W P S (DEPR) : 19 / 2011

RBI WORKING PAPER SERIES

QE-II and FII inflows into India – Is there a Connection?

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OCTOBER 2011

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Abstract

Faced with near zero interest rates, monetary easing in the form of quantitative easing (QE) undertaken after the global financial crisis in many developed countries have added to global liquidity and are said to be fuelling massive capital flows into the Emerging Market Economies. In this context, this paper traces a brief history of QE and in this light analyzes the effect of Quantitative Easing-II in the US on FII inflows into the Indian Stock Market using daily data between March 2010 and June 2011 in a "before-after" setting. Results suggest that FII inflows have fallen after the November 3, 2010 announcement of the Fed. This finding can be explained using expectation factoring behaviour of market participants and developments in India and abroad.

JEL Classification Number: E52, E58, F32, O16

Keywords: Quantitative Easing, Monetary Policy, FII Inflows, Indian Stock Market

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I. Introduction

The recent global financial crisis brought about a sharp decline in economic activity and employment in most of the developed world. As a result, fiscal and monetary measures were undertaken in these nations to boost economic recovery. As part of monetary measures, central banks in some developed nations cut their policy interest rates and purchased long term securities. Faced with near zero interest rates, the United States of America and the United Kingdom undertook large scale purchase of longer term securities to aid faster economic growth.

The first phase of longer term asset purchase in the US was terminated on March 31, 2010, with about US $1.75 trillion worth of asset purchase by the Fed between November 2008 and March 2010. The unemployment rate, however, remained high enough to be inconsistent with the Federal Reserve's (Fed) congressionally mandated objectives of promoting full employment and price stability. By the autumn of 2010, there was enough evidence to suggest that the economic recovery has slowed down and that there was a considerable downward risk to inflation in the US.

In a bid to aid faster recovery and fight deflation, the Fed, on November 3, 2010, announced its purchase of additional US Treasury securities worth US $ 600 billion over an eight month period along with reinvestment of principal payments from agency debt and mortgage backed securities to the tune of US $250 billion - US $300 billion (Federal Reserve 2010b). This method of monetary easing by the Fed came to be commonly referred to as Quantitative Easing-II (QE-II) in popular parlance. It was widely believed in large part of the academia that QE-II would lead to increasing capital flows into the emerging market economies (EMEs), a rise in asset prices in the EMEs and a fall in the value in the US dollar (Ocampo 2010, Nachane 2010, Feldstein 2010, Jones and Gallagher 2011)

This paper seeks to explain FII inflows in terms of factors such as stock market returns, stock market volatility and interest rate differential among other factors and tries to discuss any change in FII behaviour after the announcement of QE-II. In particular, this paper tries to establish whether inflows in the form of net Foreign

Institutional Investments (FIIs) into India increased after the Fed's announcement on November 3, 2010.

The rest of the paper is organized as follows- Section II discusses the rationale, history and evidence of QE along with the existing concerns. In Section III, tools of analysis, data, empirical evidence and robustness checks are discussed. Section IV concludes the paper.

Section-II

i. Quantitative Easing: Rationale, History and Evidence

Conventional monetary policy usually operates through the interest rate channel in any economy. Central banks influence real variables in an economy by influencing the price and yields of financial assets through changes in the policy interest rate. However, when policy interest rates are approaching zero, interest rate as a policy variable becomes less potent to affect real variables positively as the transmission mechanism of monetary policy breaks down. This usually takes place in a deflationary scenario when the real interest rates become unusually high. As nominal interest rates cannot fall below zero and expected inflation is negative during a recession, the real interest rate tends to increase. [2] Increase in real interest rate makes borrowing by the corporate sector and households more expensive, thereby worsening the recession/deflation (Wieland 2009).

In such a scenario, reducing real interest rates is the objective of monetary policy. As reducing nominal interest rate to boost economic activity is not feasible because these rates are already near zero, the only solution that exists in this situation is to increase the inflationary expectations of economic agents by stimulating the economy through loose monetary policy at a fixed near zero policy interest rate

[2] $Real\ InterestRate = Nominal\ InterestRate - Expected\ Inflation$

(Krugman 2010). Bernanke *et.al* (2004) discuss three methods of monetary easing at the zero lower bound (ZLB) policy rates which include: i) shaping expectation on interest rate in the economy; ii) changing the composition of the central bank's balance sheet and iii) increasing the size of the central bank's balance sheet.

Central banks can shape interest rate expectations in an economy by issuing a commitment to maintain interest rates at a certain level for a certain period of time or until some pre-specified economic condition is achieved. Therefore, when policy interest rate is near zero, a central bank can commit to maintaining interest rates at near zero per cent till credible signs of economic recovery and inflation emerge. In this way any central bank can convey to the market participants that interest rates will be maintained at a low level until the economy recovers.

Central banks hold different kinds of assets on their balance sheet and can influence the interest rates in an economy by changing the composition of their balance sheets. Central banks, usually, are large players in the government securities market. Thus, at the zero lower bound, a central bank can reduce the yield on any security it deems necessary to stimulate the economy by purchasing more of it. This massive purchase raises the price of the security and consequently reduces the yields making borrowing cheaper. This method of monetary easing is commonly referred to as 'credit easing'. The main objective of this measure is to reduce liquidity premium and unfreeze credit markets in times of financial turmoil. Central banks can also increase the size of their balance sheets beyond what is necessary to keep the policy interest rate at zero by purchasing additional securities from the market (commonly called Quantitative Easing). This method of monetary easing works in a similar but not exact method as described above. As long as economic agents treat securities as imperfect substitutes for money, increasing the money holding by the public through purchase of securities will induce the public to diversify their holding of incremental money by buying different kinds of bonds thereby increasing the price and reducing the yields on those securities. Falling yields then lead to cheaper borrowing costs for households and corporates and boost spending in the economy thereby, bolstering economic growth.

In general, QE can be described as a process of injecting money directly into the economy by central banks *via* purchase of bonds from the market when there are downward risks to inflation at near zero policy interest rates (Bank of England 2010). Quantitative Easing as a tool of monetary policy at the zero lower bound does not have a particularly long history. The experiences of a few countries that have used QE as a policy tool are discussed below.

Japan

The Bank of Japan (BOJ) was the first Central Bank to employ QE to counter deflation risks. Extremely low economic growth rates for a great part of the 1990s and the economic downturn brought about by the dot com bubble crisis in 2000 prompted the Bank of Japan to undertake a Quantitative Easing Policy (QEP) in March 2001. Under QEP, the BOJ replaced the overnight call rate with the current account balances held by financial institutions at the BOJ as its operating target (Suda 2003). The BOJ also committed to maintaining high current account balances until the headline inflation (excluding perishables) was stably zero or above along with purchase of long term Japanese government bonds. The target for the current account balances were progressively increased to 5 trillion yen in 2001 to 30-35 trillion yen in January 2004 (Shiratsuka 2009). The current account balance was maintained at this level till the termination of the QEP in March 2006.

Consensus on the effects of QEP in Japan is divided. Ugai (2007) finds that commitment by the BOJ to undertake and sustain the QEP led to a fall in yields on short and medium term instruments and boost market confidence. The effect of purchase of government bonds by the BOJ was smaller than that of the commitment to sustain QEP. Ito and Mishkin (2004) find that even with increase in the monthly purchase of government bonds from 400 billion yen per month in August 2001 to 1200 billion yen in October 2002, deflation in Japan worsened. QEP led to the narrowing of the yield spread of the CD rate and the T-bill rate after the introduction of QEP along with a fall in spreads for the non-financial businesses as well (Shiratsuka 2009). However, QEP also led to the deterioration of functioning of the money market. Spiegel (2006) opines that although QEP led to fall in long term

interest rates, change in expectation of market participants along with increased risk tolerance, the magnitude of impact of QEP was uncertain and that QEP had delayed the long overdue structural reform in the Japanese economy. Girardin and Moussa (2009) use the factor analysis methodology and find that QEP led to increase in output and inflation. Ueda (2010) concludes that while management of expectation of interest rates and target asset purchase programmes have helped lower interest rates and contain liquidity premiums, the effect of quantitative easing was unclear.

United Kingdom

The United Kingdom, too, embarked on monetary policy easing in response to the global financial crisis and the consequent downturn in real economic activity. The Monetary Policy Committee (MPC) of the Bank of England (BOE) aggressively cut UK's policy interest by 450 basis points from 5 per cent in October 2008 to 0.5 per cent in March 2009 (Joyce *et.al* 2010).[3] However, even with this measure in place, there was a risk of inflation falling below the target rate of 2 per cent. In order to meet the target inflation rate, the BOE undertook QE worth £ 200 billion (large part of which was the purchase of government bonds), an amount equivalent to 14 per cent of UK's nominal GDP (Joyce *et.al* 2010). The announcement of QE in the UK led to a fall in the yields on government securities (Meier 2009 and Joyce *et.al* 2010). However, there was not much change in their yields in May 2010 from their level in February 2009 when the QE began. QE in the UK also led to improved liquidity in the government securities market. Yields on investment grade corporate bonds fell after QE was initiated (Bean 2009). Meier (2009) finds that QE led to improved liquidity in the private credit markets along with rebound in near term inflation expectations.

United States

The US was the epicenter of the global financial crisis. The US Treasury and the Fed undertook fiscal and monetary measures to stall the collapse of the US economy. In response to this near collapse of the US economy, the Fed, in November 2008, announced a plan, among many others, to purchase US $500 billion of mortgage backed securities and US $ 100 billion of agency debt (Federal Reserve 2010). The Fed also reduced its fund target rate to between zero and 0.25 per cent in December

[3] For related details refer to BOE 2009

2008. With economic conditions deteriorating further, the purchase programme was expanded to accommodate US $1250 billion of mortgage backed securities and US $200 billion worth of agency debt, along with US $300 billion worth of government securities in March 2009 (Federal Reserve 2010).[4]

Preliminary evidence suggests that the asset purchase programme in the US was successful in lowering mortgages rates and yields on debt instruments. Hancock and Passmore (2010) find that announcement of the asset purchase programme by the Fed provided a credible and strong signal to the market participants and consequently led to a fall in mortgage rates. The mortgage rates at the end of the asset purchase programme (March 31, 2010) were significantly lower than their pre-purchase programme level. However, some effects of this programme were lost due to the uncertainty in the motive of the Fed in conducting this programme.

In the case of QE in the US, one must distinguish between Quantitative Easing and Qualitative Easing (or Credit Easing). The asset purchase programme announced by the Fed in November 2008 is considered to be a credit easing programme as this programme was aimed at reducing the liquidity premiums in private debt markets by the purchase of mortgage backed securities as well as agency debt. However, the more recent announcement to purchase additional US $600 billion worth of government securities *via* an increase in the size of the Fed's balance sheet is aimed at increasing the over-all economic growth in the economy and is commonly referred to as quantitative easing. Gagnon *et al*. (2010) study the effect of large scale asset purchase on the US economy. They find that this programme was able to reduce term premium, improve market liquidity, lower private borrowing rates and propel economic growth.[5] However, one can argue that if this programme was really successful in increasing growth rates considerably then there would not have been any need for the Fed to take up a second round of quantitative easing.

ii. Concerns on Quantitative Easing

Global acceptability of the US dollar and its hegemony as a major component of forex reserves of many countries is a foregone conclusion. This hegemony of the

[4] Also see Bernanke (2009)
[5] Also see Morgan 2009

dollar makes it globally mobile. Thus, when the Fed conducts QE, it is plausible that these dollars flow out of the US in search of higher returns to other nations. Since purchase of securities by the Fed puts additional money in the hands of economic agents, these agents reduce their holding of additional money by purchasing other financial assets. In a world in which finance is globalised, economic agents are able to purchase financial assets in other nations that offer higher returns leading to build up of asset bubbles in those nations along with an appreciation pressure on the exchange rate.

Academicians and central bankers have raised concerns over global liquidity increasingly finding its way into the EMEs. Quantitative easing of credit and frequent bailouts in the US and the Euro-zone is injecting huge capital into the EMEs (Nachane 2010). Quantitative Easing in the US is leading to a reduction in the value of the dollar *vis-à-vis* other currencies (Feldstein 2010). Ocampo (2010) and Jones and Gallagher (2011) also lend support to the argument that QE in the US is leading to massive capital flows in to emerging economies. Given this background and the existing lacuna in terms of quantitative analysis of the issue, this paper seeks to establish the link or lack of it between QE-II in the US and FII inflows in to India. Equity markets, usually, generate higher returns than the bond markets and hence a majority of the Foreign Institutional Investment (FII) inflows are directed towards them. This paper seeks to establish whether or not FII inflows in to the Indian stock markets increased after the announcement of QE-II in the US. According to the November 3, 2010 announcement, the Fed's total purchase of additional government would be around US $600 billion. Added to it, the Fed would reinvest the principal payment from mortgage backed securities and agency debt in the range of US $250- US $ 300 billion. Hence, between November 3, 2010 and end-June 2011, the Fed is supposed to have purchased securities in the range of US $850 billion to US $ 900 billion. This increased liquidity should ideally show up as increased FII inflows into India if the arguments of QE-II leading to more capital flow into EMEs are correct. Hence, we seek to establish whether or not there was an increase in FII inflows into the Indian stock market after the announcement of the asset purchase by the Fed.

Section-III

i. Tools of Analysis

Shares are bought and sold by FIIs in the Indian stock markets. At any point in time, FIIs buy and sell shares. Hence, to arrive at the net support that FIIs lend to the stock market, it is necessary to net out the sale and purchase transactions of FIIs. Thus, on any given day net FII inflows portray a representative picture of FII support to the stock market.[6] These FII flows are influenced by a multitude of factors. Many of these factors explaining the FII flows into India have been studied in Chakrabarti (2001), Rai and Bhanumurti (2004), Shah and Patnaik (2008), Kaur and Dhillon (2010) among others. The analyses in these studies are based on monthly data. The analysis in this study is based on daily data as FII inflows are volatile by their very nature and hence using daily data allows us to study their short term behaviour more effectively. Using monthly data would provide only a few data points for analysis and would not be amenable to robust econometric analysis. Besides, using daily data enables us to have more degrees of freedom while conducting econometric analysis. The time period of the study has been identified so as to accommodate an equal period of eight months pre and post the November 3, 2010 Fed's QE-II announcement. One must be cognizant of the fact that the announcement of QE-II was not entirely sudden; markets had been anticipating further monetary easing by the Fed since August 27, 2010 when Ben Bernanke delivered a speech at Jackson Hole in which additional purchase of longer term securities by Fed was considered as a policy tool in view of the slowdown in recovery.[7]

On an *a-priori* basis, stock market returns should positively influence FII inflows. Similarly, FII inflows should be negatively affected by stock market volatility. Interest rate differential should also contribute towards attracting FII inflows. In particular, the following variables have been identified to explain FII inflows into India.

[6]Net FII = FII Purchases – FII Sales
[7] Refer to Bernanke (2010)

- *"R_Nifty"* is the daily return on the S&P CNX Nifty Index.
- *"R_S_P"* is the return on the S&P-500 Index.
- *"R_MSCI_EM"* is the return on the MSCI Emerging market Index.
- *"Ind_Vix"* is the volatility index based on Nifty Index stock option prices and is indicative of the market's expectation of volatility in the near term.
- *"Spread"* is the difference between the call rate in the Indian money market and the effective Federal funds rate.
- *"Exc_Rate"* is the daily RBI reference rate (Rs/US $).
- *"Aug_27"* is a dummy variable which takes the value 1 for all dates on and after August 27, 2010, zero otherwise similarly
- *"Nov_3"* is a dummy variable which takes the value 1 for all dates on and after November 3, 2010, zero otherwise.

The dummy variables have been included to capture the effect of announcement by the Fed and its representatives.

This paper seeks to estimate a regression equation of the following form:

$$Net\_FII_t = \alpha + \beta_1 R\_Nifty_{t-1} + \beta_2 R\_Nifty_{t-2} + \beta_3 R\_S\_P_{t-1} + \beta_4 R\_S\_P_{t-2} + \beta_5 R\_MSCI\_EM\_P_{t-1} + B_6 R\_MSCI\_EM\_P_{t-2} + B_7 Ind\_Vix_{t-1} + B_8 Exc\_Rate + B_9 Spread + B_{10} Nov\_3 + B_{11} Aug\_27 + e_t \ldots\ldots (1)$$

When dealing with FII flows and stock market returns, it is imperative to keep the causality structure in mind. Stock market returns is perhaps the single most important determinant of FII inflows into the Indian Stock market. Studies have found that the causality runs from stock market returns to FII inflows and not the other way around .*i.e.* stock market returns are the cause and not the effect of FII inflows [Mukherjee *et al* (2002) & Kaur and Dhillion (2010)]. Building on the framework of these papers we model FII inflows as shown in equation (1). Ideally, we would have liked to include some macroeconomic variables as well; however, daily macroeconomic data are not available and are therefore not included in the model. Thus, having controlled for the effect of returns on the Nifty, return on the MSCI Emerging Markets Index, returns on the S&P 500 Index, India volatility Index, interest rate differential between India and

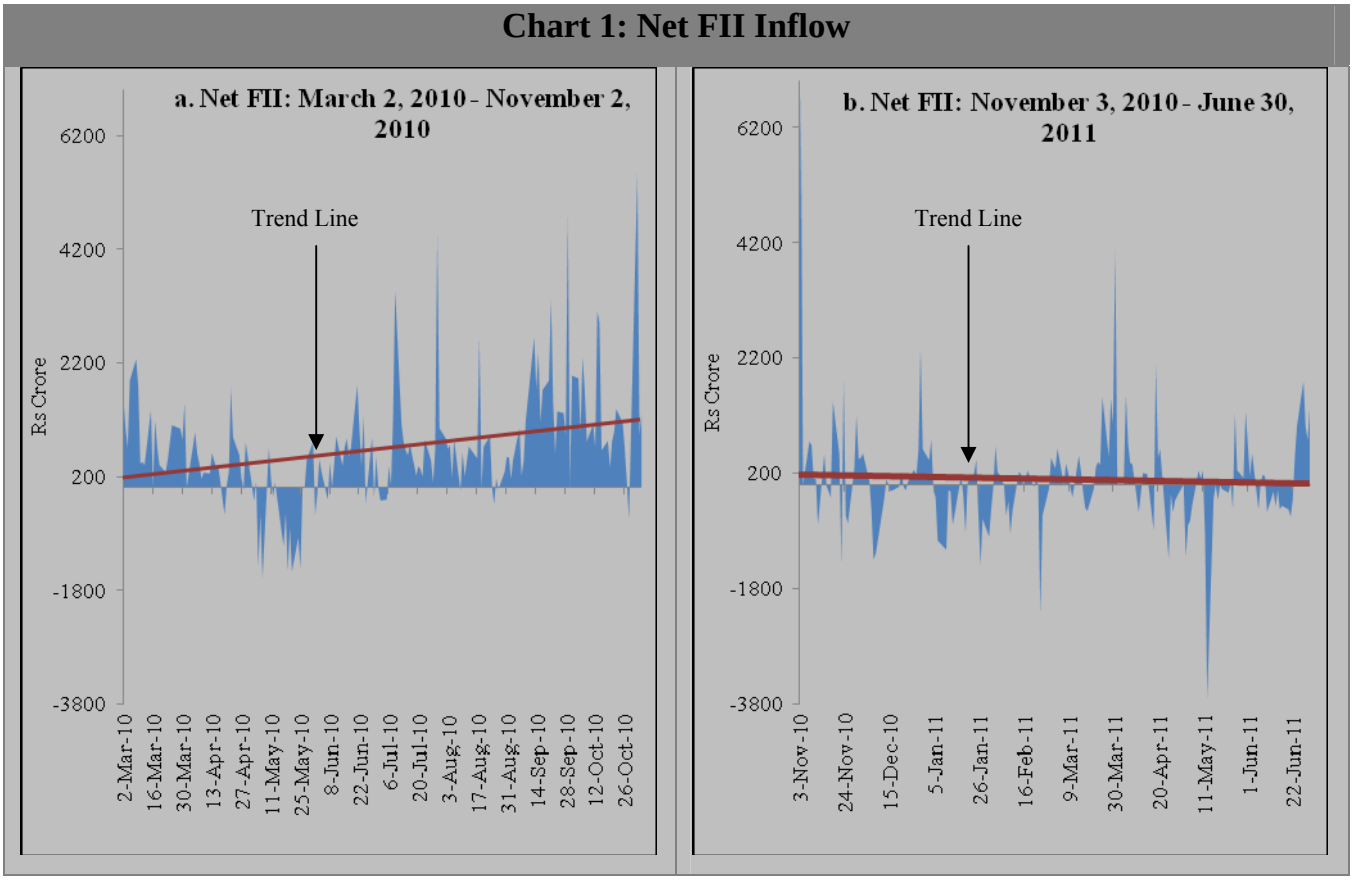
the US and exchange rate movements, we seek to establish whether FII inflows have increased in India after the announcement of QE-II in the US.

On an *a-priori* basis, one would expect the coefficient of the dummy variable "*Nov 3"* to be positive and statistically significant if FII inflows into India increased after the announcement of QE-II.

ii. Stylized Facts

Interestingly, the highest daily net inflow of FII in the period under study occurred, on November 4, 2010, a day after the announcement of QE-2. A plot of the data shows the movement of FII inflows in the two periods under study (Chart 1a & b).

Chart 1: Net FII Inflow



The charts have been constructed in the panels above taking the announcement date of QE-II as the point of break. Chart 1a depicts the movement in net FII inflow in

the period before November 3, 2010 and Chart 1b shows the movement in net FII inflow for the period after November 3, 2010. The gradient of the linear trend fitted in Chart 1a is positive while that of Chart 1b appears to be almost flat, albeit with a tendency to be negative. This sort of a demarcation in the period of study enables a "before-after" analysis of movements in net FII inflows. Charts 1a and b visually establish that net FII inflows were higher in the pre November 3, 2010 period than the period after it. This finding has been supported by econometric analysis, the results of which have been discussed below.

Econometric Evidence

Results of the Unit Root tests have summarized in Table 1

Table 1: Unit Root Structure of the Data

Variable	Augmented Dickey-Fuller test statistic
NET_FII	-5.8410*
R_NIFTY	-17.8661*
IND_VIX	-3.6547*
R_MSCI_EM	-15.7834*
R_S_P	-19.1573*
EXC_RATE	-18.7644#
SPREAD	-5.0072##

Note: * indicates significance at 1 per cent. # indicates stationarity with first difference. ## refers to stationarity with trend and intercept.

. The Augmented Dickey-Fuller Unit Root tests reveal that the null hypothesis of unit root is rejected for all variables except "*Exc_Rate"* and "*Spread"*. For "*Exc_Rate",* the null of unit root is rejected after first differencing the variable. The null of unit root is rejected for "*Spread"* after including a trend and a constant in the test equation.

Pair-wise Granger Causality Tests

The Granger Causality tests yield similar results to that of Mukherjee et al (2002) and Kaur and Dhillion (2010) *i.e.* stock market returns are the cause and not the effect of FII inflows (Table 1). The null of return on nifty not Granger causing net FII inflows has been rejected while the null of net FII inflows not Granger causing Nifty returns has been accepted at 5 per cent level.

Table 2: Granger Causality-Net FII and Return on Nifty

Null Hypothesis	Accept/Reject
R_NIFTY does not Granger Cause NET_FII	Reject at 5 per cent
NET_FII does not Granger Cause R_NIFTY	Accept at 5 per cent

Note: Number of lags included: 2

Regression estimates are presented in Table 3.

Table 3: Model Estimates- March 2, 2010 to June 30, 2011

Variable	Coefficient	t-Statistic
R_NIFTY(-1)	174.23***	2.699
R_NIFTY(-2)	82.64	1.284
R_S_P(-1)	134.43*	1.914
R_S_P(-2)	-34.83	-0.504
R_MSCI_EM(-1)	25.37	0.284
R_MSCI_EM(-2)	105.47	1.334
IND_VIX(-1)	-35.38*	-1.824
EXC_RATE	6.93	0.571
SPREAD	2.05**	2.672
NOV_3	-1294.06***	-7.437
AUG_27	474.87**	2.308
Adjusted R-squared	0.273692	
Durbin-Watson stat	1.549376	

Note: ***, ** and * indicate significance at 1 per cent, 5 per cent and 10 per cent. Full results reported in the appendix

Empirical evidence of this paper suggests that return on the Nifty is a positive and significant determinant of FII inflows. The lagged value of Nifty return positively affects FII inflows albeit without any statistical significance. Since, FIIs seek to maximize short term gains; their behaviour is dictated largely by stock market returns. Similarly, return on the S&P-500 index also exerts a positive and significant effect on FII inflows into India. However, return on the MSCI Emerging market index has no effect on FII inflows. Expectation of higher volatility in the near term has a negative impact in FII inflows. After controlling for other factors, exchange rate does not have any statistically significant effect of net FII inflows. However, *"Spread"* has a statistically significant and positive effect on net FII inflows. The dummy variable '*Nov 3'* has a negative and significant coefficient; implying net FII inflows were significantly lower in the period after November 3, 2010 than the period before it.

Interestingly, *"Aug 27"* has a positive and significant coefficient implying that net FII inflows were higher after August 27, 2010 than in the period before it.

Coming to the question of whether results presented in this paper prove that the announcement of QE-II in the US led to higher inflows into India, this paper offers the following explanations. By July 2010, it was evident that the recovery in the US economy had weakened significantly. A large part of this slowdown was attributed to lower than expected growth in consumer spending and the consequent sluggishness in output and employment generation. This led to the speculation that a fresh round of monetary easing policies were in the offing. Market participants anticipated a fresh round monetary policy action in the US by August 2010 [BIS 2010 & Gagnon (2010)]. This speculation gained more ground on August 27, 2010 when Ben Bernanke, Chairman of the Fed, delivered a speech at Jackson Hole stating that in view of the slowdown in recovery, the Fed was open to using a variety of tools to provide additional stimulus which could include additional purchase of longer term securities. This led to increased flow of capital into emerging economics (BIS 2010).

One would have expected the FII inflows to increase significantly after November 3, 2010 announcement of additional purchase of treasury securities. However, results suggest that FII flows have indeed fallen in the period after November 3, 2010. One explanation is that since the markets had already anticipated and factored in the effect of QE in their behaviour, they were not surprised by the announcement of QE-II on November 3, 2010.

The Granger causality test has established that nifty returns Granger cause FII inflows. Thus, any change in FII inflows must hence be necessarily explained *via* a change in returns on the Nifty. While it is desirable to directly establish the cause of the fall in FII inflows, it is only feasible to do so by identifying the causes that led to a fall in returns on the nifty. Therefore, developments in India and abroad can be used to explain this outcome. By the second week of November 2010, sovereign debt problems had become apparent in some of the Euro-zone economies particularly Ireland (BIS 2010). This led to a FII outflows from India to safer markets. Political tensions between North and South Korea accentuated this trend in November 2010.

High inflation and the related fear of policy rate hike by Reserve Bank of India marred market sentiments for much of December 2010 and January 2011. Successive policy rates hikes by the RBI since January 2011 due to stubbornly high inflation did little to uplift the market sentiment. Rise in crude oil price due to political tensions in the Middle East and North Africa Region (MENA) in February 2011 suppressed sentiments in the Indian equity markets. Greece, once again, came under the scanner due to its sovereign debt debacle and the fiscal solidity of the peripheral Euro zone economies came to the fore in May and June 2011. All these things put together led to a fall in the stock market indices in India and hence could have led FII to withdraw from the Indian stock market.

iii. Robustness Check

As part of robustness check, a similar model was run replacing Nifty returns with BSE Sensex returns (results reported in the appendix). The results of the exercise with BSE returns were similar to results of the exercise with Nifty returns, *i.e.* net FII inflows were higher in the period before November 3, 2010 than in the period after it.

It must, however, be recognized that factors other than those captured explicitly in the model of this paper also influence net FII inflows in to India. Lack of daily macroeconomic data has prevented the inclusion of these variables in the study and perhaps explains the low coefficient of determination. An interesting area of research would be to identify FIIs by country of origin and assess their movement into India in relation to QE-II and developments in India.

Section-IV

Conclusion

Faced with near zero interest rates and a weak recovery in the US prompted the Fed to announce a fresh round of monetary easing on November 3, 2010. This action has come to be known as QE-II in the popular parlance. It has been argued that this easing of monetary stance in the US led to increasing capital flows into the EMEs. This paper has briefly stated the rationale for conducting QE along with a brief history of QE. We have studied the pattern of inflows of FII post the announcement of QE-2.

The results suggest that post the announcement of QE-2, FII inflows have fallen significantly. The fall in FII inflows post November 3, 2010 has been explained *via* factors negatively affecting stock market returns in India using global and domestic factors which include sovereign debt problems in the Euro-area, political tensions between North and South Korea and in the MENA region, high inflation in India and policy rate hikes by Reserve Bank of India.

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Appendix

Table A.1a: Unit Root Test for Net_FII

Null Hypothesis: NET_FII has a unit root			
Exogenous: Constant			
Lag Length: 2 (Automatic - based on SIC, maxlag=16)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.841	0.0000
Test critical values:	1% level	-3.44968	
	5% level	-2.86995	
	10% level	-2.57132	
*MacKinnon (1996) one-sided p-values.			

Table A.1b: Unit Root Test for R_Nifty

Null Hypothesis: R_NIFTY has a unit root			
Exogenous: Constant			
Lag Length: 0 (Automatic - based on SIC, maxlag=16)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-17.8661	0.0000
Test critical values:	1% level	-3.44962	
	5% level	-2.86993	
	10% level	-2.57131	
*MacKinnon (1996) one-sided p-values.			

Table A.1c: Unit Root Test for R_S_P

Null Hypothesis: R_S_P has a unit root			
Exogenous: Constant			
Lag Length: 0 (Automatic - based on SIC, maxlag=16)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-19.1573	0.0000
Test critical values:	1% level	-3.45115	
	5% level	-2.87059	
	10% level	-2.57166	
*MacKinnon (1996) one-sided p-values.			

Table A.1d: Unit Root Test for R_MSCI_EM

Null Hypothesis: R_MSCI_EM has a unit root			
Exogenous: Constant			
Lag Length: 0 (Automatic - based on SIC, maxlag=16)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-15.7834	0.0000
Test critical values:	1% level	-3.44962	
	5% level	-2.86993	
	10% level	-2.57131	
*MacKinnon (1996) one-sided p-values.			

Table A.1e: Unit Root Test Ind_VIX

Null Hypothesis: IND_VIX has a unit root			
Exogenous: Constant			
Lag Length: 0 (Automatic - based on SIC, maxlag=16)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.65473	0.0052
Test critical values:	1% level	-3.44956	
	5% level	-2.8699	
	10% level	-2.57129	
*MacKinnon (1996) one-sided p-values.			

Table A.1f: Unit Root Test for EXC_Rate

Null Hypothesis: D(EXC_RATE) has a unit root			
Exogenous: Constant			
Lag Length: 0 (Automatic - based on SIC, maxlag=16)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-18.7644	0.0000
Test critical values:	1% level	-3.45115	
	5% level	-2.87059	
	10% level	-2.57166	
*MacKinnon (1996) one-sided p-values.			

Table A.1g: Unit Root Test for Spread

Null Hypothesis: D(SPREAD) has a unit root			
Exogenous: Constant, Liner Trend			
Lag Length: 2 (Automatic - based on SIC, maxlag=16)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.007166	0.0002
Test critical values:	1% level	-3.986374	
	5% level	-3.423627	
	10% level	-3.314787	
*MacKinnon (1996) one-sided p-values.			

Table A.1h: Unit Root Test for R_BSE

Null Hypothesis: R_BSE has a unit root			
Exogenous: Constant			
Lag Length: 4 (Automatic - based on SIC, maxlag=16)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-17.6549	0.0000
Test critical values:	1% level	-3.44962	
	5% level	-2.86993	
	10% level	-2.57131	
*MacKinnon (1996) one-sided p-values.			

Table A.2-Granger Causality Test: Net FII and R_Nifty

Pairwise Granger Causality Tests			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
R_NIFTY does not Granger Cause NET_FII	335	5.89662	0.003
NET_FII does not Granger Cause R_NIFTY		0.91322	0.4022

Table A.3-Full Regression Results

Dependent Variable: NET_FII				
Method: Least Squares				
Sample (adjusted): 3/04/2010 6/30/2011				
Included observations: 300 after adjustments				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
R_NIFTY(-1)	174.23	64.56332	2.699	0.0074
R_NIFTY(-2)	82.64	64.34189	1.284	0.200
R_S_P(-1)	134.43	70.24706	1.914	0.0567
R_S_P(-2)	-34.83	69.1327	-0.504	0.6148
R_MSCI_EM(-1)	25.37	89.27067	0.284	0.7764
R_MSCI_EM(-2)	105.47	79.04293	1.334	0.1831
IND_VIX(-1)	-35.38	19.39124	-1.824	0.0691
EXC_RATE	6.93	12.13745	0.571	0.5686
SPREAD	2.05	0.768526	2.672	0.008
NOV_3	-1294.06	173.9999	-7.437	0.0000
AUG_27	474.87	205.7333	2.308	0.0217
R-squared	0.297983	Mean dependent var		428.7485
Adjusted R-squared	0.273692	S.D. dependent var		1063.858
S.E. of regression	906.6592	Akaike info criterion		16.49339
Sum squared resid	2.38E+08	Schwarz criterion		16.62919
Log likelihood	-2463.01	Hannan-Quinn criter.		16.54774
Durbin-Watson stat	1.549376			

Table A.3- Serial Correlation Test Results

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	2.110737	Prob. F(2,287)	0.123
Obs*R-squared	4.347415	Prob. Chi-Square(2)	0.1138

Number of lags included: 2

Robustness Tests

Table A.4- Granger Causality Test: Net FII and R_Nifty

Pairwise Granger Causality Tests			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
R_BSE does not Granger Cause NET_FII	335	5.74551	0.0035
NET_FII does not Granger Cause R_BSE		0.90425	0.4058

Table A.5-Full Regression Results with R_BSE

Dependent Variable: NET_FII				
Method: Least Squares				
Sample (adjusted): 3/04/2010 6/30/2011				
Included observations: 300 after adjustments				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
R_BSE(-1)	172.9083	64.5836	2.677279	0.0078
R_BSE(-2)	82.5333	64.11791	1.287211	0.1991
R_S_P(-1)	132.8593	70.12726	1.894546	0.0592
R_S_P(-2)	-35.0924	69.06954	-0.50807	0.6118
R_MSCI_EM(-1)	29.91822	88.35424	0.338617	0.7351
R_MSCI_EM(-2)	105.555	78.19953	1.349816	0.1781
IND_VIX(-1)	-34.9998	19.40431	-1.80371	0.0723
EXC_RATE	6.843575	12.13885	0.563775	0.5733
SPREAD	2.047034	0.768507	2.663652	0.0082
NOV_3	-1293.45	173.9965	-7.43378	0.0000
AUG_27	474.153	205.7016	2.305053	0.0219
R-squared	0.298027	Mean dependent var		428.7485
Adjusted R-squared	0.273737	S.D. dependent var		1063.858
S.E. of regression	906.6312	Akaike info criterion		16.49333
Sum squared resid	2.38E+08	Schwarz criterion		16.62913
Log likelihood	-2463	Hannan-Quinn criter.		16.54768
Durbin-Watson stat	1.547528			

Table A.6- Serial Correlation Test Results

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	2.163444	Prob. F(2,287)	0.1168
Obs*R-squared	4.454397	Prob. Chi-Square(2)	0.1078