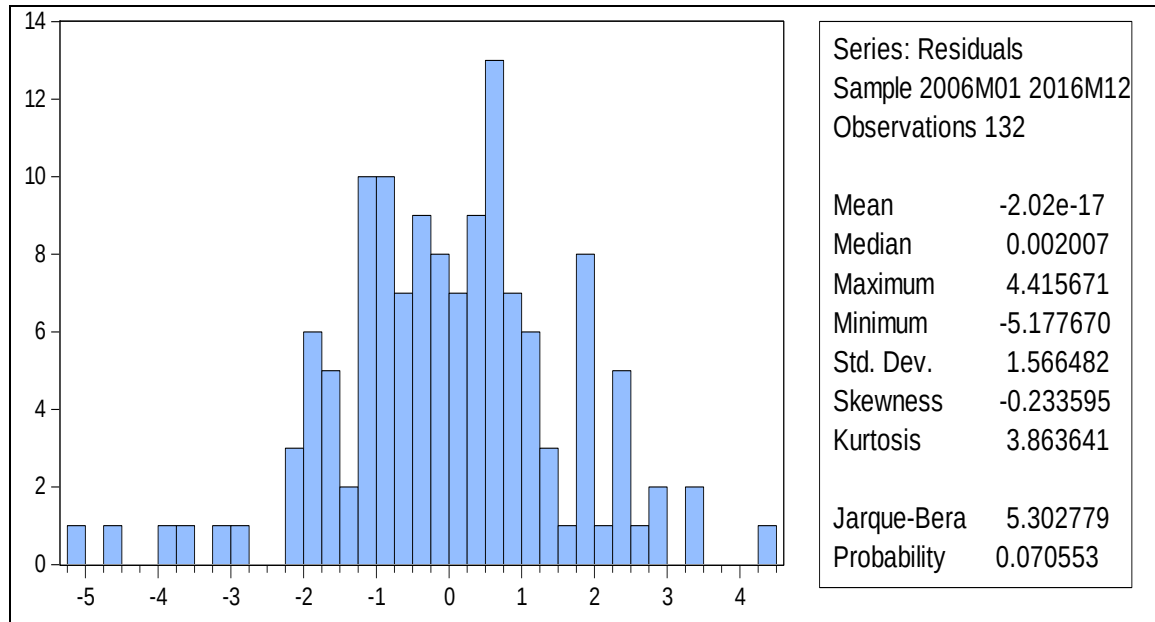


Figure 28 Residuals' Jarque-Bera Test Results of Modified Model

Moreover, the residuals of the modified model is tested for correlation. The Breusch-Godfrey Serial Correlation LM Test results for the modified model are presented below Table 10. The results indicate that there is no correlation among the residuals of the modified model.

Table 10 Breusch-Godfrey Serial Correlation LM Test Results

F-statistic	1.128191	Prob. F(2,123)	0.3269
Obs*R-squared	2.377863	Prob. Chi-Square(2)	0.3045

Furthermore, the residuals of the modified model are tested for the heteroscedasticity by using Breusch-Pagan-Godfrey test. The test results as presented Table 11 indicate that modified model's residuals are homoscedastic.

Table 11 Heteroscedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.041588	Prob. F(6,125)	0.4017
Obs*R-squared	6.285262	Prob. Chi-Square(6)	0.3920
Scaled explained SS	8.070197	Prob. Chi-Square(6)	0.2330

Finally, the residuals of the modified model are tested against stationary by using Augmented Dickey-Fuller Test statistics. As presented at the Table 12 below, residuals are stationary.

Table 12 Augmented Dickey-Fuller Test Statistics of Residuals

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-10.99525	0.0000
Test critical values: 1% level	-3.480818	
5% level	-2.883579	
10% level	-2.578601	

Null Hypothesis: Residuals has a unit root

After modifying the base model by using the first difference of the all variables and passing the tests of the residuals for normality, correlation and heteroscedasticity, the regression results of the modified model are presented at Table 13 below.

Table 13 Regression Test Results of the Modified Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	0.267813	0.152057	1.761260	0.0806
FED's Balance Sheet**	0.000902	0.001699	0.530758	0.5965
Reserve Option Mechanism**	0.150546	0.076595	1.965488	0.0516
Interest Rate Difference**	5.334921	13.93513	0.382840	0.7025
VIX	0.033710	0.032262	1.044866	0.2981
USDTRY Rates	4.643948	2.186920	2.123511	0.0357
Investment Grade Criterion**	3.751673	1.152285	3.255856	0.0015
R-squared	0.184269	Mean dependent var.		0.415009
Adjusted R-squared	0.145114	S.D. dependent var.		1.734411
S.E. of regression	1.603637	Akaike info criterion		3.833997
Sum squared resid	321.4563	Schwarz criterion		3.986873
Log likelihood	-246.0438	Hannan-Quinn criterion		3.896119
F-statistic	4.706145	Durbin-Watson stat		1.935286
Prob (F-statistic)	0.000237			

Table reports coefficient estimates of OLS regressions of one month change of external borrowing of banks. Significance level: %5

* All variables are used with their first difference.

** Second lags of the variables are used.

As a result of the modifications on the variables to have a robust model, we had to give up the explanatory power of the model. Therefore, the adjusted R^2 decreased to 14% from 95%. Moreover, the results of t-statistics of the variables have changes. The actual and fitted levels of the external borrowing levels of Turkish banks presented at Figure 29.

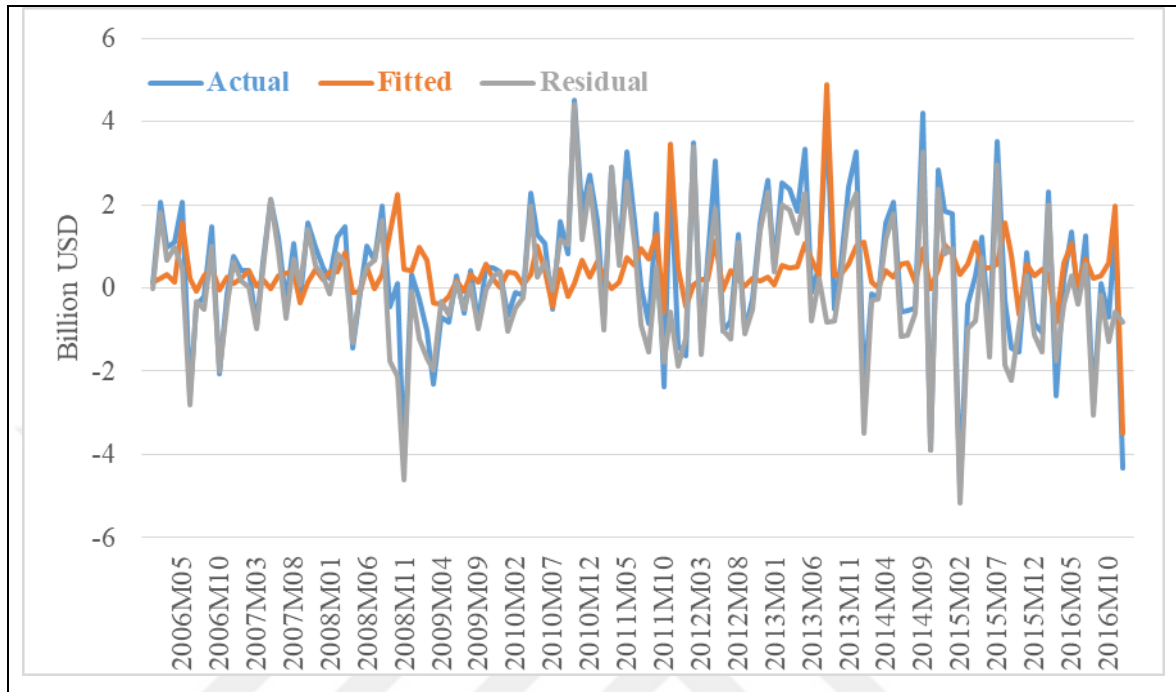


Figure 29 Actual, OLS Fitted and Residuals

5.4.3 Main Findings

The regression model presented Equation 9 provides us satisfactory expected results in terms of the expectations and literatures, respectively. FED's unconventional monetary policy actions and thus balance sheet expansion and CBRT's ROM facility have positive affect on the banks' external borrowing levels. On the other hand, surprisingly the ROM facility had statistically the more significant independent variable in both base model and modified model compared to the FED's balance sheet expansion. Therefore, it may be interpreted that CBRT's ROM facility has stronger effects on external borrowings of Turkish banks than that of FED's asset purchases unintentionally. Moreover, to having investment grade from two of the major three credit rating agencies is one of the most important independent variables which drives banks to borrow externally thanks to FED maintaining low level of borrowing costs.

For the explanatory control variables, although the interest rate difference has not significant at the %5 level, the sign of the coefficient of the variable is as expected. Moreover, investment grade criterion of Turkey has positive coefficient as expected and is the most

significant factor of the external borrowing of the banks. Therefore, it can be said that when Turkey has investment grades from two of the three credit rating agencies, the level of the external borrowing of the banks increases. Additionally, when the policy interest rate difference becomes wider, the level of external borrowing increases due to the increasing return of the lenders abroad. Moreover, the relationship between exchange rates and capital flows is as expected. The modified test results indicate that the depreciated exchange rates has positive effect on the external borrowing of the banks. On the other hand, VIX do have neither expected sign nor the significant t-statistics according to the test results.

5.5 VAR

In addition to event study and regression analyses, VAR models are also used to measure FED's unconventional monetary policy's spillover effects on other countries. Therefore, whether or not FED's unconventional monetary policy and CBRT's ROM policy affected Turkish banks' external borrowings is investigated by using VAR in this part.

Although, VAR analyses have been widely used to analyze financial markets, it is not so common compared to event studies. The early VAR models generally focus on policy announcements and their effects on selected financials of emerging countries. One of the first studies regarding FED's unconventional monetary policy is done by Machowiak (2007) who identify the effects of FED's unconventional monetary policy on eight emerging countries including Hong Kong, Korea, Malaysia, Philippines, Singapore, Thailand, Chile and Mexico.

Bruno and Shin (2013) prefer an extended VAR to show the impacts of monetary policy actions on international capital flows. In their paper, Wei Ho et al (2014) employ a factor augmented (FA)-VAR model to study the effects of FED's monetary policy on the Chinese economy. Bauer and Neely (2014) use first-order Gaussian VAR model to decompose the changes in government bond yields on the announcement dates for selected countries. Moreover, Lim et al. (2014) set a VAR system in which they are comprising the various transmission channels to investigate how FED's unconventional monetary policy affect the gross financial flows into developing countries. Bhattarai et al. (2015) also employ Bayesian VAR model when quantifying the international effects of FED's quantitative easing policies. Bowman et al (2015) prefer to use VAR model to demonstrate the impacts of monetary policy decisions of developed countries' central banks on selected asset prices in emerging countries. Moreover, Tillman (2016) uses a Qual VAR to measure the effects of FED's announcements regarding unconventional monetary policy on selected variables of emerging countries. On the other hand, Chen et al. (2015) evaluate domestic and international effects of FED's unconventional monetary policies on the real and financial activities on emerging countries by using GVECM. When studying on the effects of FED's monetary policy announcements on emerging markets' equity markets, Hayo et al. (2012)

prefer to use a generalized autoregressive conditional heteroscedasticity model (GARCH) as an empirical model.

Moreover, there are several studies in which VAR is used as an addition to event studies. For example, after using event study, Chen et al. (2011) also prefer an estimated GVECM to explore the effects of FED's quantitative easing policies on the real activity in other economies. In addition to panel regression and event study analyses, Moore et al. (2013) use a VAR system to demonstrate the impacts of FED's asset purchase programs on yields in developing countries. Barroso et al. (2016) investigate the effects of FED's unconventional policies on Brazilian markets by using a structural VAR model supplementary to event study method. Therefore, as confirmed by the literature, after FED's unconventional monetary policy actions in 2008, VAR methodology has been one of the preferred empirical methods when analyzing the international effects of these policies on emerging countries. Therefore, in this section, a VAR model is set to measure the effects of FED's asset purchases and CBRT's ROM facility on external borrowings of Turkish Banks.

5.5.1 VECM or VAR

According to the literature review, some of the scholar prefer to use VECM rather than the VAR models as a result of their variables' preferences. As it is critical which model to be used, Johansen Co-integration test is run for the variables. We plan to use, external borrowing level of Turkish banks, USDTRY exchange rates, VIX, ROM utilization level and FED's balance sheet. As to see whether the variables moving together or not, nominal forms of variables are also used in the following section.

The Johansen Co-integration test results are displayed at Table 14 below. We prefer "Intercept (no trend) in CE and test VAR" and perform Trace and Maximum Eigenvalue Tests. The Trace (Panel a) and Maximum Eigenvalue (Panel b) statistics indicates that there are no co-integration at the 5% level.

Table 14 Johansen Co-integration Test Results of the Variables

a. Unrestricted Co-integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.160535	59.65079	69.81889	0.2462
At most 1	0.106714	36.90197	47.85613	0.3522
At most 2	0.085456	22.23162	29.79707	0.2858
At most 3	0.054477	10.61877	15.49471	0.2361
At most 4	0.025340	3.336619	3.841466	0.0677

Trace test indicates no cointegration at the 0.05 level

** denotes rejection of the hypothesis at the 0.05 level*

***MacKinnon-Haug-Michelis (1999) p-values*

b. Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.160535	22.74882	33.87687	0.5497
At most 1	0.106714	14.67035	27.58434	0.7738
At most 2	0.085456	11.61285	21.13162	0.5862
At most 3	0.054477	7.282153	14.26460	0.4563
At most 4	0.025340	3.336619	3.841466	0.0677

Max-eigenvalue test indicates no cointegration at the 0.05 level

** denotes rejection of the hypothesis at the 0.05 level*

***MacKinnon-Haug-Michelis (1999) p-values*

As indicated at the Johansen Co-integration Test results, the selected variables are not co-integrated. Therefore, there is no need to use Vector Error Correction (VEC) or nonstationary regression methods to estimate the co-integrating equation.

5.5.2 VAR System

To setup the VAR system, it is critical to demonstrate how FED's unconventional monetary policy and CBRT's ROM facility decisions transform to the external borrowing of Turkish banks. In the VAR system, when FED decreases monetary policy rates and injects liquidity to the market via large scale asset purchases at the same time; the cost of borrowing decreases, available liquidity level and risk appetite increases in the market. As a result of abundant liquidity and low yields in the U.S., the investors in the U.S. start to search for assets with higher yields. When asset yields in Turkey are higher, some part of the liquidity heads to assets in Turkey. As banks are assumed to have easier access to international fund markets, Turkish banks increase their external borrowings. In the meantime, CBRT introduces ROM facility to be utilized by the banks. In a period, due to abundant global liquidity and low level of borrowing costs due to FED's asset purchases and ROM facility, it is assumed that banks increased their external borrowing level.

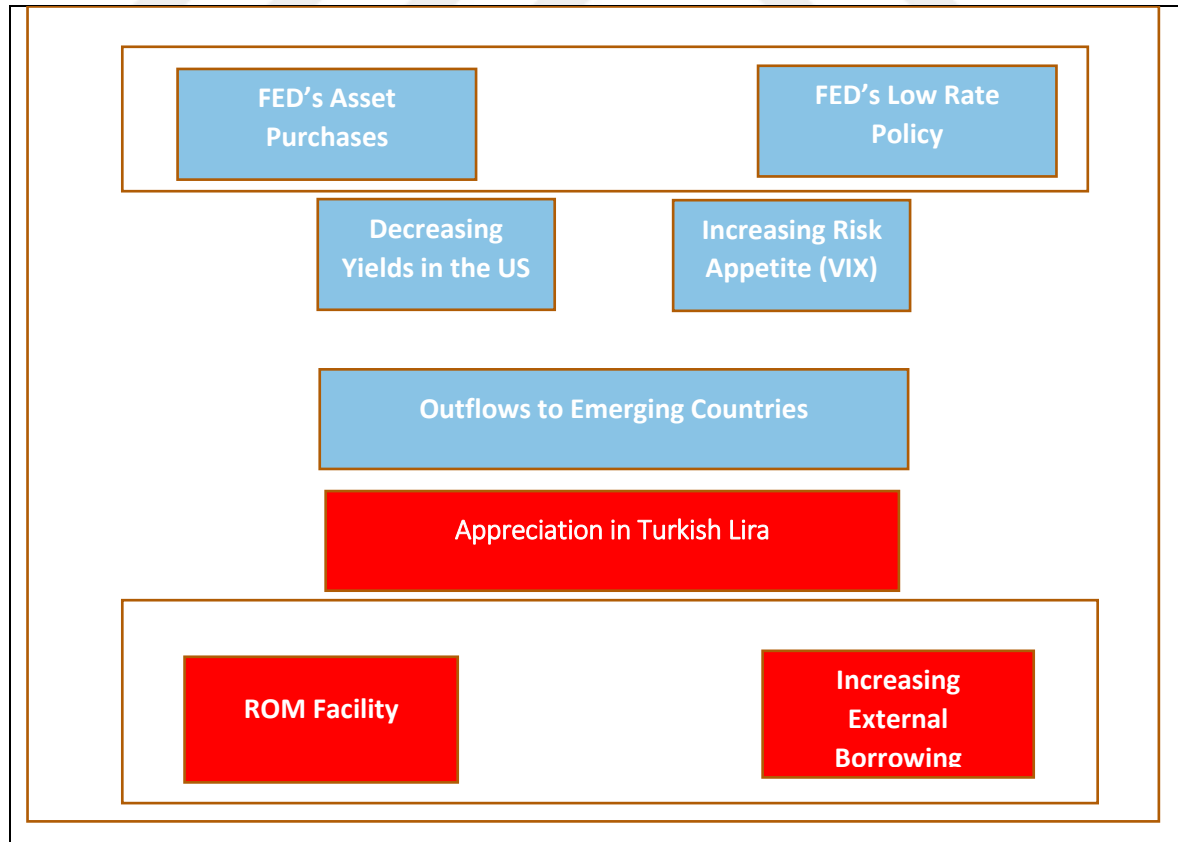


Figure 30 VAR System

All in all, it is assumed that Turkish banks may increase their external borrowings as a result of FED's asset purchases and CBRT's ROM facility. The VAR system that is prepared according to the logic above is depicted at the Figure 30. In the VAR models, the ordering of the variables may directly affect the ordering of the system is;

- (1) FED for FED's Balance Sheet
- (2) VIX for VIX
- (3) FX for USDTRY exchange rates
- (4) ROM for ROM facility
- (5) DEBT for External Borrowings of Turkish Banks

Similar to Brono and Shin (2013), to identify the impacts of the shocks, VAR system is set as follows:

$$T(L)y_t = \varepsilon_t$$

Equation 10

where $T(L)$ is a matrix of polynomial with a lag operator (L), y_t is an "n x 1" data vector. Moreover, ε_t is a vector of disturbances and serially not correlated. As stated in the order, it is a five variable VAR system and the Cholesky restrictions is employed.

After selecting endogenous variables and their orders in the system, it is important to check the system for autocorrelation and stationarity the system. As to have non-auto correlated residuals in the model, we prefer to use first differences of all endogenous variables. To test the correlation, we prefer to use the VAR residual serial correlation Lagrange Multiplier Test. As presented at Table 15, there are no autocorrelation among the residuals according to the test statistics.

Table 15 VAR Residual Serial Correlation

Lagrange Multiplier Test Results

Lags	LM-Stat	Prob
1	31.27220	0.1802
2	36.31735	0.0669
3	35.04131	0.0875
4	32.08079	0.1557
5	19.39832	0.7776
6	26.02153	0.4065

Probs from chi-square with 25 df.

After checking the system for the autocorrelation, it is important to perform the unit test for the model. The stability condition test results are presented at Table 16. According to the results, the eigenvalues are less than one and the formal test confirms no root lies outside the unit circle. Therefore, the VAR system satisfies the stability condition and is stationary.

Table 16 Stability Condition Test of VAR*

Root	Modulus
0.115229 - 0.290153i	0.312197
0.115229 + 0.290153i	0.312197
0.296742	0.296742
-0.208624	0.208624
0.067700	0.067700

**D(BSFED) D(VIX) D(USDTRY) D(ROM) D(DEBT) and C are Endogenous and exogenous variables, respectively.*

As FED's unconventional monetary actions are expected to have impacts on the selected variables with a certain lag, the VAR system is checked for the optimal lag structure as well. For deciding on the optimal lag order, we prefer to use common lag selection procedures. The lag order selection results of the selected procedures are presented at the Table 17. Although Schwarz information criterion does not suggest any lag, it is not applicable as the variables with no lag have autocorrelation. The majority of the remaining criteria including Akaike and Hannan-Quinn Information Criterion suggest using one lag for the VAR system. Therefore, as suggesting by the majority of the formal lag selection tests, using one lag in the VAR system is the optimum selection.

Table 17 VAR Lag Order Selection Results

Lag	LogL	Sequential modified LR test statistic	Final prediction error	Akaike information criterion	Schwarz information criterion	Hannan- Quinn information criterion
0	-1476.938	NA	7831.397	23.15528	23.26669*	23.20055
1	-1417.704	112.9155*	4588.581*	22.62037*	23.28881	22.89196*
2	-1399.268	33.70175	5093.310	22.72294	23.94843	23.22086
3	-1382.008	30.20507	5773.693	22.84388	24.62640	23.56813
4	-1365.024	28.39637	6599.148	22.96912	25.30867	23.91969
5	-1349.752	24.33893	7788.398	23.12113	26.01772	24.29803
6	-1327.970	33.01338	8359.163	23.17141	26.62504	24.57464

** indicates lag order selected by the criterion*

After finishing checking the stationary of the endogenous variables and autocorrelation among the residuals and selecting the optimum lag length according to test results, set up of the VAR system is completed. The results of the VAR system and the respond functions among the endogenous variables are interpreted at the next section.

5.5.3 VAR Results

The test results of the VAR system are presented in three steps in this section. After demonstrating statistical results of the VAR system, we discuss the impulse responses of the selected endogenous variables that follow a shock to latent FED's balance sheet expansion and CBRT's ROM facility. Finally, we decompose the forecast error variance into the contribution of the external borrowing level of the Turkish banks.

*Table 18 Estimates of the VAR System**

	D(FED)	D(VIX)	D(FX)	D(ROM)	D(DEBT)
D(FED(-1))	0.319422 (0.08107) [3.94011]	0.000119 (0.00527) [0.02262]	1.82E-05 (7.7E-05) [0.23676]	-0.001172 (0.00200) [-0.58712]	0.000738 (0.00159) [0.46493]
D(VIX(-1))	5.342897 (1.51395) [3.52910]	0.031576 (0.09845) [0.32075]	0.002267 (0.00144) [1.57835]	0.073706 (0.03727) [1.97743]	0.014584 (0.02966) [0.49170]
D(FX(-1))	-59.69680 (105.871) [-0.56386]	-9.801792 (6.88444) [-1.42376]	0.049494 (0.10042) [0.49287]	-1.885766 (2.60654) [-0.72347]	-13.59879 (2.07410) [-6.55647]
D(ROM(-1))	-2.433652 (3.61498) [-0.67321]	-0.518503 (0.23507) [-2.20574]	-0.007467 (0.00343) [-2.17777]	-0.064294 (0.08900) [-0.72240]	-0.054480 (0.07082) [-0.76927]
D(DEB(-1))	1.914635 (4.09578) [0.46747]	0.562109 (0.26633) [2.11054]	0.002356 (0.00388) [0.60639]	-0.137384 (0.10084) [-1.36242]	0.050079 (0.08024) [0.62412]
C	19.49447 (7.29720) [2.67150]	0.059928 (0.47451) [0.12629]	0.016309 (0.00692) [2.35629]	0.439900 (0.17966) [2.44855]	0.605491 (0.14296) [4.23544]

R-squared	0.240495	0.075073	0.067071	0.045149	0.296607
Adj. R-squared	0.210593	0.038658	0.030341	0.007557	0.268914
Sum sq. resids	722569.4	3055.349	0.650097	437.9800	277.3220
S.E. equation	75.42892	4.904882	0.071546	1.857057	1.477714
F-statistic	8.042836	2.061624	1.826070	1.201017	10.71067
Log likelihood	-760.6334	-397.1498	165.1266	-267.9751	-237.5850
Akaike AIC	11.52832	6.062402	-2.392881	4.119927	3.662933
Schwarz SC	11.65871	6.192794	-2.262489	4.250318	3.793324
Mean dependent	27.30997	0.007820	0.016313	0.293619	0.418311
S.D. dependent	84.89605	5.002530	0.072657	1.864114	1.728248

* all endogenous variables with first difference and one lag. Standard errors in () & t-statistics in []

The auto regression estimates of the VAR system is presented Table 18. According to the results, the most significant variable that explains external borrowing of Turkish banks' is USDTRY exchange rates which adversely affects external borrowing of Turkish banks. As a whole the model explains 24 percent of the debt level.

5.5.3.1 Impulse Response Analysis

As mainly the study focus on the FED policy actions, ROM and the external borrowing level of the banks, only these variables' responses are interpreted. After uncovering the latent variables and estimating VAR parameters, impulse response functions can be derived. For this purposes, the impulse response functions of all endogenous variables are separated into ROM and FED's unconventional monetary actions.

Monthly and cumulative responses of the endogenous variables to a one standard deviation shock to the latent FED's balance sheet are presented at Figure 31. As FED's asset purchases have indirect impacts on the global risk appetite, VIX immediately and sharply increases as a response to a shock of FED's asset purchases. However, the effect fades away after 2 months and goes negative after third month. Similar to VIX, the USDTRY exchange rate increases and normalizes after fifth month in response to FED's asset purchases. However, the magnitude is smaller than that of VIX. As expected, the response of external borrowing level of Turkish banks to FED's asset purchases is positive at first month, but later decreases and hits below zero at the second month. As a whole, responses of the selected endogenous variables to the FED's asset purchases are high and positive at the first months.

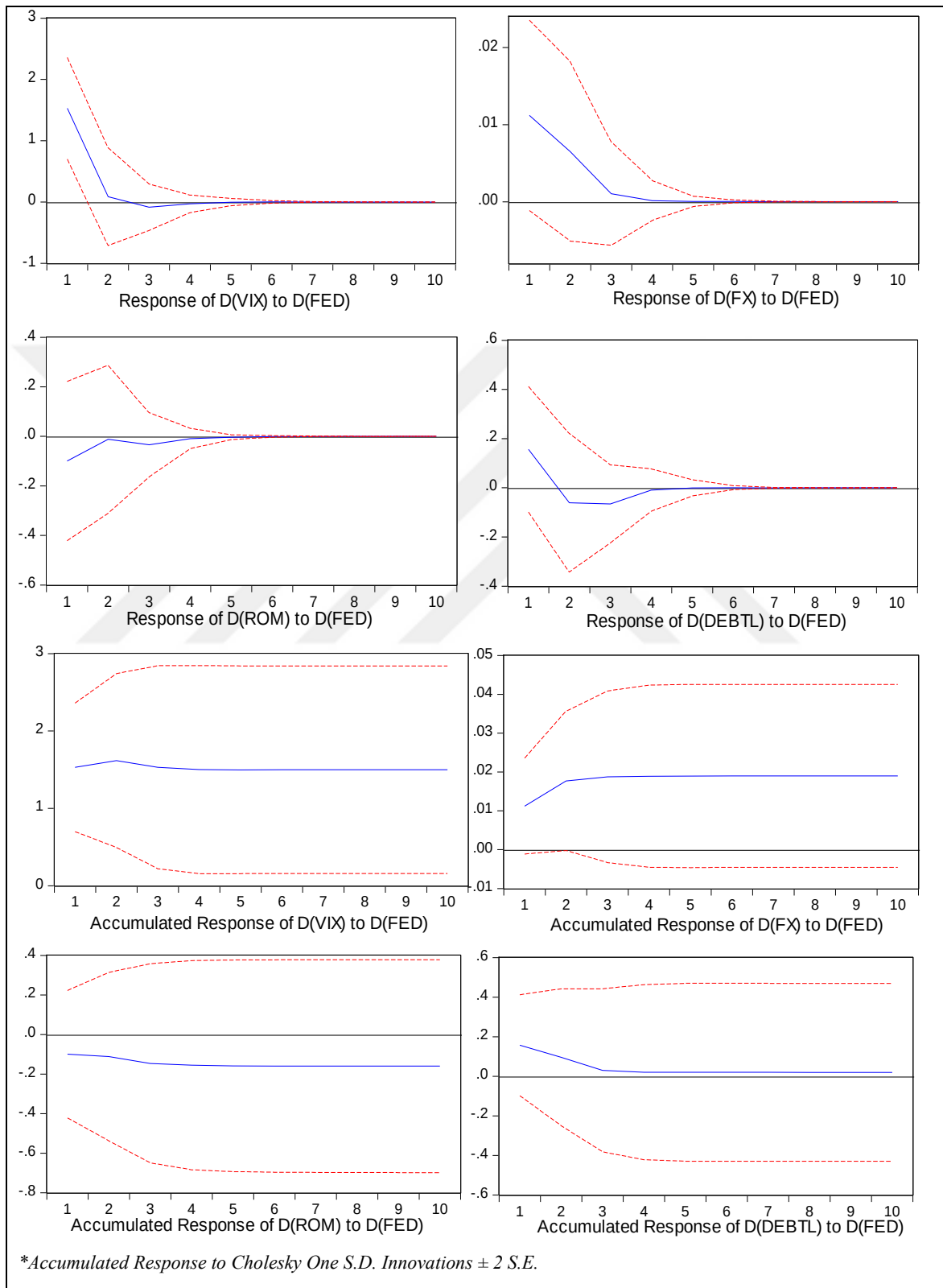
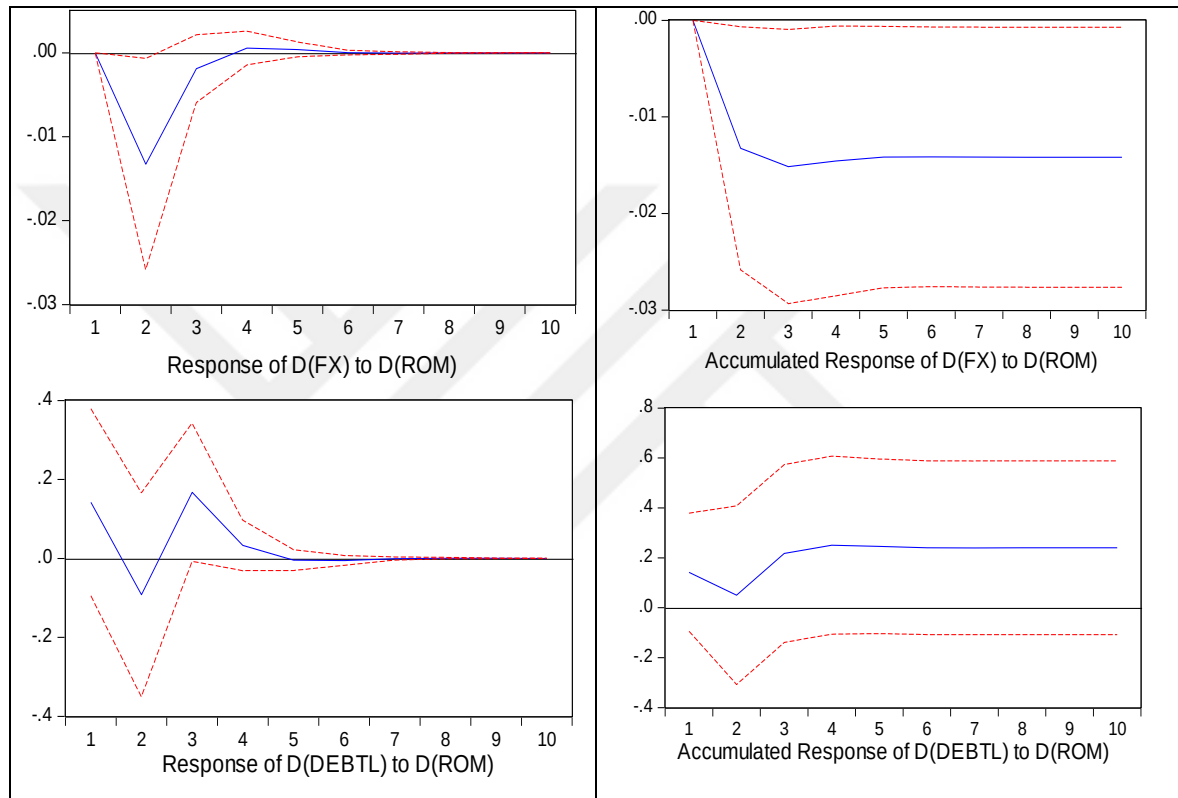


Figure 31 Responses to FED's Asset Purchases

In addition to the responses to FED's asset purchases, the responses of selected variables to ROM is measured as well. The monthly and cumulative responses are presented at Figure 32. USDTRY exchange rate decreases in response to a shock in the ROM. Moreover, external borrowing level increases in response to a shock in the ROM.



*Accumulated Response to Cholesky One S.D. Innovations ± 2 S.E.

Figure 32 Responses to CBRT's ROM*

All the impulse response functions demonstrate that both FED's balance sheet and ROM facility have strong and positive effects on the external borrowings of Turkish banks. A shock in FED's balance sheet or CBRT's ROM leads banks to increase their external borrowings. On the other hand, the ROM's effect lasts longer compare to the FED's effects.

5.5.3.2 Variance Decomposition

The VAR system presented in this section gives the opportunity to decompose the forecast error variances into the contribution to the external borrowings of Turkish banks. The decomposition gives the overall magnitude role of these variables for measuring the subtleties of the endogenous variables. The variance decomposition results of external borrowing of Turkish banks are presented at the Figure 33 and Table 19.

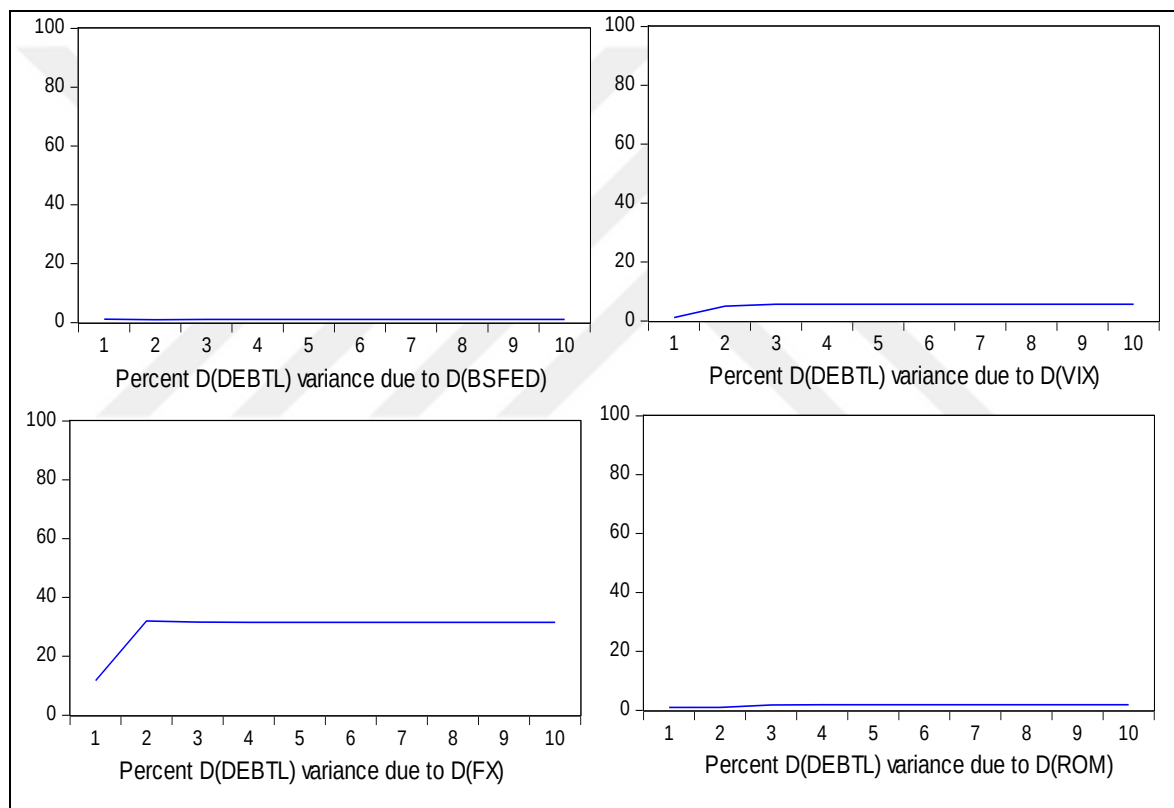


Figure 33 Variance Decomposition of External Borrowing of Turkish Banks

The variance decomposition results indicate that both FED's balance sheet and CBRT's ROM facility have limited effect on variance of the external borrowings of Turkish banks. On the other hand, USDTRY exchange rates has small effect on the first month while the effect increases in the following months.

Table 19 Variance Decomposition of External Borrowing of Turkish Banks

Period	S.E.	D(FED)	D(VIX)	D(FX)	D(ROM)	D(DEBT)
1	75.42892	1.123536	1.191225	11.78088	0.924389	84.97997
2	85.23653	0.927862	5.036025	32.00762	0.941206	61.08729
3	86.37176	1.048513	5.684569	31.60217	1.824040	59.84071
4	86.53863	1.050098	5.692971	31.56471	1.856456	59.83576
5	86.56091	1.049815	5.699187	31.57470	1.856616	59.81968
6	86.56218	1.049798	5.699255	31.57467	1.857478	59.81880
7	86.56224	1.049799	5.699296	31.57464	1.857489	59.81877
8	86.56225	1.049800	5.699302	31.57465	1.857492	59.81876
9	86.56225	1.049800	5.699302	31.57464	1.857492	59.81876
10	86.56225	1.049800	5.699302	31.57464	1.857492	59.81876

5.5.4 Impulse Responses with Level Data

After finishing the VAR system in which the variables are used with their first differences, a supplementary exercise with level data is performed with the same VAR system at this subsection.

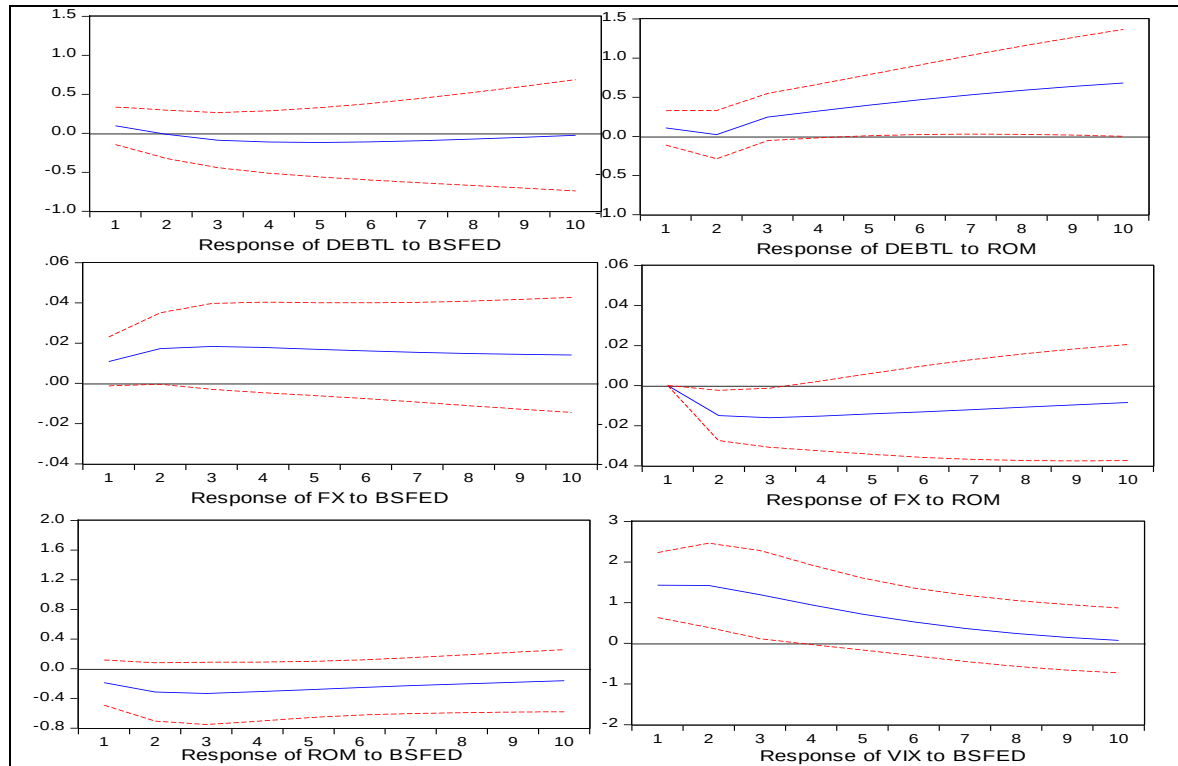


Figure 34 Impulse Responses to CBRT's ROM and FED's Asset Purchases

External borrowings of Turkish banks respond to CBRT's ROM facility very high after 2nd month and continue until 10th month. The results are similar to the regression model's results. On the other hand, the external borrowings of Turkish banks do not respond to the FED's large scale asset purchases as expected.

5.5.5 Main Findings

In general, the VAR system explains whether external borrowings of Turkish banks are affected in a system of endogenous variables. According to the system, both FED's balance sheet and ROM facility have positive effects on external borrowings of Turkish banks. On the other hand, the ROM's effect is higher and lasts longer compared to that of the FED's unconventional monetary policy.

6 CONCLUSION

At the end of 2008, the house market collapse in the U.S. forced FED to reduce its policy rates to near zero levels. However, the impacts of the collapse could not be mitigated only by conventional monetary policies of FED. At this stage, FED announced to purchase direct obligations and MBS of mortgage related Government Sponsored Enterprise's (GSE) (Fannie Mae, Freddie Mac, Ginnie Mae and the Federal Home Loan Banks) to rise stimulate again the economy. As the first stimulus package was not enough to heal the economy, FED expanded its purchases to include also long term Treasury securities. As a result of these large scale asset purchases, the balance sheet of the FED increased from 0,9 trillion U.S. dollar to 4,5 trillion U.S. dollar. By large scale asset purchases, FED targeted to reduce directly the yields on long term papers in order to lead the price of remaining securities in the market to increase and finally to lower the yields across a range of financial assets. The final and desired result of the large scale asset purchases in the secondary market was to increase investment and purchases of consumer durables, to appreciate the domestic currency and to increase in the prices of more risky assets. In this framework, purchasing large scale securities at the secondary market when policy rates are near zero level is generally called unconventional monetary policy.

On the other hand, the abundant amount of U.S. dollar liquidity due to FED's unconventional policy had some spillover effects on countries, especially on the emerging countries. Therefore, emerging countries had reached to cheap and abundant liquidity. One of the most important reasons of the inflows to the emerging countries was their positive interest rate difference with U.S.. Having easier access to the global fund market compared to real sector, financial institutions of emerging countries borrowed large portion of these funds especially during the second stage of QE. As financial institutions provided this funds to domestic corporates in their countries, their balance sheets also expanded.

During FED's unconventional monetary policy period, banks in Turkey became able to use foreign exchange for their Turkish lira reserve requirements with certain limits at the end of 2011, which was called ROM. As the cost of funding for Turkish lira was higher compared to U.S. dollar, the difference between the costs of funding encouraged banks to utilize ROM facility. Therefore, to reduce their Turkish lira holdings at CBRT, banks may have increased their foreign exchange borrowings abroad. Moreover, ROM may have resulted in a decrease in Turkish banks' cross-currency swap positions abroad and an increase in CBRT's foreign exchange reserve requirement accounts. Therefore, similar to FED's unconventional monetary policy, CBRT's ROM facility also affected banks' balance sheets.

The aim of this study is to demonstrate whether or not FED's unconventional monetary policy and CBRT's ROM policy affected external borrowings of Turkish banks. The effects of FED's unconventional monetary policy started in 2008 on other countries have been a topic for researchers since 2012. The researchers mainly prefer to use event study method to examine these effects. Although not as popular as event study analysis, regression analysis and VAR also employed for this purpose. In this study, all of these three methods employed to verify that FED's and CBRT's policy actions affected external borrowings of Turkish banks.

The event study results demonstrate that FED's announcements related to its unconventional monetary policy significantly affected Turkish banks' external borrowing levels and leverage ratios. On the other hand, these effects' extent differentiated depending on the phases of the quantitative easing. Turkish banks' external borrowing levels and leverage ratio were decreased during the first phase of FED's quantitative easing. On the other hand, external borrowing levels and leverage ratio of Turkish banks were increased during second phase of FED's quantitative easing. The results are in line with the results of other researches such as Chen et al. (2011).

In the regression analysis, FED's balance sheet and utilization of CBRT's ROM facility are assumed to be as the main determinants of the Turkish banks' external borrowing levels. In this respect, explaining external borrowing level of the Turkish banks by using

FED's balance sheet and CBRT's ROM facility is the main contribution of this study. In the model, VIX, monetary policy interest rate difference, USDTRY exchange rates and investment grade criterion are included as the control variables. According to the results of the model, although expansion in FED's balance sheet leads Turkish banks to increase their external borrowings, the effect is not statistically significant. On the other hand, the model indicates that there are positive relationship between ROM facility and Turkish banks' external borrowings. Among the control variables, investment grade criterion is the most effective factor impacting external borrowings of Turkish banks.

In the VAR system, when FED decreases its policy rates and injects liquidity to the market via large scale asset purchases at the same time; the cost of borrowing decreases, available liquidity and risk appetite increases in the market. As a result of abundant liquidity and low yields in the US, the investors in the U.S. start to search for assets with higher yields. When asset yields in Turkey are higher, some part of the liquidity is expected to head to assets in Turkey. As banks are assumed to have easier access to international fund markets, Turkish banks increase their external borrowings. In addition, the ROM facility is assumed to be another factor that may affect Turkish banks' external borrowings. In general, the VAR system explains how the external borrowings of the Turkish banks is determined in a system of endogenous variables. According to the system, both FED's balance sheet and ROM facility have positive effects on the external borrowing level of Turkish banks. On the other hand, the ROM's effect lasts longer compare to that of the FED's.

As a result of the study, it can be said that Turkish banks external borrowings are affected by FED's unconventional monetary policy. On the other hand, the magnitude and the direction of the effect differentiates according to the phases of FED's quantitative easing. As supported by the models, second phase of the quantitative easing encouraged Turkish banks to borrow abroad. Moreover, Turkish banks external borrowing levels are affected by the CBRT's ROM facility. In this respect, there are several contributions of the study.

There are several contributions of the study. Using both FED's balance sheet and CBRT's ROM facility in a VAR system; including an investment grade criterion in a

regression model; and explaining external borrowing levels and leverage ratios of Turkish banks with FED's balance sheet and CBTR's ROM are considered as the main contributions.

For the following study, the impacts of FED's unconventional monetary policy and its exit strategy on emerging countries would be studied by using panel data set.



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YAZARIN

Soyadı : YAMAN

Adı : Bülent

Bölümü : Bankacılık ve Finans

TEZİN ADI : Do FED's Unconventional Monetary Policy and CBRT's ROM Facility Affect Turkish Banks' External Borrowing?

TEZİN TÜRÜ : Yüksek Lisans

☐

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TEZİN KÜTÜPHANEYE TESLİM TARİHİ:

APPENDICES

A. CURRICULUM VITAE

B. TURKISH SUMMARY



A. CURRICULUM VITAE

Personal Information

Birth : 17 September 1973
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Phone(work) : +90 312 507 5230/5231
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Education

2013-- Yıldırım Beyazıt University, Ankara, Banking and Finance Dep. PhD candidate,
2003-05 Duquesne University, Pittsburgh, USA MBA, Finance (high honor)
1993-97 Marmara University, Istanbul, Turkey B.Sc. in Business Admin.

Work Experience

CBRT
Director
2015- Promoted as the Director of FX Markets Division. Key responsibilities: Manages all domestic FX market operations of the Central Bank of Turkey including direct FX interventions, spot market FX auctions, swap auctions, forward auctions, exporting/importing Turkish Lira banknotes to/from banks abroad, gold bullion buying and selling via Borsa Istanbul, collecting, analyzing and reporting FX market related information, preparing and presenting various reports to monetary policy committee, representing CBRT at international and domestic meetings.

CBRT
Specialist
(II Class)
2014 Promoted as Specialist (II Class) at FX Markets Division. Key responsibilities: Preparing various reports regarding FX market operations and developments for senior management team, Guiding his assistant specialists on the market operations,

CBRT Specialist (III Class) 2010-2014	Promoted as Specialist (III Class) to the FX Markets Division of the Markets Department. Key responsibilities: Buying and selling banknotes, Preparing various reports about the developments and expectations in the Turkish financial market, Guiding his assistant specialists on the market operations, Calculating and publishing Daily FX rates, Supply or withdraw FX to/from the markets through interventions and auctions
CBRT Specialist (V Class) 2009	Appointed to Money Markets Division of the Markets Department. Key responsibilities: Providing intraday or end of day credit to the banking system within the framework of its lender of last resort function, Forecasting banks' required reserve level of the banking system, Forecasting TL liquidity, rediscount and advance rates
CBRT Specialist (V Class) 2007-2008	Appointed to Treasury Operations Division of the Markets Department. Key responsibilities: Conducting government domestic borrowing auctions on behalf of the Treasury, Advising the Treasury on domestic borrowing issues, Forecasting general budget, Forecasting TL liquidity, Preparing yield curve analysis, Calculating un-traded Treasury borrowing instruments' values using NS models
CBRT Specialist (IIX Class) 2003-2007	Promoted after publishing his specialist dissertation as Specialist at Foreign Exchange and Banknotes Markets Division of the Markets Department. Key responsibilities: Buying and selling banknotes in the domestic market, Preparing various reports about the developments and expectations in the Turkish financial
CBRT Assistant Specialist 2000-2002	Worked as Assistant Specialist in the Foreign Exchange and Banknotes Markets Division of the Markets Department, Key responsibilities: Monitoring movements in domestic FX market as well as the emerging markets through electronic information systems (Reuters, Bloomberg), Importing and exporting Turkish Lira Banknotes from/to the correspondent banks in foreign countries.
CBRT Staff 1997-1999	Worked as a purchasing official in the Purchasing Department, which is responsible for purchasing every necessary material for the Bank. Key responsibilities: Preparing required reports related to the adjudications and companies, Preparing contracts and purchasing agreements for adjudications, Examining company documents attending to adjudications, Attending as a commission member to the Purchasing Commissions

Publications

“Do FED’s Quantitative Easing and CBRT’s ROM Facility Affect Turkish Banks’ External Borrowing” upcoming PhD dissertation thesis.

“Optimal versus adequate level of international reserves: evidence for Turkey” *Applied Economics*, 2005, vol. 37, issue 13, pages 1557-1569 with Suheyly Ozyildirim.

“*International Reserves and Reserve Adequacy and Optimum Level of International Reserves of Turkey*” Central Bank of Republic of Turkey, August 2002.
<http://www.tcmb.gov.tr/kutuphane/TURKCE/tezler/bulentyaman.pdf>

Technical Assistances as an External FX Market Expert

With CBRT;

- TRNC; “*Establishing Domestic Turkish Lira / Foreign Exchange Market*”, one week, 2007

With IMF;

- Albania; “*Domestic FX market analysis and diagnosis*”, two weeks, 2015
- Tunisia; “*Domestic FX market analysis, how to conduct interventions/auctions*”, two weeks, 2014
- Morocco; “*FX interventions/auctions and the process of transition from fixed exchange rate regime to floating*”, one week, 2014
- Indonesia; “*Developing and Deepening Indonesian Financial Markets, Including the Money and Foreign Exchange Markets, the Government and Corporate Bond Markets, and the Equity Market*”, two weeks, 2013
- Egypt; “*FX Auction and Intervention Processes*”, one week, 2012

Achievements and Projects

- General Coordinator, in creating the process of *“TL Settled FX and Swap Operations in Borsa Istanbul”*
- General Coordinator, in creating the process of *“TL Settled FX Forward Auctions”*
- General Coordinator, in creating the process of *“Gold buying against Turkish Lira”*
- General Coordinator, in creating the process of *“FX Deposits against Turkish Lira Deposit Auctions”*, 2016-2017
- General Coordinator, in facilitating and usage of *“Bilateral Swap Agreement between Central Bank of Turkey and Peoples’ Bank of China”*, 2011-2016
- Team Leader, in preparing *“Guideline of Noticed Foreign Exchange Accounts”* 2015
- General Coordinator, in designing *“Development of Market Data Dissemination System”*, 2014
- Team member, in preparing *“Guideline of Foreign Exchange Markets Guideline”* 2013-2015
- Department Coordinator, *“Redesigning of the Web Page of Central Bank of Turkey”* 2013
- Department Coordinator, *“Relationship with Data Provider Firms; Bloomberg and Reuters”* 2012-2014
- Team member, preparation of *“Total Volume of FX Transactions of Banks Against Turkish Lira”* statistic collecting system in 2002-2004
<http://www.tcmb.gov.tr/evds/pgm/dovef/DECEMBER2012.html>
- Team member, *“Urgent Liquidity Support Guide of CBRT”*
<http://www.tcmb.gov.tr/yeni/mevzuat/PIYASALAR/likidite.pdf>
- Team Member, *“Design and algorithm of FX Market and FX Auctions and Intervention IT Process”* 2001-2002

Certificates and Seminars

- Central Bank’s Financial Operations, CBRT, 2018 as presenter
- Central Bank’s Operations, IMF, 2018 as a lecturer
- Monetary and Exchange Rate Policy, JVI, 2013
- Analyzing Sovereign and Country Risk, S&P, 2012
- Exchange Rates and Capital Flows, Bank of England, 2010
- Public Debt Management, Bank de France, 2008
- Treasury Bond and Market Member Representative, BIST 2007
- Introduction to Futures and Options, IMF, January 2006

Additional Information

- A member of Vingly Club, Ankara
- A member of Cankaya “*Modern Arts Center*”, Ankara (Charcoal drawing and painting), present.
- Former Vice President of “*Business Administration Student Society*” in Marmara University, Istanbul, in 1994-1996.
- Served to the Turkish Army as the team leader of 17 and as the station chief of 105 soldiers at Caldiran, Van (the Turkey Iranian Border), in 1999-2000 (for 18 months)

TURKISH SUMMARY

2008 yılı sonunda baş gösteren ve ev piyasasındaki gelişmeler ile tetiklenen finansal krize, FED kısa sürede cevap vermek durumunda kalmıştır. Bu gelişmelere bir tepki olarak, tam istihdamı sağlamak ve enflasyon hedefini gerçekleştirmek için FED politika oranlarını önemli ölçüde azaltarak sıfıra yakın seviyelere getirmek durumunda kalmıştır. Faiz indirimleri piyasanın düzelmesinde etkili olmayınca, FED geleneksel olmayan para politikaları uygulamak zorunda kalmıştır.

Gecelik bankalararası faiz oranı, merkez bankalarının temel para politikası araçlarından biridir. Merkez bankaları bu araçla, kısa vadeli faiz oranlarının mevcut ve beklenen patikasını doğrudan etkilemeye ve böylece orta ve uzun vadeli faiz oranlarını etkilemeye çalışmaktadırlar. Piyasa koşullarına göre politika faiz oranlarının değiştirilmesinin yanı sıra likidite koşullarını yönetmek için de açık piyasa işlemleri kullanılmaktadır. Ancak, açık piyasa işlemleri genel olarak kısa vadeli olarak yapılmaktadır. Dolayısıyla, FED'in 2008 yılında başladığı, özel sektör ile Hazine kıymetlerinin yüksek miktarda satın alınarak faiz oranlarını etkilemeye çalışması sıklıkla kullanılan bir para politikası aracı değildir. Bu çerçevede, politika faiz oranlarının sıfır veya sıfıra yakın tutulduğu bir dönemde, ikincil piyasadan yüksek miktarlarda varlık alımı, geleneksel olmayan para politikası eylemleri olarak değerlendirilmektedir.

Varlık alımlarıyla, FED uzun vadeli menkul kıymet faiz oranlarının gerilemesini sağlamaya çalışmaktadır. Bu çerçevede; FED,

- konut finansman maliyetini azaltmak ve konut satın almak için kredi kullanılabilirliğini artırmak amacıyla; Fannie Mae, Freddie Mac ve the Federal Home Loan Banks'ın doğrudan yükümlülükleri için 175 milyar ABD doları ve Fannie Mae, Freddie Mac ve Ginnie Mae tarafından garanti edilen 1.25 trilyon ABD doları tutarında MBS satın almıştır.
- özel kredi piyasası koşullarını iyileştirmek için 300 milyar ABD dolarlık (Ocak 2009 - Ağustos 2010: Mart 2009'dan Ekim 2009'a kadar) uzun vadeli Hazine kıymeti satın almış, sonrasında 600 milyar ABD doları daha uzun vadeli Hazine kıymeti satın

alarak alımlarını artırmıştır. Aralık 2012'de vade uzatımı programının tamamlanmasını takiben, aylık 45 milyar ABD dolarlık uzun vadeli Hazine kıymeti almaya başlamıştır.

- 2012 yılı Eylül ayından itibaren aylık 40 milyar dolarlık ek MBS satın aldı.

Yukarıda bahsedilen büyük ölçekli kıymet alımlarının sonucunda FED'in bilançosu 0.9 trilyon dolardan 4.5 trilyon ABD doları rekor seviyelere yükselmiştir.

FED'in ülke ekonomisini tekrar ayağa kaldırmak için faizleri sıfıra yakın seviyeye indirmesine ek olarak yüksek miktartlı kıymet alımı ile piyasaya yaklaşık 3.6 trilyon ABD doları likidite sağlanmıştır. Bu likiditenin tümü ABD içinde kalmayıp dış ülkelere de geçiş yaptığı değerlendirilmektedir. Bunun temel nedenlerinden birisi diğer ülkelerde faiz oranlarının ABD ile karşılaştırıldığında oldukça yüksek kalması olarak gösterilmektedir.

FED'in geleneksel olmayan para politikasının diğer ülkeleri çok sayıda kanaldan etkilediği düşünülmekle birlikte, “portföy (denge) kanalı”, “likidite kanalı”, “sinyal kanalı”, “faiz oranı kanalı” ve “risk kanalı” en fazla atıfta bulunulan kanallardır. FED'in varlık alımları piyasadaki mevcut varlık seviyesini azalttığı için ilk ve en çok onaylanan kanal “Portföy (denge) Kanalı” olarak kabul edilmektedir. Finansal varlıklar, likidite ve risk seviyeleri gibi farklı özellikleri nedeniyle mükemmel bir şekilde ikame edilemese de, FED'in varlık alımları, portföy kanalının çalıştığı diğer varlık sınıflarının talebini ve fiyatını değiştirebilmektedir. Karşılanmamış risk iştahı, diğer varlıklara yönelmekte ve bu nedenle diğer riskli varlıkların fiyatlarının artmasına neden olmaktadır. Buradan hareketle, hem uzun vadeli hem de diğer ülke kâğıtlarına artan talep, yatırımcıların portföylerini yeniden dengelemesi olarak tanımlanmaktadır. Likidite kanalı ise şu şekilde çalışmaktadır. FED'in alımları iyi işleyen bir piyasada likiditeyi artırdığı için, likidite maliyeti azalırken varlık fiyatları da buna bağlı olarak düşmektedir. Likidite priminin düşmesi, daha önce likidite kısıtı olan bankaların kredi limitlerini artırmalarını sağlamaktadır. Bu ise, borçlanma maliyetlerinde düşüşe neden olurken, gelişmekte olan ülkelere borç verme dahil olmak üzere genel banka kredilerini artırır. Sinyal kanalına göre ise, merkez bankalarının duyuruları, piyasaya gelecekte uygulayacağı faiz oranlarının uzun bir süre daha düşük kalacağına ilişkin bir taahhüt olarak algılanmaktadır. Ayrıca, bu gibi bir sinyal, risklere ilişkin endişeleri de

azaltarak, hane halkı ve tüzel kişilerin piyasa algılarının daha olumluya dönmesini sağlamaktadır. “Faiz Kanalı”na göre, büyük ölçekli varlık alımları sonucunda uzun vadeli nominal ve reel faiz oranları azalmaktadır. Daha düşük faiz oranları hane halkı ve firmaların daha fazla borç almasını teşvik etmektedir. FED'in piyasadan satın aldığı uzun vadeli varlıklar, özel bankaların bilançolarının rezervlerinde artışa neden olmaktadır. Bu düşüş, daha önce likidite kısıtlı bankaların kredilerini yatırımcılara yaymalarını sağlayarak, borçlanma maliyetlerinde bir düşüşe ve gelişmekte olan ülkelere doğrudan borç verme ve belki de daha önemlisi, ticaret yoluyla dolaylı borç verme de dahil olmak üzere genel banka kredilerinin artmasına neden olmaktadır. “Risk kanalına” göreyse, FED ikincil piyasadan kıymet aldığı anda, yatırımcılar mülkiyetlerindeki varlıkların elden çıkarır veya azaltırken, özel sektör aynı anda kısa vadeli ve risksiz banka rezervlerinin miktarını artırır. Bu kanallar aracılığıyla, FED tarafından piyasaya verilen likiditenin bir kısmının Türk bankaları tarafından borçlanılarak kullanıldığı düşünülmektedir.

FED'in geleneksel olmayan para politikası ile piyasaya yüksek miktarda likidite sağlamanın yanı sıra, TCMB'nin 2011 yılı sonunda uygulamaya başladığı “Rezerv Opsiyon Mekanizması”nın da Türk bankalarının yurtdışından borçlanmalarını artıran diğer bir değişken olduğu düşünülmektedir. Bankalar ROM imkânları çerçevesinde Türk lirası zorunlu karşılıklarının belirli bir oranını döviz cinsinden TCMB’de tutabilmektedirler. Sistemde, rezerv opsiyon oranı (ROR) ve rezerv opsiyon katsayısı (ROC), bir birim Türk Lirası zorunlu karşılık için ne kadar döviz tutulabileceğini belirlemek için kullanılan iki ana parametredir. Türk lirası cinsinden zorunlu karşılıkların döviz cinsinden hesaplanmasında ROR, Türk Lirası başına yapılabilecek döviz cinsini belirlemek için ise ROC kullanılmaktadır. A Bankasının, Türk lirası yükümlülüklerini için 1.000 Türk lirası zorunlu karşılık tutacağını; ROR’un %80, ROC’un 1 (Bankalar TL karşılığı 1 Türk Lirası karşılığıdır) ve son olarak USDTRY döviz kurunun ise 4,0000 olduğunu farz edelim. Bu durumda, A Bankası, 1.000 Türk lirası zorunlu karşılık için (Türk Lirası tutulması gereken Türk lirası tutarı * ROR * ROC / USDTRY kuru = 1.000 * 0,80 * 1,00 / 4,0000) cinsinden 200 ABD doları tutabilmektedir. Bu durumda, A Bankası 1.000 Türk Lirası yerine 200 ABD doları ve 200 Türk Lirası ile Türk lirası cinsi zorunlu karşılık yükümlülüğünü yerine getirebilmektedir. ROM, bankalara Türk lirası koşullarının ana parçalarını yerine getirme ve

başka amaçlar için 800 Türk Lirası ek Türk Lirası likidite imkanı sunmaktadır. Faiz oranlarının ve likidite koşullarının döviz ve Türk Lirası için benzer olması durumunda, ROM tesisinin bankaların bilanço kalem tercihlerini değiştirmesi beklenmemektedir. Ancak, Türk lirası ve yabancı para için finansman maliyeti farklı olduğundan, özellikle de FED'in politika faizinin neredeyse sıfır olduğu geleneksel olmayan para politikası döneminde ROM'u kullanmak bankalar açısından önemli bir avantaj oluşturmaktadır. Dolayısıyla, ROM aslında pratikte TCMB ile yapılan bir döviz swap işlemi olarak kullanılmaktadır. Bunun sonucu olarak da bankalar ROM imkanının sunulmasından sonra ilk tepki olarak yurtdışı yerleşikler ile yaptıkları döviz swap işlemlerini azaltmışlardır. Swap etkisine ek olarak, söz konusu dönemde bankaların yabancı para cinsinden yurtdışından borçlanmaları artış göstermiştir.

Dolayısıyla, gerek FED'in geleneksel olmayan para politikası gerekse TCMB'nin ROM uygulamasının Türk bankalarının yurtdışından borçlanmalarını etkilediğine ilişkin bazı emareler dikkat çekmektedir. Bu çalışmada da söz konusu sav, ampirik metotlar ile test edilmektedir. Literatür taraması sonucunda 2008 yılında FED tarafından başlatılan geleneksel olmayan para politikası uygulamalarının diğer ülkelere olan etkilerine ilişkin çeşitli çalışmalar gerçekleştirildiği görülmektedir. Bu çalışmalarda kullanılan temel metot ise Olay Çalışmasıdır. Olay çalışması kadar sıklıkla kullanılmasa da regresyon analizi ve VAR modellemelerinin de kullanıldığı görülmektedir. Bu çerçevede, sav sırasıyla Olay Çalışması, Regresyon Analizi ve VAR ile sınanmıştır.

Olay Çalışması

Olay çalışmasının en temel faydası, her bir duyurunun veya politika adımının seçilen finansal büyüklükler üzerindeki etkisini ayrı ayrı sergileyebilmesidir. Bu çerçevede, FED'in geleneksel olmayan para politikası döneminde yaptığı duyurular ile adımların, Türk bankalarının yurt dışından borçlanmalarına etkisinin yanı sıra, diğer finansal büyüklüklere etkileri de incelenebilmiştir. Bu değişkenler; bankaların kaldıraç oranları, USDTRY döviz kuru, FED ile politika faiz farkı, VIX, Türkiye CDS'i ve EMBI olarak belirlenmiştir. Söz konusu verilerin belirlenmesinde bu konuda daha önce yayımlanmış çalışmalar esas alınmıştır.

Olay alışmasının sonuçları, Trk bankalarının yurtdışından borlanmalarının FED'in ilk dnemde geleneksel olmayan para politikasını duyuru ve adımlarından fazla etkilenmediğini gstermektedir. Diğerk taraftan, ikinci parasal genişleme dnemindeki duyuru ve adımların ise Trk bankalarının yurtdışından borlanma seviyeleri üzerinde etkisi daha yksek olmuştur. Diğerk bir ifadeyle, FED'in geleneksel olmayan para politikası uyguladığı dnemde yaptığı duyuru ve adımlar bankaların borlanmalarını artırıcı etkide bulunmuştur.

alışmada parasal genişlemenin dış borlanmalara etkisinin yanı sıra, diğerk bazı ekonomik gstergelere olan etkileri de incelenmiştir. rneğın, birinci parasal genişleme dneminin USDTRY kuru üzerinde olumlu etkilerinin olduđu grlmektedir. Buna gre, birinci dnemde Trk Lirası ABD doları karşısında nemli oranda değerk kaybet, gl bir şekilde teyit edilmese de ikinci dnemde değerk kazanmıştır. Birinci dnemde, FED ve TCMB politika faiz farkı (spread) fazla etkilenmese de, ikinci ve nc dnemlerde spread etkilenmiştir. Bu bulgu, merkez bankaları politika faizi farklılıklarının gelişmekte olan lkelere sermaye girişlerinde nemli bir değışken olduğunu belirten alışmalar ile uyumludur.

Olay alışması genel olarak değerklendirildiğinde, birinci dnemde yapılan geleneksel olmayan para politikası duyuru ve adımlarının Trk bankalarının yurtdışından borlanmalarını pek etkilemediği grlmektedir. Diğerk taraftan, ikinci dnemde piyasaya verilen likiditenin Trk bankalarının yurtdışından borlanmalarını artırmalarına neden olduđu değerklendirilmektedir.

Regresyon Analizi

Olay alışmasına ek olarak regresyon analizi de yapılmıştır. Kurulan modelde, Trk bankalarının yurtdışından borlanmaları bağımlı değışken olurken, FED'in bilano byklğ ile bankaların ROM kullanımları temel belirleyici bağımsız değışkenler olarak tanımlanmıştır. USDTRY dviz kuru, FED ve TCMB politika faizleri arasındaki fark, VIX, USDTRY dviz kuru ve kredi notu kriteri kukla kontrol değışkenleri olarak kullanılmıştır. Kredi notu kriteri 0 ve 1 değerklerini alan bir kukla değışkendir. Kriter, Trkiye'nin  uluslararası kredi derecelendirme kuruluşundan en az ikisinden yatırım yapılabilir notu

aldığı ay için 1, diğer aylar için 0 değerini almaktadır. FED'in geleneksel olmayan para politikası uygulamalarının diğer ülkelere yayılmasını inceleyen bazı çalışmalarda ülke notu kullanılsa da bu şekilde kullanıma rastlanmamıştır.

Söz konusu modelin OLS olarak açıklayıcı olabilmesi için tüm değişkenlerin bir aylık değişimleri kullanılmıştır. FED'in geleneksel olmayan para politikası adımları ve dolayısıyla bilanço genişlemesi ile TCMB'nin ROM kullanımı ile bankaların dış borçlanma seviyeleri aynı yönde hareket etmektedir. Öte yandan, regresyon sonucunda şaşırtıcı bir şekilde ROM kullanımının, FED'in bilanço genişlemesiyle karşılaştırıldığında, istatistiksel olarak daha anlamlı katsayılar vermektedir. Diğer taraftan, kredi notu kriteri, bankaların dış borçlanma davranışlarını etkileyen en önemli bağımsız değişkenlerden biridir. Model, sırasıyla, beklentiler ve literatür açısından tatmin edici ve beklenen sonuçlar vermektedir.

VAR Sistemi

Çalışmada son olarak FED'in geleneksel olmayan para politikası ile TCMB'nin ROM uygulamasının Türk bankalarının yurtdışından borçlanmaları üzerindeki etkisi irdelenmiştir. Bir VAR sistemi kurabilmek için, FED ve TCMB kararlarının Türk bankalarının dış borçlanmasına nasıl dönüştüğünü göstermek önemlidir. FED politika faizlerini düşürdüğü için, portföy başta olmak üzere çeşitli kanallar aracılığıyla borçlanma maliyetleri azalır. FED, aynı zamanda geleneksel olmayan bir yaklaşım olarak, ikincil piyasadan kıymet alarak; gerek piyasadaki yatırım yapılabilir varlık sayısını azaltır gerekse likiditeyi artırır. Portföyünde piyasaya enjekte edilen yüksek miktarda likidite olan yatırımcılardan bazıları, ABD'deki düşük getiri seviyesi ve yatırım yapılabilir varlık miktarının azalmasıyla yeni ve/veya daha yüksek getiri arayışına girerler. Türkiye'deki varlıkların getiri seviyesinin yüksek olduğu durumlarda, Türkiye'ye de taze fon girişleri başlar. Bankaların diğer sektörlerle nazaran yurtdışı fonlara erişimleri daha kolay ve düşük maliyetli olduğundan, yurt dışından borçlanmalarını artırmaları beklenmektedir. VAR sisteminde, ayrıca, TCMB ROM imkânının da, Türk bankalarını yurtdışından borçlanmasını bir ölçüde etkilediği farz edilmiştir. Dolayısıyla, VAR sistemine göre, hem FED'in bilançosu hem de TCMB'nin ROM uygulaması, Türk bankalarının dış borçlanma seviyesi üzerinde olumlu etkiler yaratmaktadır. VAR sonuçlarına göre, ROM'un bankaların yurtdışından

borçlanmaları üzerindeki etkisinin FED'in geleneksel olmayan politika adımlarına göre daha yüksek olduğu ve uzun sürdüğü ortaya çıkmaktadır. Ayrıca, bankaların dış borçlanma seviyeleri USDTRY döviz kuru ve VIX seviyelerinden de etkilenmektedir.

Çalışmanın tümü değerlendirildiğinde, FED'in piyasadaki ABD doları likiditesini rekor miktarda artırmasına yol açan geleneksel olmayan para politikasının, Türk bankalarının yurtdışından borçlanma davranışlarını etkilediği görülmekte olup, bu durum ampirik sonuçlarla desteklenmiştir. Öte yandan, etkinin büyüklüğü ve yönü politika adımlarının ne zaman ve ne şekilde yapıldığına göre farklılık göstermektedir. Buna göre, FED'in ikinci dönem geleneksel olmayan para politikası adımlarının Türk bankalarının borçlanma miktarlarını artırmaları ile sonuçlandığı görülmektedir. Ayrıca, TCMB'nin ROM uygulaması ile Türk bankalarının yurtdışından borçlanmaları arasında da pozitif bir ilişki olduğu değerlendirilmektedir. Yapılan ampirik çalışmalar arasında, olay çalışmasının beklentilere en yakın sonuçları verdiği görülmektedir, konu hakkında yapılan ve literatür bölümünde belirtilen diğer çalışmalar bu görüşü desteklemektedir.

Literatüre katkı açısından değerlendirildiğinde ise; (i) TCMB'nin ROM ve FED'in para politikası araçlarının regresyon ve VAR analizlerinde beraber kullanılarak Türk bankalarının yurtdışından borçlanmalarının açıklanmaya çalışılması, (ii) özgün bir kredi notu kriteri oluşturulması ve yurtdışından borçlanmaların irdelenmesinde kullanılması ve (iii) Türk bankalarının yurtdışından borçlanma seviyeleri ile kaldıraç oranının FED'in ve TCMB'nin politika adımları ile açıklanması temel katkılardır.

Bir sonraki çalışma için, FED'in geleneksel olmayan para politikası araçlarının gelişmekte olan ülke finansallarına etkileri, panel veri seti kullanılarak incelenecektir.