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The Impact of Interest Rate Futures on the Underlying Interest Rate Markets in India

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ABSTRACT

If the market is perfect and complete, ideally, the introduction of derivatives should not in any way affect the equilibrium conditions in the underlying market. However, the presence of information asymmetry in the market ensures that introduction of a derivative alters the speed with which equilibrium is attained. This may generally affect the underlying asset's price level and also its volatility. A study of a similar phenomenon is done in the case of the Indian bond market. The Indian Bond market which is predominantly G-sec saw the introduction of the interest rate futures recently. The 10 year Interest rate futures contract based on a 10 year notional coupon bearing Government of India security, the 91 day T Bill futures which is based on 91 day T bills issued by the Government of India and the 2 and 5 year Interest rate Futures based on 2 and 5 year notional Gsec. The purpose of this paper is to understand their impact on the underlying market. The developments in the interest rate futures market can be attributed to the novelty of this market in India. In this paper we will try and understand whether there has been any change in the behavior of the markets for the underlying post the introduction of these derivatives. It is seen that both the short term interest rate and long term interest rate markets gets impacted on their turnover post the introduction of these derivatives. However, when it comes to volatility, it is only the short term interest rates which gets significantly impacted.

1.1 INTRODUCTION

The idea that financial markets are imperfect is more or less accepted with the theorists rejecting the possibility of a Walrasian type equilibrium in this market. Also, the assertion by Modigliani and Miller that there should be indifference between debt and equity has also not been found to be true in the case of financial market. If the market is perfect and complete, ideally, the introduction of derivatives should not in any way affect the equilibrium conditions in the underlying market. However, the presence of information asymmetry in the market ensures that introduction of a derivative alters the speed with which equilibrium is attained. This may generally affect the underlying asset's price level and also its volatility.

The Indian Bond market which is predominantly G-sec saw the introduction of the following interest rate futures recently. The 10 year Interest rate futures contract based on a 10 year notional coupon bearing Government of India security. The notional coupon shall be 7% per annum with semi annual compounding and the contract shall be settled by physical delivery of deliverable grade securities. The 91 day T Bill futures which is based on 91 day T bills issued by the Government of India. The contract would be cash settled and the final settlement price of the contract shall be based on the weighted average price/yield obtained in the weekly auction of the 91 day Treasury Bills on the date of expiry of the contract. It was also proposed to have the 2 and 5 year Interest rate Futures based on 2 and 5 year notional Gsec with semiannually compounded coupon of 7%. These would also be cash settled and the final settlement price shall be based on the yields on basket of securities for each Interest rate Futures contract specified by the respective stock exchange.

Interest rate derivatives, as we can see are very new to the Indian financial market and one is obviously intrigued to know as to how they are affecting the market for the underlying. Before analyzing their impact on the underlying, a look at the current trend in the futures market in India does not present a very encouraging picture. The interest rate futures based on 10 year notional bond initially picked up momentum but it gradually lost steam. In September 2009, the total trading volume was Rs 1473 which by December 2009 dropped to Rs 215 crores and further to a meager 57 crores in February 2010. Similarly, the market for interest rate futures based on notional 91 days T bill has shown a very identical trend. At its launch by NSE on July 4 2011, it saw a turnover in excess of Rs 730 crore. By August 4, the volume dropped to Rs 14 crores. There is a wide potential for the 91 days futures in India. Corporate houses dealing in floating rate bonds, mutual funds and banks which park a substantial amount in T bills of this duration are expected to use this instrument for hedging purposes. This market, as can be seen is far

away from its potential. The purpose, however, of this paper is not to analyze the causes of the declining turnover in the interest rate futures market but to understand their impact on the underlying market. The developments in the interest rate futures market can be attributed to the novelty of this market in India. In this paper we will try and understand whether there has been any change in the behavior of the markets for the underlying post the introduction of these derivatives. In particular, we would like to explore the effects on the volatility of the underlying assets.

2.1 REVIEW OF LITERATURE

World over studies have been done in this regard and data overwhelmingly support the theory that derivatives in general have affected the volatility of the underlying asset prices. While the impact of option contracts on the underlying is more or less clearly established through numerous empirical research, the impact of futures contracts on asset price volatility is more debated and controversial. However, this uncertainty is more visible in financial futures and their relationship to the price of the underlying. When it comes to futures on commodities, there is an overwhelming body of support to assert that they seem to reduce the price volatility of the underlying.

Futures on stocks were analyzed by Stoll and Whaley (1987) who found an increase in the market volatility of stocks included in the index basket on the day of contract expiration. Damodaran (1990) using S&P 500 index future also report that stocks included in the index have a significantly higher volatility than those not included. The effect of the introduction of stock index futures on volatility of the Italian stock exchange was examined by Bologna and Cavallo(2002). They concluded that the introduction of the stock index futures had led to a decline in the stock market volatility. They attributed this to the increased impact of recent news and diminishing effect of the uncertainty arising from the old news. Whereas, in yet another study of KOSPI 200 futures on Korean stock market, Ryoo and Graham Smith (2003) argue that introduction of index futures have increased the volatility of the stock markets. Their results show that futures trading increases the speed at which information is impounded into the spot market prices, reduces the persistence of the information and increases the spot market volatility.

The role of futures on stock under Indian conditions also does not present a very unambiguous picture. In a study done by Bandivadekar and Ghosh (2003), the results shows that while the future effects play important role in reduction of volatility in S&P CNX Nifty, in case of BSE Sensex, its role seemed ambiguous.

Unlike futures on stock, futures on bonds, especially treasury bonds, seem to be associated with some volatility reduction. This is explained by the limited relevance of information asymmetry in this market. Futures market in bond seems to increase the market liquidity.

Esposito and Giraldi (1994) studied the Italian Treasury Bond market and found that the introduction of futures trading on the BTP contract reduced the volatility of the underlying market. Studies on the US government and mortgage bond market (Froewiss(1978), Simpson and Ireland(1982) and Edwards (1988)) found that futures trading either has no effect or stabilizes the underlying markets.

Another effort to detect the impact of futures contract on Treasury bond was made by Citanna and Rovelli (1991), who analyzed the French market and found a reduction of term premia in the yield curve after the listing of the futures on OAT.

Preliminary evidence of the lead lag relationship between futures and spot prices on the bond market is provided by Angeloni, Drudi and Majnoni (1994) who analyze the intraday price behavior for the Italian market in the period 1992-94. They found clear evidence of futures leading the spot market.

Some studies have been done to ascertain the impact of futures on volume of trade in the underlying market. As of now, these studies do not reveal a significant effect on volumes. Bansal, Pruitt and Wei (1989) find that trading volumes increase after option listing but only for a short period around the listing date. Damodaran and Lim (1991) find a small effect on market adjusted volumes. Skinner (1989) reports the disappearance of volume effects after the seventies. Damodaran and Subrmanyam (1992) interpret this evidence as a sign that the introduction of derivatives was not able to attract speculators into the underlying markets. While no specific study has been done regards the interest rate derivates market, one would expect something similar in them as well.

2.2 UNDERSTANDING THE MARKET

A look at the interest rate futures market at National Stock Exchange in India has a rather peculiar story to tell. We can see that having good beginnings in both the 91 day T bill market as well as the long term bond market (futures), it could not sustain its momentum. The trading volumes have virtually come to nil in both these markets. The open interest in 91 day T bill futures was 4300 contracts on July 4, 2011, rose gradually but dropped to zero contract by Jan 2012. A similar story unfolded in the bond market futures where in August 2009, there were 1893

contracts as open interest but dropped to zero by March 2011. It would be interesting to compares the trading volumes in these futures market with the trading volumes in the respective underlying market.

In graph 1and 2, we show the graph for open interest in the 91 day T bill futures NSE in comparison with weekly turnover in the actual 91 day T bill markets, the data for which have been taken from RBI. The frequency of data for the underlying is weekly while for the futures is daily.

Looking at both the figures together, we can say that the volumes in the futures market for 91 day T bill seems to be driving the underlying market as well. As we can see since the time of the introduction of futures on 4th July 2011, uptil December 2011, volumes in both the markets seem to move together. Of course, post November 2011, the volumes in futures market died down but before this period, one can clearly see a synchronicity between the two markets. These exhibits establish, albeit pictorially that in the short run, the futures market may be having an effect on the underlying.

It would also be interesting to see the impact on short term interest rates of the trading in 91 day T bill futures. For this purpose, we have taken the weighted average of the daily repo rates on similar period as the introduction of the futures in 91 day T bill segment i.e., from Aug 04, 2011 to December 31st 2011 and the fluctuations in yield is as represented in Graph 3.

We would also like to see if there is any such relationship in the futures for long term bonds. For this purpose we take a look at Futures daily open interest on long term bonds and weekly turnover of Government of India securities from August 2009 (when this future was introduced at NSE) and March 2011. Looking simultaneously at Graph 4 and 5, gives a peep into their possible relationship.

Here also, there seems to be some impact of the futures in driving the volumes of the underlying. Pictorially, it appears that the volume effect is probably more in the 91 day t bill segment.

3.1 ECONOMETRIC ANALYSIS

We can see that the volatility in the repo rates were very high when the futures market was gaining in strength (Aug 2011 to sep 2011) but the volatility died down with the futures market losing steam. The question as to whether this volatility change is significant needs to be explored. For this purpose we will make use of the GARCH model and look at the volatility of the repo rates before and after the event. With the help of the GARCH model, we generate the conditional variance series which is represented in Figure 6. This gives us a pictorial idea of changing volatility of repo rates with time.

The data has to be read backwards chronologically in this graph. The 248th data point is Jan 01, 2011 and the 1st data point is 31'st December 2011. Accordingly, we can see that somewhere around August 04, 2011, the volatility in the repo market has substantially come down. This coincides with the date of the introduction of interest rate futures on 91 day treasury bills. So, in the short run market, we see that interest rate derivatives have had a calming influence on the repo (underlying) market. Now to test the significance of the above result, we add a dummy variable D which is equal to zero for all dates before Aug04, 2011 and 1 for the dates afterwards in our GARCH estimation. The results are tabulated in Table 1.

We can see that in the mean equation, the dummy comes out to be statistically significant affecting the variance.

For the interest rate futures in the long term bond category, for the purpose of underlying, we consider the NSE G SEC Index. The NSE-Government Securities Index prices components off the NSE Benchmark ZCYC, so that movements reflect returns to an investor on account of change in interest rates only. For our purpose, we have taken daily data from November 2008 to June 2010. With the help of GARCH model, we have generated a conditional volatility series for this data.

As can be seen in the figure, the volatility trend is not definitive. Around the observation 200, futures were introduced. But it does not seem to affect volatility in a significant manner. In order to test this, we run a GARCH with a dummy D taking values of 1 after the IRF introduction and 0 before that. The results are summarized in Table 2. As per our assertion, we can see that the dummy comes out to be statistically insignificant.

Conclusion

The 91 day T bill futures as well as the long term bond futures have not shown any volumes in the recent times. This can be due to many reasons, not the least of which is the inability of market participants to take a directional call on interest rates. There is an obvious lack of depth in the bond futures market where a majority of government as well as corporate bonds do not come into the purview of Interest rate futures. However, one expected the demand for 91 day T bill futures to be high given the fact that mutual funds as well as banks require such hedging instruments. Yet, the period in which the market volumes were good, it had a concomitant effect on the underlying

market. When it comes to turnovers, we see that there is an impact on the underlying in both the markets. However, when we look at volatility, while the impact on the short term interest rate market is significant, it does not come across as significant in the long term interest rate markets. There is an indication that the short term market for interest rates showed a tendency to stabilize post the introduction of futures while no such impact was observed on the long term bond markets. Maybe the futures market in long term bond needs to acquire more depth before it starts making an impact.

Figure 1: Open Interest for 91 day T bill futures on National stock exchange, India

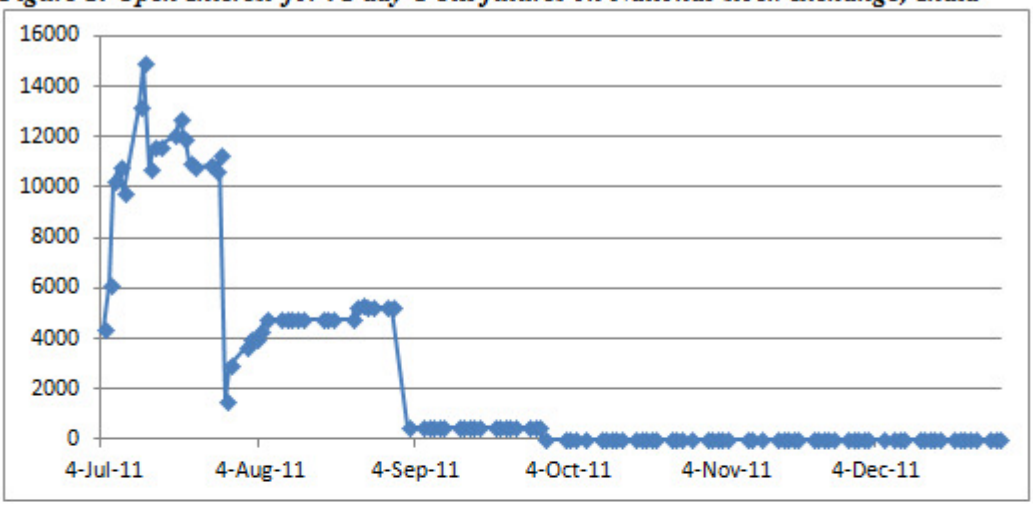

Figure 2: Daily Turnover of 91 days Treasury bill

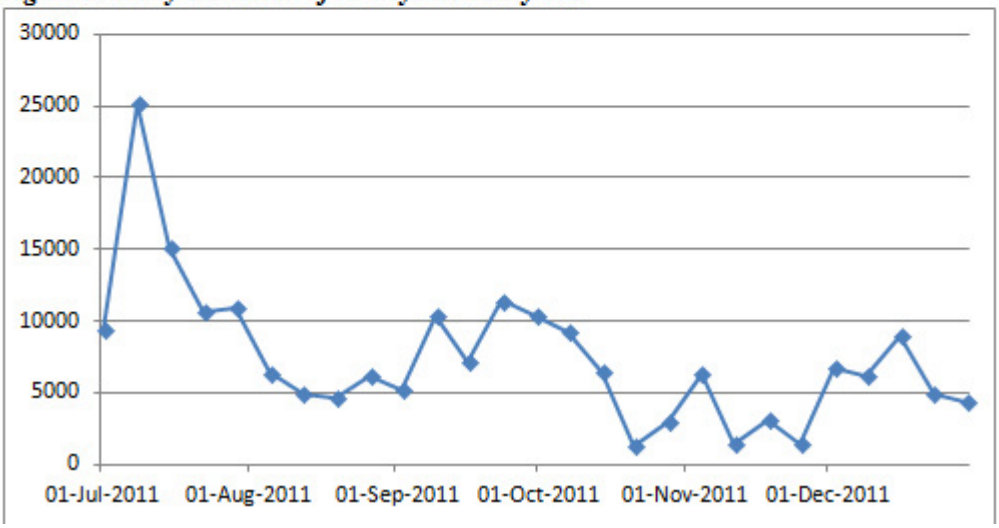

Figure 3: Daily repo rates

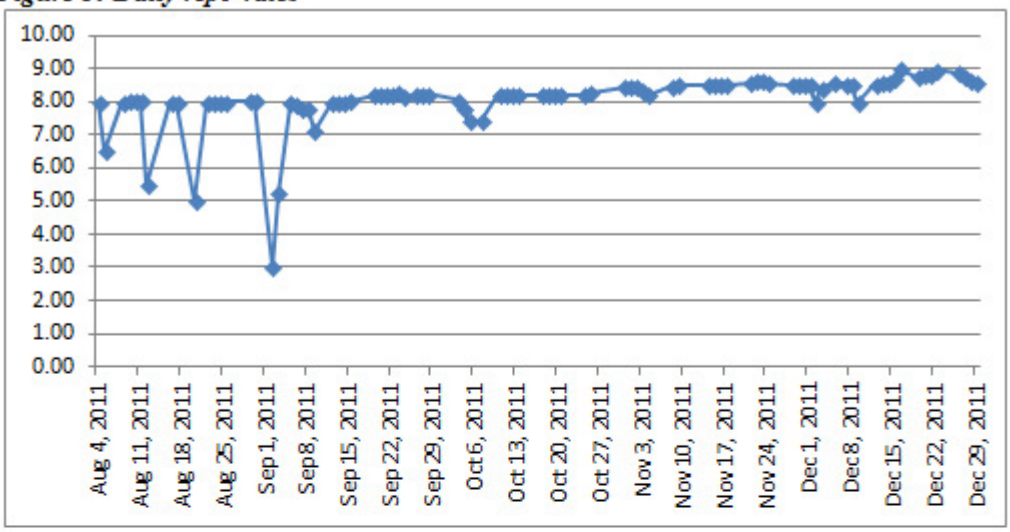

Figure 4: Futures daily open interest on Long term bonds

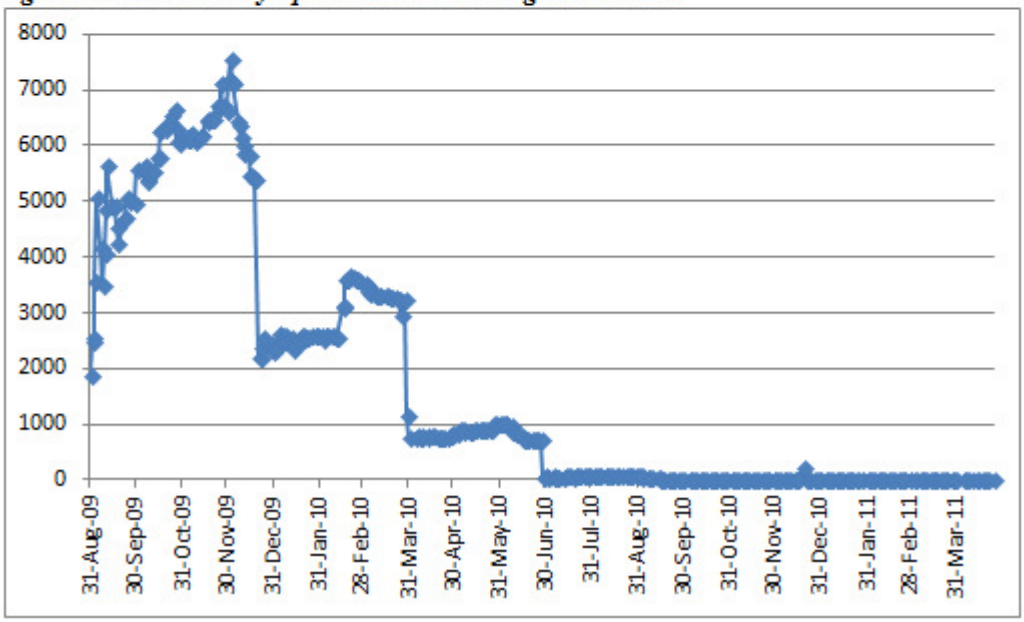

Figure5:Weekly turnover in central government(Govt of India) dated Securities

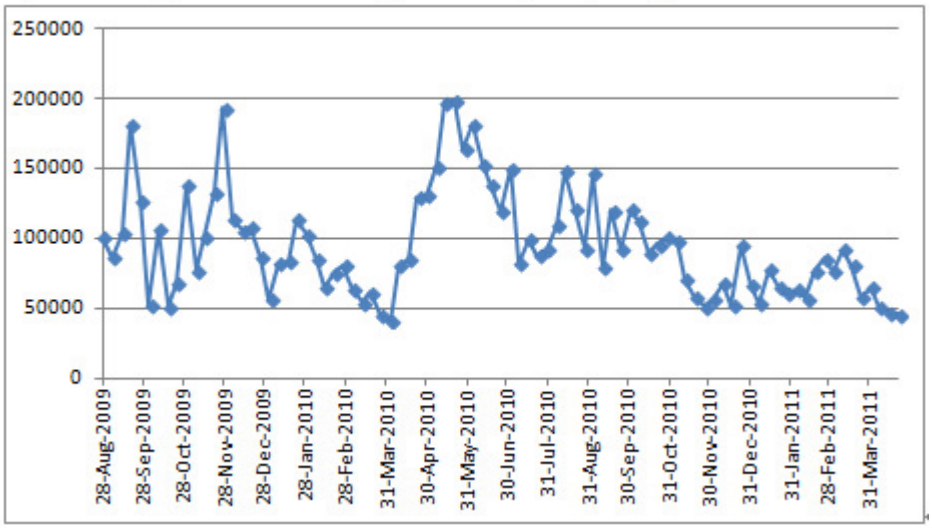

Figure 6: Volatility of the repo rates

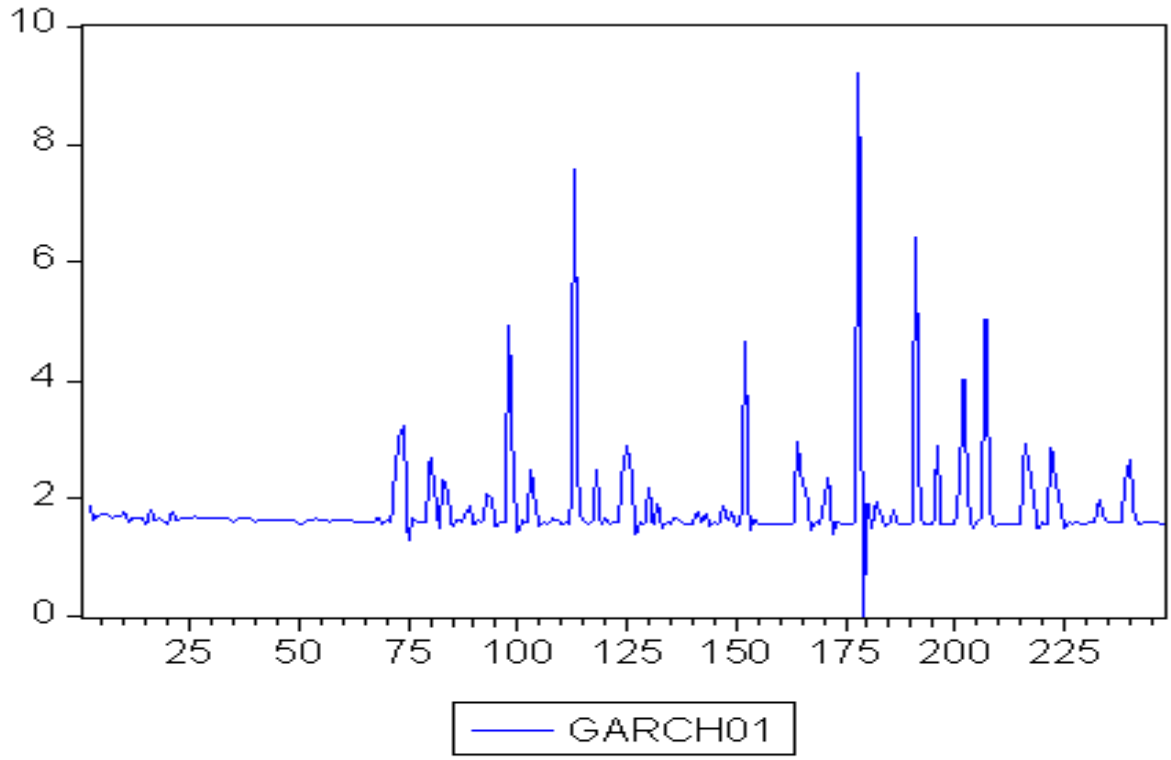

Table 1: Garch estimates for repo

	Coefficient	Std. Error	z-Statistic	Prob.
C	3.751834	0.341992	10.97054	0
SERIES01(-1)	0.364237	0.052147	6.984761	0
dummy	1.67024	0.195308	8.551828	0
	Variance Equation			
C	0.003412	0.001386	2.461168	0.0138
RESID(-1)^2	0.112954	0.016555	6.822934	0
GARCH(-1)	0.917233	0.013121	69.90415	0

Figure 7: Volatility for NSE G SEC Index

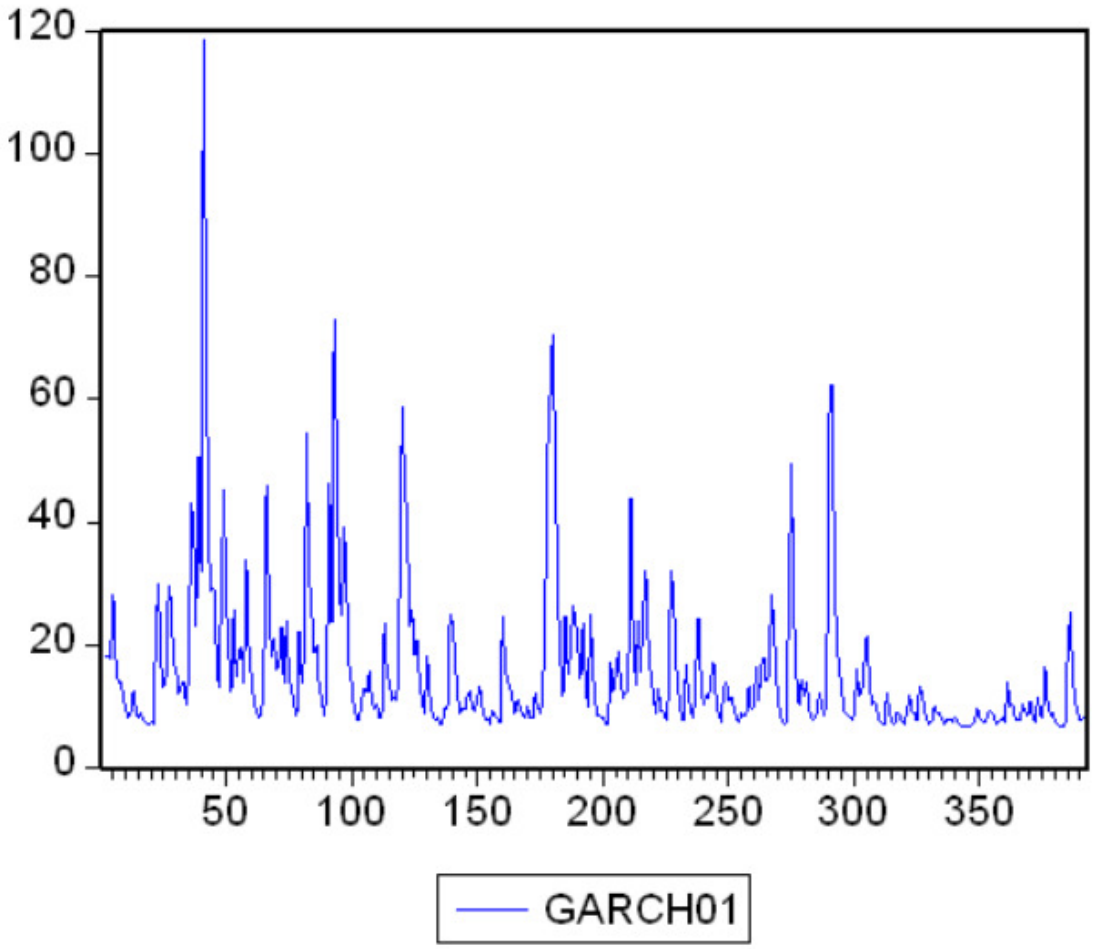

Table 2: Garch values for before and after event

Table 1: Garch estimates for repo

	Coefficient	Std. Error	z-Statistic	Prob.
C	60.66631	7.818402	7.759425	0
TOTAL_RETURN_INDEX(-1)	0.797696	0.025971	30.71462	0
dummy	-0.18532	0.297611	-0.6227	0.5335
	Variance Equation			
C	3.750676	0.959796	3.907784	0.0001
RESID(-1)^2	0.342464	0.08631	3.967821	0.0001
GARCH(-1)	0.431004	0.104253	4.134204	0

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