Statistics for financial sector development and stability

Information flow between non-deliverable forward, spot and forward markets in Malaysian currency during the Pre and Post U.S. QE Exit

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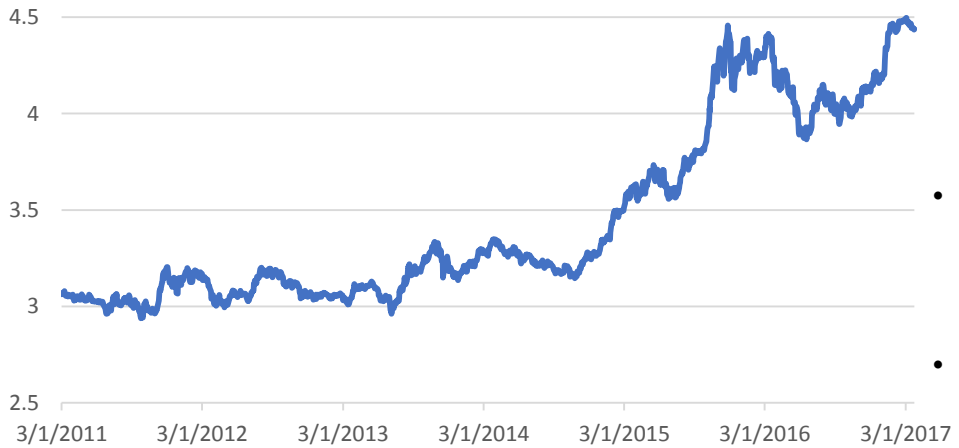
Introduction

- As an emerging market, Malaysian currency is under the regime of managed float. In other words, the exchange rate of Ringgit-Dollar (MYR/USD) is allowed to fluctuate based on supply and demand, but at times, Bank Negara Malaysia will intervene to influence the value.
- Ringgit is not an international currency, and hence its value is derived from the major currencies.
- In the spate of 27 months after FOMC ended its asset purchase program during their meeting on 29-30 October 2014, Malaysian currency suffered a decline of 35 percent.
- Another observation is when Trump won the U.S. election on 8 November 2016, there is another round of decline.
- While external factors such as the decline of oil price and capital outflow caused the decline of Ringgit, the activities of offshore Ringgit forward have also been mentioned as one of the causes.
- This issue of NDF became the headline on 2 December 2016 when Bank Negara Malaysia imposes on exporters to convert 75 percent of their proceeds denominated in foreign currency to Ringgit.
- The objective of this policy is to increase the reserve, decrease the USD volatility and stabilize the value of Ringgit.

Figure 1: USDMYR Spot



Some facts:

- In a spate 27 months from October 2014 to January 2017 after the end of US QE, the value of Malaysian currency Ringgit has dropped 35 percent relative to the US Dollar (Figure 1)
- Decline of oil price, capital outflow, and the activities of offshore Ringgit forward contribute to the depreciation of Ringgit Malaysia.
- NDF has also been claimed to cause the decline of the value of Malaysian currency.

What is NDF?

Misra and Behera (2006)

- Non domestic players, private companies and investors who invest in these Asian economies look for an avenue to hedge their currency risk.
- Non-delivery forward (NDF), which available in various currencies, have become popular for trading in the non-convertible or restricted currencies.
- Unlike Forward exchange contract, NDFs do not require physical delivery of the non-convertible currency.
- The contract is closed at maturity by settling the difference between the contracted forward rate and the prevailing spot rate.
- It is cash-settled currency forwards which provide an offshore mechanism to hedge currencies which were previously considered not being to hedge.
- There is no withholding tax required and the contracts are settled on a fixed rate.

Research Objective

Transmission channel

- This study intends to investigate the relationship between the spot, forward and NDF in this respect, and in an extended model, other financial variables are also being included.

Impulse response

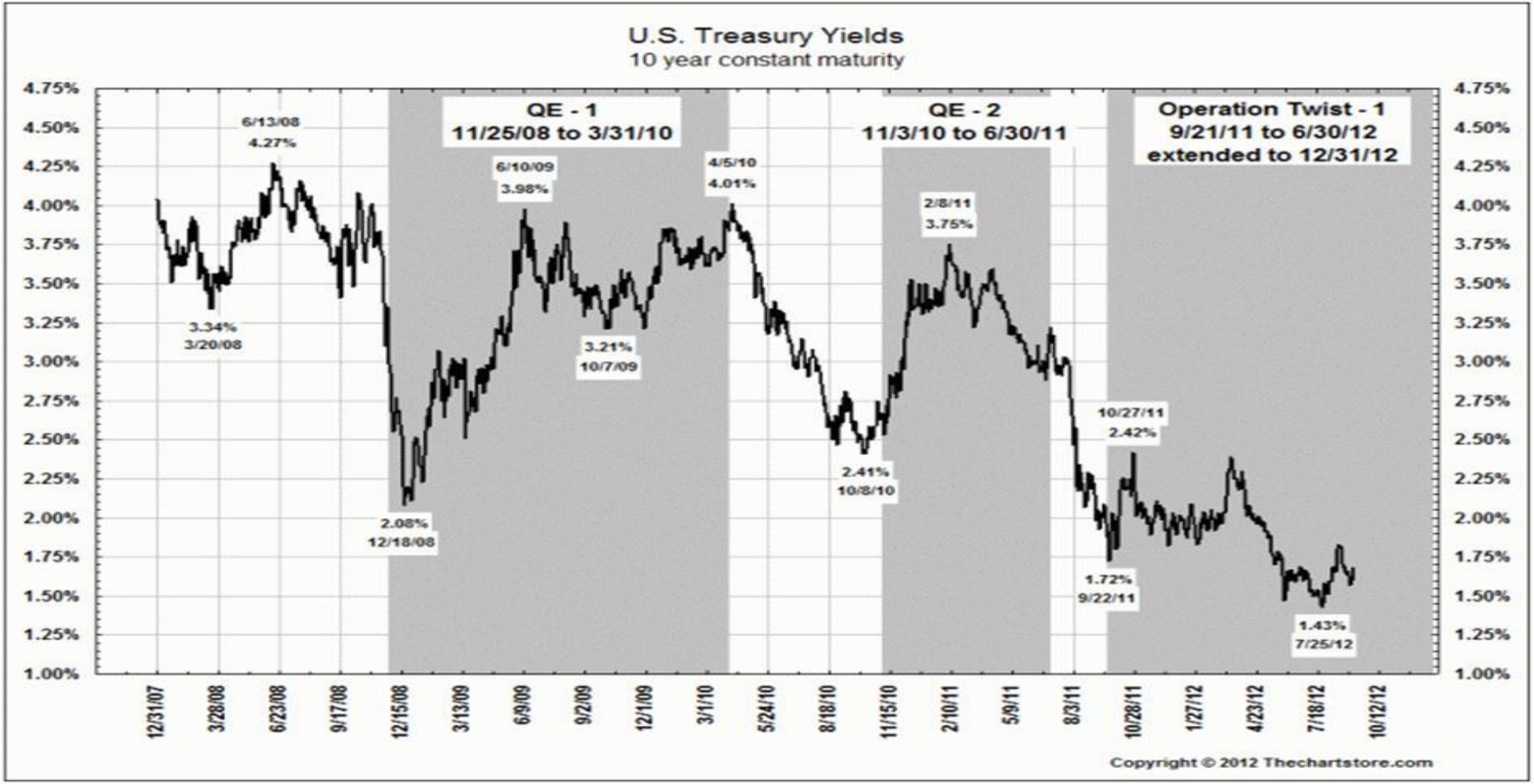
- The study will also look into the impulse response function given the shock to the key variables identified in the transmission channel.

Quantitative Easing

- Quantitative easing (QE) was widely used by the central bank in advanced countries in the aftermath of the 2007-08 financial crisis in an attempt to deal with the sluggish economy.

- In November 2008, the U.S. Federal Reserve (Fed) announced to initiate "QE1" by purchasing $100 billion in government-sponsored enterprises (GSE) debt and $500 billion in mortgage-backed securities(MBS). It was followed by "QE2" in November 2010 and "QE3" in September 2012 to boost economic activity.

- The FOMC ended its asset purchase program during their meeting on 29-30 October 2014.


U.S. Treasury Yields
10 year constant maturity
QE - 1
11/25/08 to 3/31/10
QE - 2
11/3/10 to 6/30/11
Operation Twist - 1
9/21/11 to 6/30/12
extended to 12/31/12
6/13/08
4.27%
3.34%
3/20/08
6/10/09
3.98%
3.21%
10/7/09
4/5/10
4.01%
2.08%
12/18/08
2/8/11
3.75%
2.41%
10/8/10
10/27/11
2.42%
1.72%
9/22/11
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7/25/12
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10/12/12
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Literature Review: Overview of NDF

- ***Patrick Higgins and Owen F. Humpage (2005)***

- NDF contract gain popularity among investors since early 1990s. Many use the exchange rate on these contract as a best guess of where the emerging market currency is headed.

- ***Ishii, Shogo; Otker-Robe, Inci; Cui, Li (2001)***

- The offshore transaction in domestic currency will lead to a reduction in the ability of the authorities to conduct an independent monetary policy, especially under fixed exchange rate regime. Moreover, offshore transaction have a destabilizing influence on the onshore foreign exchange market.

- ***Lipscomb, L. (2005)***

- Once a country moves to a more convertible exchange rate regime and permitted transaction in NDF, NDF market liquidity can potentially contribute to liquidity and volume in onshore currency market.

- ***Ma, G., C. Ho dan R. N. McCauley, (2004)***

- Asia's NDF turnover accounts for the overwhelming majority (70%) of global NDF turnover. NDF volatilities have been consistently higher than their spot counterparts and the volatility of the Asian NDFs typically increases with maturity.

Literature review:
Information transmission and spillover effect of NDF

- ***Park, J. (2001)***

- NDF granger cause spot market in the post-Korea exchange rate reform period. Moreover, mean and volatility spillover effect from NDF to the spot market in post-reform period can be observed.

- ***Colavecchio and Funke (2006)***

- They use multivariate GARCH method and found that Renminbi NDF has determined several of Asian currency markets in various levels.

- ***Mehra, S. dan H. Behera, (2006)***

- NDF market in Indian influenced by spot and forward market. Furthermore, mean spillover effect exist from spot and forward market to NDF market. However, volatility spillover are observed in the reverse direction.

Recent study

- ***Cadarajat, Y. and A. Lubis. (2012)***

- Mean and volatility spillover exist from NDF to spot and forward rupiah markets. Moreover, information transmission from NDF to forward rate changes are observed.

- ***Lei, G., & Yulan, D. (2016)***

- They use VAR model and found that development in the onshore sport market exert an influence on the offshore spot market in Hong Kong.

- ***Feng, Y & Yang, T (2016)***

- They use VAR-DCC-MGARCH-BEKK model and found that offshore RMB forward exchange market guide onshore RMB spot and forward exchange rate. Besides, a bi-directional mean spillover effect can be observed among the three market. Moreover, onshore RMB spot exchange rate market volatility spillover effect is greater than the offshore RMB spot exchange rate market.

Data

First data set: 3 November 2010 to 1 September 2017 (Daily data)

Variable	Description	Unit of measurement	Source
RFWD	Percentage return on 1 month forward MYR to USD rate	Daily return	Bloomberg
RSP	Percentage return on MYR to USD spot rate	Daily return	Bloomberg
RNDF	Percentage return on 1 month NDF MYR to USD rate	Daily return	Bloomberg

Second data set: November 2010 to September 2017 (Monthly data)

Variable	Description	Unit of measurement	Source
RFWD	Percentage return on 1 month forward MYR to USD rate	Monthly return	Bloomberg
RSP	Percentage return on MYR to USD spot rate	Monthly return	Bloomberg
RNDF	Percentage return on 1 month NDF MYR to USD rate	Monthly return	Bloomberg
MGS	Malaysia government securities 10 year yield	Interest rate	Thomson Reuters Data Stream
Reserve	International reserve	MYR million	Thomson Reuters Data Stream

Methodology

- First sub-period: 3 November 2010 to 30 September 2014. (Pre-QE Exit)
- Second sub-period: 30 October 2014 to 1 September 2017. (Post-QE Exit).
- International Reserve data only available in monthly basis. Second data set is monthly.
- Unit Root Test (ADF and KPSS).
- Vector Autoregressive Model (VAR)
- Granger's Causality Test
- Impulse response

RESULTS

Descriptive Statistics

First data set: 3 November 2010 to 1 September 2017 (Daily data)

Variable	Mean (%)	Standard deviation (%)	Skewness	Kurtosis	J-B statistic
US QE period					
RSP	0.0006	0.0004	-0.2032	6.2699	461.4481(0.00)
RFWD	0.0005	0.0040	-0.2576	6.4561	518.9422(0.00)
RNDF	0.0006	0.0045	-0.0887	6.2015	436.9682(0.00)
Post -US QE period					
RSP	0.0003	0.0053	-0.6064	7.5998	701.5330 (0.00)
RFWD	0.0003	0.0054	-0.5572	7.3779	632.6607 (0.00)
RNDF	0.0003	0.0104	0.6853	125.132	462464.6 (0.00)

Unit Root and Stationarity Test Results

First data set: 3 November 2010 to 1 September 2017 (Daily data)

Variable	ADF test		KPSS test	
	Level	First difference	Level	First difference
US quantitative easing period				
RSP	-31.01(0)**		0.05(10)	
RFWD	-31.40(0)**		0.05(9)	
RNDF	-33.81(0)**		0.04(11)	
Post-US quantitative easing period				
RSP	-25.72(0)**		0.35(4)	
RFWD	-25.72(0)**		0.35(5)	
RNDF	-26.99(0)**		0.29(8)	

The asterisks ** denote significance at 5% level
Figures in parentheses are the optimal lag length chosen.

Granger's Causality Results based on VAR

First data set: 3 November 2010 to 1 September 2017 (Daily data)

Figure 1: US quantitative easing period

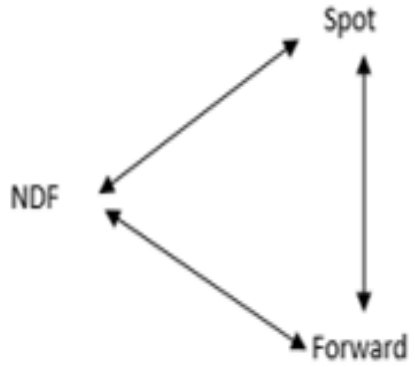
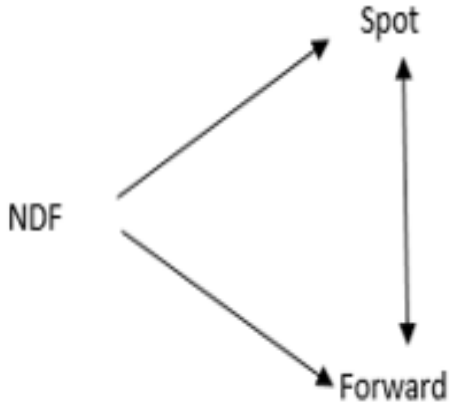


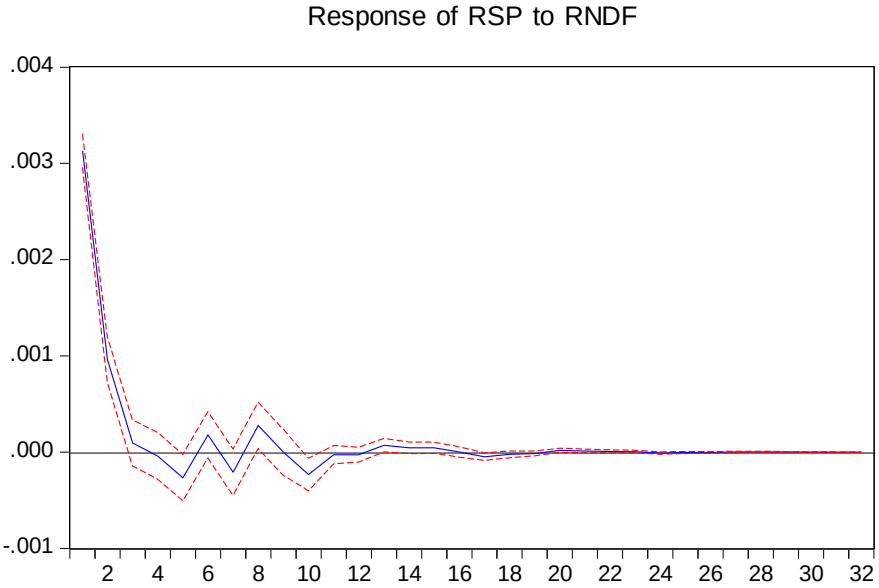
Figure 2: Post- US quantitative easing period

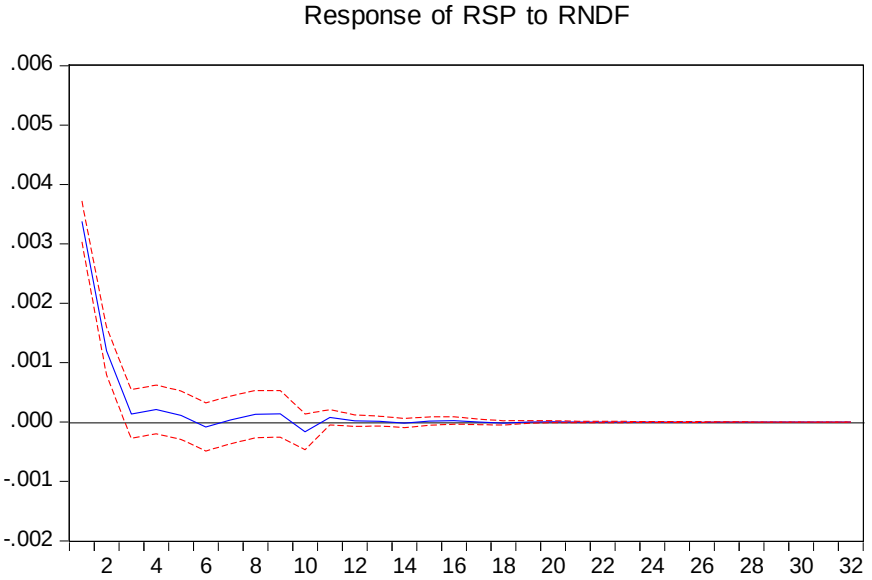


Impulse response

First data set: 3 November 2010 to 1 September 2017

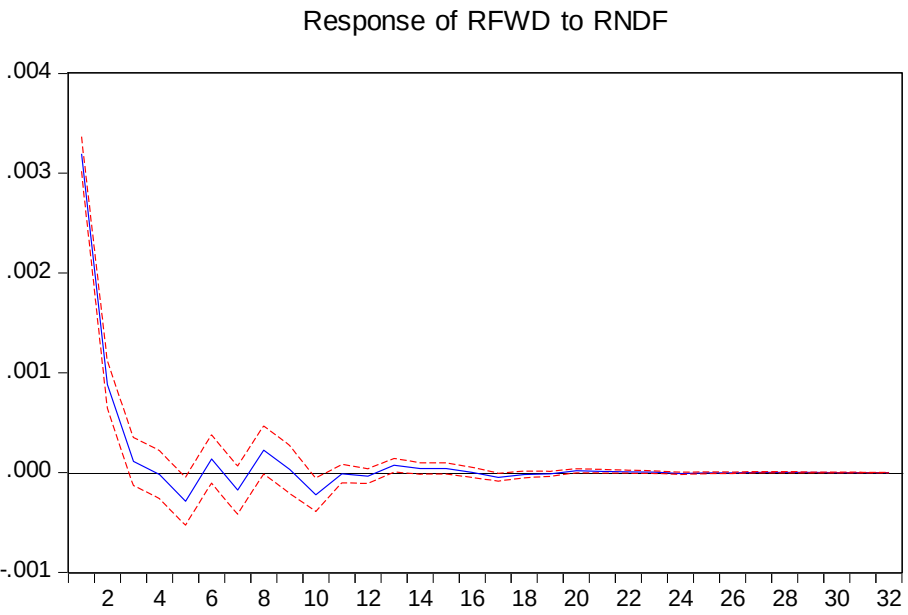
After the QE ended

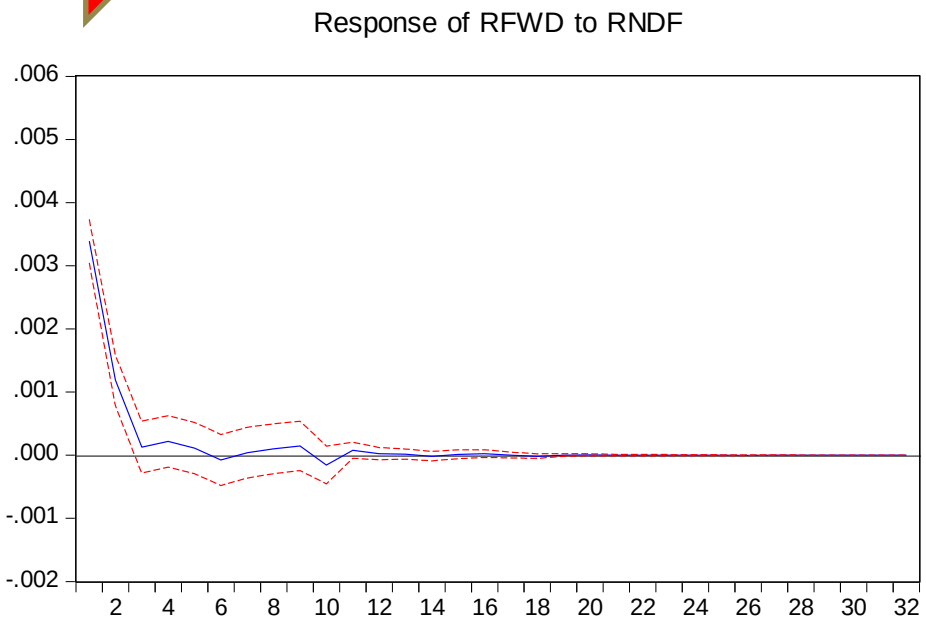




Impulse response- First data set: 3 November 2010 to 1 September 2017

After the QE ended





Descriptive Statistics

Second data set: November 2010 to September 2017 (Monthly data)

Variable/Period	Mean	Standard deviation	Skewness	Kurtosis	J-B statistic
US QE period					
RFWD	0.0010	0.0203	1.0485	5.3125	19.0845(0.00)
RSP	0.0004	0.0204	0.9867	5.2129	17.2184(0.00)
RNDF	0.0005	0.0214	1.1909	6.1738	30.8382(0.00)
MGS	3.7801	0.2581	0.0531	1.5198	4.3125 (0.11)
Reserve	415.8984	30.3452	-2.0595	6.1301	52.4113(0.00)
Post-US QE period					
RFWD	0.0078	0.0299	0.6532	3.6798	3.0728(0.21)
RSP	0.0078	0.0298	0.6938	3.8057	3.6479(0.16)
RNDF	0.0079	0.0310	0.4713	2.9277	1.2661(0.53)
MGS	3.9668	0.2207	0.1078	2.6622	0.2274(0.89)
Reserve	403.6819	18.8653	-0.4663	2.5350	1.5387(0.46)

Unit Root and Stationarity Test Results

Second data set: November 2010 to September 2017 (Monthly data)

Variables/Period	ADF Test		KPSS test	
	Level	First difference	Level	First difference
US quantitative easing period				
RFWD	-7.45(0)**		0.07(4)	
RSP	-7.38(0)**		0.07(4)	
RNDF	-6.71(1)**		0.05(3)	
MGS	-1.89(0)	-6.62(0)***	0.37(2)**	0.09(2)
Reserve	-1.79(0)	-5.76(0)***	0.18(5)**	0.50(3)
Post-US quantitative easing period				
RFWD	-4.69(0)**		0.23(2)	
RSP	-4.74(0)**		0.22(2)	
RNDF	-5.18(0)**		0.23(2)	
MGS	-2.92(0)**		0.07(3)	
Reserve	-3.12(0)	-5.68(0)***	0.16(10)**	0.27(10)

The asterisks *** and ** denote statistical significance at 1% and 10% level respectively.
Figures in parentheses are the optimal lag length chosen.

Granger's Causality Results based on VAR

Second data set: November 2010 to September 2017 (Monthly data)

Figure 1: US quantitative easing period

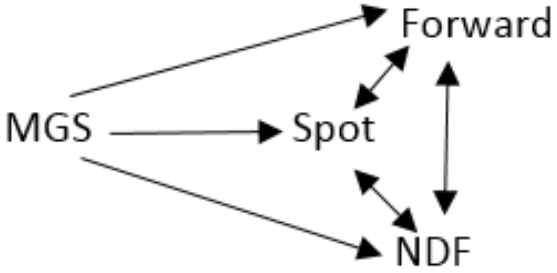
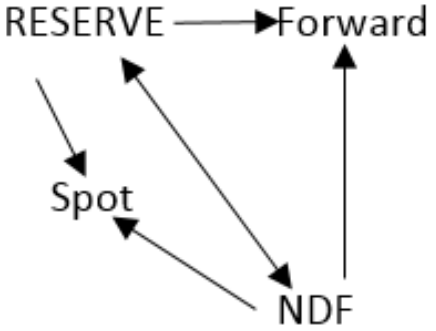
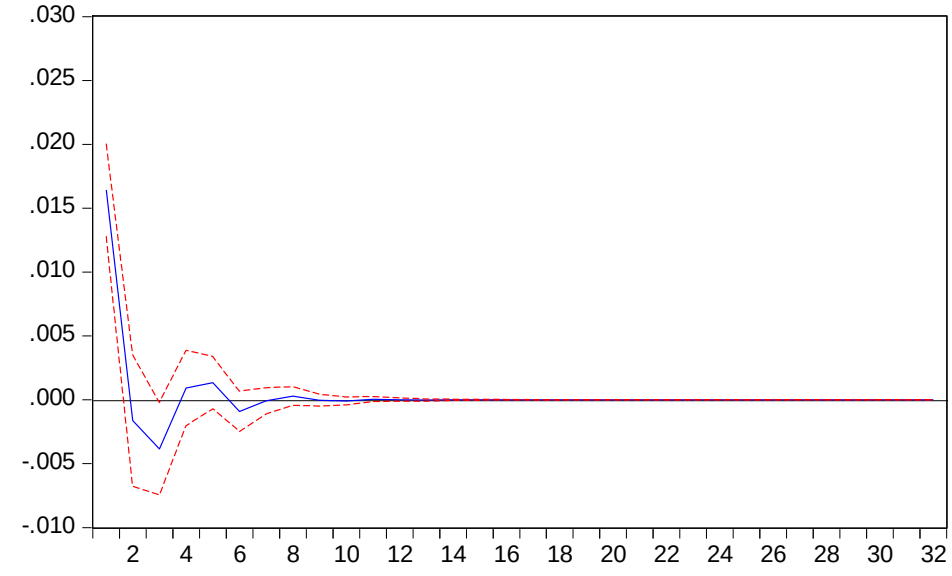


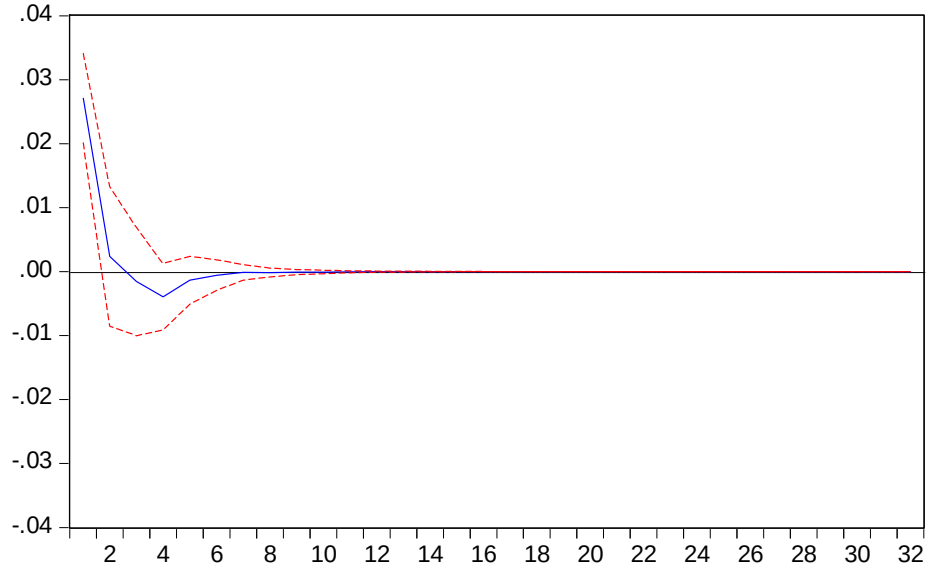
Figure 2: Post US quantitative easing period



Impulse response-
Second data set: November 2010 to September 2017

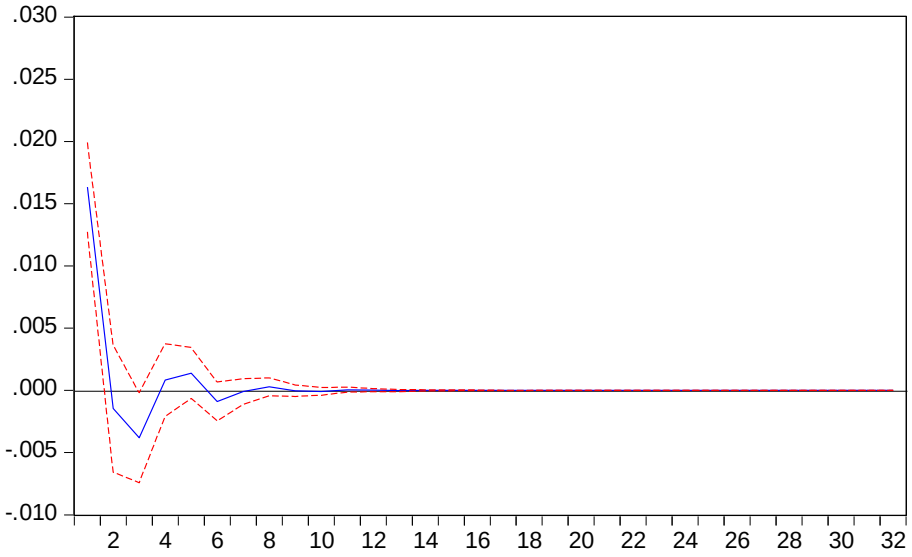
After the QE ended



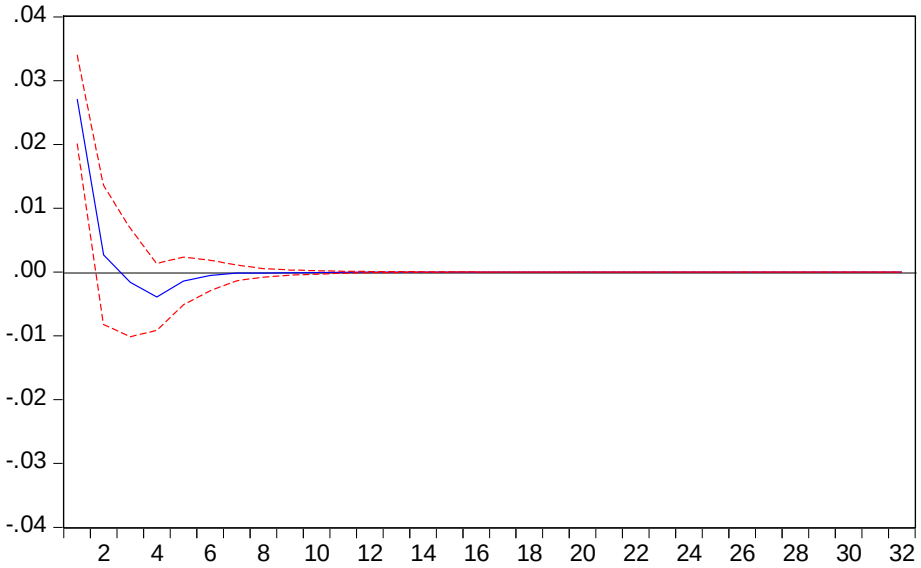


After the QE ended

Response of RFWD to RNDF



Response of RFWD to RNDF



Conclusion

- First, during Pre-QE exit, bidirectional causality can be observed between NDF and spot, NDF and forward, spot and forward.
- Second, NDF offshore market has dictated the movement of spot and forward on onshore market in post-QE exit period.
- These empirical results underscore that the NDF offshore market has dictated the movement of spot and forward on onshore market in post QE period.
- In the extended model, it is observed that MGS has important role in Pre-QE period while International Reserve is a variable that provides feedback to spot, forward and NDF marketsin post-QE era.
- The policy that aims to enhance the reserve is well justified based on the empirical results.

THANK YOU

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