

Exchange rate response to policy news in Kenya

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This paper examines the response of exchange rate to the central bank participation in the foreign exchange market, and monetary policy committee and other policymakers' pronouncements on exchange rate policies. Using the event study method, the paper identifies the events which represent either individual news or a cluster of news. In the analysis, the study traces the movement in exchange rate in the period before, during and after the event day using a four criteria that constitutes 'event', 'direction', 'reversal' and 'smoothing' criteria. Sign test is used to test whether the number of successes is larger than 50 percent. The exchange rates to the US dollar (USDR), Sterling Pound (GBPR) and Euro (EUROR) are used for analysis. We find mixed results for the exchange rates among the four criteria. In general, we find that exchange rates changes vary in terms of magnitude, direction and timing of change even with the same set of news. USDR has significant results with the 'event' and 'direction' criteria when central bank participates in the market, while GBPR is significant with 'event' and 'smoothing' criteria. All the exchange rates had significant results in almost all the four criteria with only central bank purchases that showed general depreciation. Further, we find in the event window significant successful changes in the post-event period indicating either a lag or persistence in response to news. During loose monetary policy regimes accompanied by central bank purchases, exchange rates tend to depreciate while in a tight monetary policy regime accompanied by both purchases and sales exchange rates tend to appreciate. Finally, the clusters tend to portray differences in magnitude of spikes, direction of change and timing even with same set of news.

JEL classification: E61; E58, F31

Key words: foreign exchange; central bank, exchange rates, communication, monetary policy committee.

1. Introduction

Participation of central bank in the sale and purchase of foreign reserves and pronouncements of policymakers are key policy tools that market participants look upon to derive news on the exchange rate policy. Central bank participates in the foreign exchange market to among other things stabilize exchange rate movements especially when the market is hit by a shock, realigning the exchange rate to its fundamentals. Central bank also participates in the market to accumulate foreign reserves, expecting to have insignificant impact on the exchange rate movements. However, given that such actions have implications on market perceptions especially if the objective of participation is not clearly communicated to the market, this may bring with it unintended movements in exchange rate depending on how the market interprets the presence of central bank in the market.

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In addition, policy statements of monetary policy committees, analyze the exchange rate market, the impact that previous policy stance have had on exchange rate movements and the expected outcome of the current policy stance being adopted. Such news is used by market participants in their trading activities. Further, policymakers make pronouncements to correct a growing perception in the market or misinterpretation of policy action by the market or communicate changes in operations of the market. While these tools have been used in various markets including the developed and the developing markets, the key question is whether the exchange rate responds to such news in the market.

Earlier literature on the impact of central bank policy statements on the market concentrated on establishing whether such statements influenced interest rate and exchange rate movement in developed economies. (Rosa and Verga 2007, Kohn and Sack 2003, Guthrie and Wright 2000) find that the central bank policy statements played a significant role in influencing the interest rates and exchange rates. Specifically, Rosa and Verga (2007) find that, the ECB's statements had on average matched actions and its communication passed on useful information that influenced the Repo rate in the short run. Further, it was possible to forecast the European's monetary authority interest rate setting behavior fairly well from the statements. Guthrie and Wright (2000), find that "open mouth operations" made noteworthy changes to interest rates of varying maturities that could not be explained by "open market operations". Kohn and Sack (2003) find that statements as well as actions shaped investors expectations. They concluded that statements and policy actions could serve as effective substitutes for each other.

With the established empirical evidence that central bank statements do impact on financial variables, more recent studies have concentrated on the magnitude and direction of these effects. For example, Fratzcher (2008) finds that both oral intervention and actual intervention had been successful in affecting the euro-dollar and dollar-yen in the short to medium term. Further, three pieces of evidence from the study provide significant support for the importance of a coordination channel in the ECB. *"One, oral interventions had a longer lasting and permanent effect, two oral interventions were more effective under large market uncertainty and when exchange rate deviated substantially from fundamentals and three oral interventions function independently of monetary policy."* Rosa (2011) finds that on the Monetary Policy Committee (MPC) days, the Fed could significantly influence the direction of exchange rate movement through their statements or through news shock³. The two surprise elements of monetary policy and communication significantly affected the exchange rate movement.

³ Defined as the "difference between what the central bank does (or announces) compared to what the market expects the central bank to do (or announce)."

There is very little work done in emerging and developing economies on implications of policy news on exchange rate movements. This paper attempts to analyze the implications of policy pronouncements by MPC and other policymakers, and participation of central bank in exchange rate market, in Kenya using the events study methodology. The analysis treats the pronouncements and market participation as news that affect the direction, movement, magnitude and stability of exchange rate. The study also attempts to test whether the duration of news events matters in achieving the desired results.

The paper proceeds as follows. Section two discusses the scope of news used in the study. Section three lays the methodology used in the study, in this case event-study method. Section four and five give the empirical results and conclusions of the study respectively.

2. Back ground, market participation and policy pronouncements

Kenya's exchange rate has undergone various regime shifts since Kenya gained her independence in 1963. The regime shifts have largely been driven by economic events, in particular movements in the balance of payment position in the country. From independence to 1974, exchange rate was pegged to the dollar. Between 1974 and 1982, the exchange rate experienced a series of devaluations that led to moving from the peg to the dollar, to a crawling peg in real terms by end of 1982. The crawling peg regime lasted eight years to 1990, when Kenya adopted a dual exchange rate up to 1993, when the exchange rate was fully liberalized. Kenya's exchange rate regime is free float determined in the market through demand and supply forces. The central bank participates in the forex market when it needs to stem volatility emanating from external shocks, when it is building the stock of foreign reserves, when effecting government payments and when injecting or withdrawing liquidity in the market.

By Law, Kenya is required to hold foreign reserve holding to cover a minimum of up to four months of import. The foreign reserve holdings are held in three main currencies the US dollar (68.4%), Euro (6.45%) and Sterling Pound (16.3 %) as at June 2013. Other currencies take up 8% of the total reserve holdings. In the previous years, reserve holdings were held in three major currencies only. For instance in 2010, USD reserve holdings were held in USD (47%), GBP(28%) and Euro (25%). The move to hold reserves in more currencies is to avoid losses emanating from revaluation of currencies.

With the establishment of monetary policy committee (MPC) in May 2008, Central Bank of Kenya publishes MPC statements after their periodic meetings. In addition to defining monetary policy stance, the statement analyses the exchange rate market and assess broadly the response of the market to previous policy actions. Table 1 gives examples of the statements made by MPC with regard to exchange rate market developments and implications of policy stance on exchange rate.

The MPC started issuing statements in June 2008⁴. We consider the content of the MPC statements as containing news that can be used by market participants. Figure 1 traces the movement in exchange rate when MPC makes such policy pronouncements. The exchange rate is the local currency price of one unit of the foreign currency, so that a negative movement corresponds to an appreciation and a positive movement corresponds to depreciation. The MPC statements are marked on the X axis from 2008 when MPC began operations. The Y primary axis represents situations where the statements were meant to yield to an appreciation of the exchange rate. Notably from the zero line on the left, most of the spikes are on the negative values implying an appreciation. The Y secondary axis likewise represents situation where the statements were meant to depreciate the exchange rate. From the zero line on the right, most of the spikes are upwards on the positive values indicating a depreciation of exchange rate. The figure 1, distinguishes statements meant to result to depreciation and appreciation of the exchange rate. Generally, it is expected that an increase in policy rate/tightening of policy stance would result in appreciation of the local currency as market participants adjust their portfolio.

The monetary policy committee statement hits the market after the trading session of the day of the meeting. Thus, market participants utilize the information in the statement the following trading day after the meeting is held and this is what we define as the event day. In the run up to the MPC meeting, market analysts make their predictions on what to expect as the outcome of the meeting thus we also consider possible market reactions in the period before the meeting. Similarly with possible lags in information communication or persistence in response of exchange rate to the news, we expect movements in exchange rate in the period after the event day. All the MPC statements are available in the central bank website. We picked information from the statements on the analysis of the exchange rate market by the committee and inferred the implied exchange rate movement with the defined monetary policy stance.

⁴ We are aware that the central bank used to publish monetary policy statements, before June 2008, spelling out the monetary policy for the next six months but we did not take this into consideration in this study.

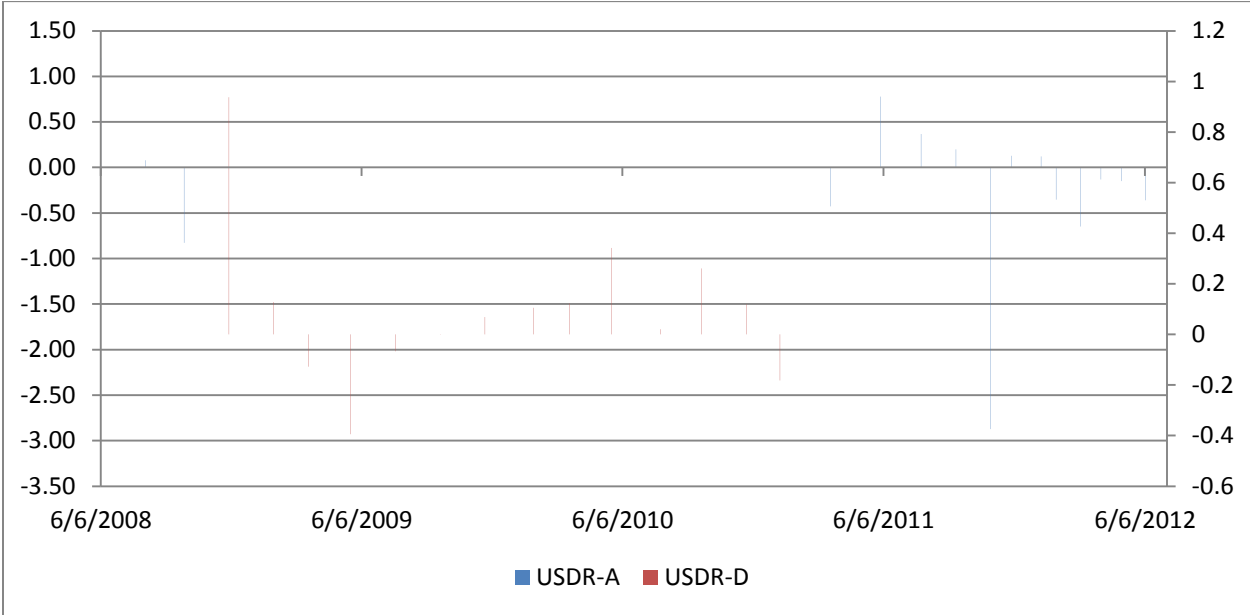
Table 1 Monetary Policy Committee pronouncements on exchange rate

Date	Statement on exchange rate	Monetary Policy Stance pursued	Expected movement of exchange rate
June 5, 2008kshs against the US\$ has encountered a major shock with the declining confidence in the shilling as a result of the post election stability.	Tight	Appreciate
September 29, 2008	... Kenya shilling had experienced excess volatility.....	Tight	Appreciate
September 23, 2009	...in the last two months, central bank purchased from the market to build its foreign reserves and inject liquidity into the market when needed. ... Kenya shilling remained relatively stable against US\$, EURO and the Sterling Pound.	Ease	Depreciate
November 24, 2009	The building up of reserves had no effect on the exchange rate beyond, perhaps, moderating the speed at which the international weakening of the US\$ had been drawn into the Kenyan economy.	Ease	Depreciate
January 26, 2010	.. the exchange rate of the Kenya shilling against major currencies continued to be stable...	Ease	Depreciate
March 23, 2010	The committee saw the need to provide an additional cushion through gradual build-up of reserves to 4.5 months of import cover.... This can be achieved without exerting significant pressure on the exchange rate...	Ease	Depreciate
May 20, 2010	Central bank has continued to build reserves to reach the statutory target and maintain stability in the foreign exchange market	Ease	Depreciate
July 28, 2010	.. the central bank had participated in the foreign exchange market to build up its foreign reserves.	Ease	Depreciate
September 23, 2010	During the last two months the central bank has continued to build up its foreign exchange reserves through either the US\$ or Euro purchases from the market. It was noted that the media had misinterpreted participation by the bankby suggesting that this intervention was to support a particular value of exchange rate of the shilling to the dollar....	Ease	Depreciate
November 25, 2010	... the central bank's acquisition of foreign exchange in the course of its programme to augment reserves was shown to have no impact on exchange rate movement...	Ease	Depreciate
March 22, 2011	.. the need to contain inflationary pressures and stabilize the exchange rate, the committee decided to tighten MP stance.	Ease	Depreciate
May 31, 2011	The committee noted that following its previous decision.....the exchange rate was responsive to the policy.	Ease	Depreciate
July 27, 2011	Exchange and interest rates volatility in the recent past had necessitated the need for policy action...	Tight	Appreciate
September 14, 2011	Committee observed that inflation, exchange rate and money market volatility continued to pose a challenge to the economy.	Tight	Appreciate
October 5, 2011	...immediate action is required from monetary policy side to stem inflationary pressure, stabilize exchange rate.....	Tight	Appreciate
November 1, 2011	.. exchange rate volatility persisted.... therefore a need for further tightening of monetary policy to tame inflationary pressures and stabilize exchange rate.	Tight	Appreciate
December 1, 2011	Kenya shilling has been appreciating strongly, showing	Tight	Appreciate

2011	that the tight monetary policy stance adopted by committee is achieving its desired results .		
March 6, 2012	Monetary policy stance supported by appropriate fiscal policy continued to deliver the desired outcomes on inflation and exchange rate stability	Tight	Appreciate
April 4, 2012	Monetary policy measures continue to yield desired results....exchange rate stability sustained...	Tight	Appreciate

Source: Various issues of MPC statements, Central Bank of Kenya

Figure 1 Exchange rate changes when MPC pronouncements imply appreciation (USDR-A) and depreciation (USDR-D) of the local currency



In some occasions the central bank governor goes to the media to provide information on growing market pressures and also to clarify any misinterpretations of the central bank actions. At the same time central bank releases press statements on operational changes that affect the foreign exchange market. The Minister of Finance has also used the media to communicate government actions on developments in the foreign exchange market. All these were considered as news to the market. A chronology of the pronouncements was constructed searching through various popular media including Kenya daily newspaper, Reuters and Bloomberg. The search criterion was based on the name or title ‘exchange rate’ and also the name of policy maker – governor or minister of finance. The news on what the governor or minister has said appear in the newspapers the following day. Hence, we considered the day the news is reported as the day information is picked by the market, thus the event day. Sometimes the central bank governor engages the media on the outcome of the MPC meeting emphasizing on content of MPC statement. Such events are not considered as different from the MPC event and therefore they are not included as news.

Central bank participates in the foreign exchange market to buy or sell foreign reserves and this affects market perceptions. Generally, the central bank does not announce its intention to participate in the market as such news get to the market the day the central bank is transacting in the market, which then becomes the event day. However, with growing market perceptions it has become important that central bank explains its objective of participating in the foreign exchange market as indicated in Table 1. There are situations when the central bank is in the market for a number of successive days and in some situation it is in the market once - a one-off event. The bank has indicated that the key objective in purchasing is to accumulate foreign reserves and in some cases to inject liquidity in the market. In recent period, the media reports participation of central bank in the exchange rate market in the following day. While those in the market when central bank is present get to use the information immediately, the rest of the market only gets the information in the post trading day. In Figure 2 and 3 we track the movement of exchange rate with the type of participation by central bank – buying or selling-and also in the periods with and without the central bank trading in the market. In figure 2, the Y primary axis represents the USD sales whereas the Y secondary axis represents the USD purchases. The exchange rate returns is the log difference of the exchange rate based on a daily 5 day week data multiplied by 100. The movements are therefore in percentage terms. The exchange rate return data runs for 12 years from 2000 – 2012. The figures 2 and 3 show there is evidence of spikes in exchange rate movement when the central bank is participating in the market but the movements seem to mimic the general trends when the central bank is not in the market.

Figure 2: Exchange rate changes when the central bank is purchasing (USDR-PUR) and selling (USDR-SALE) foreign reserves

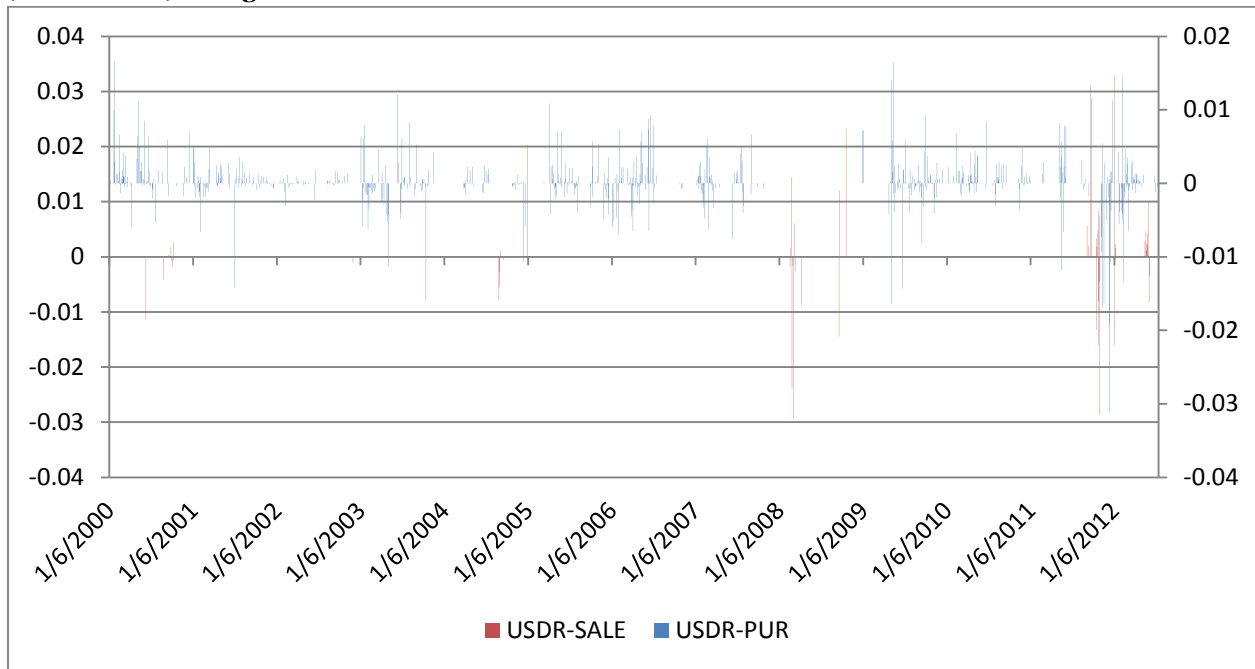
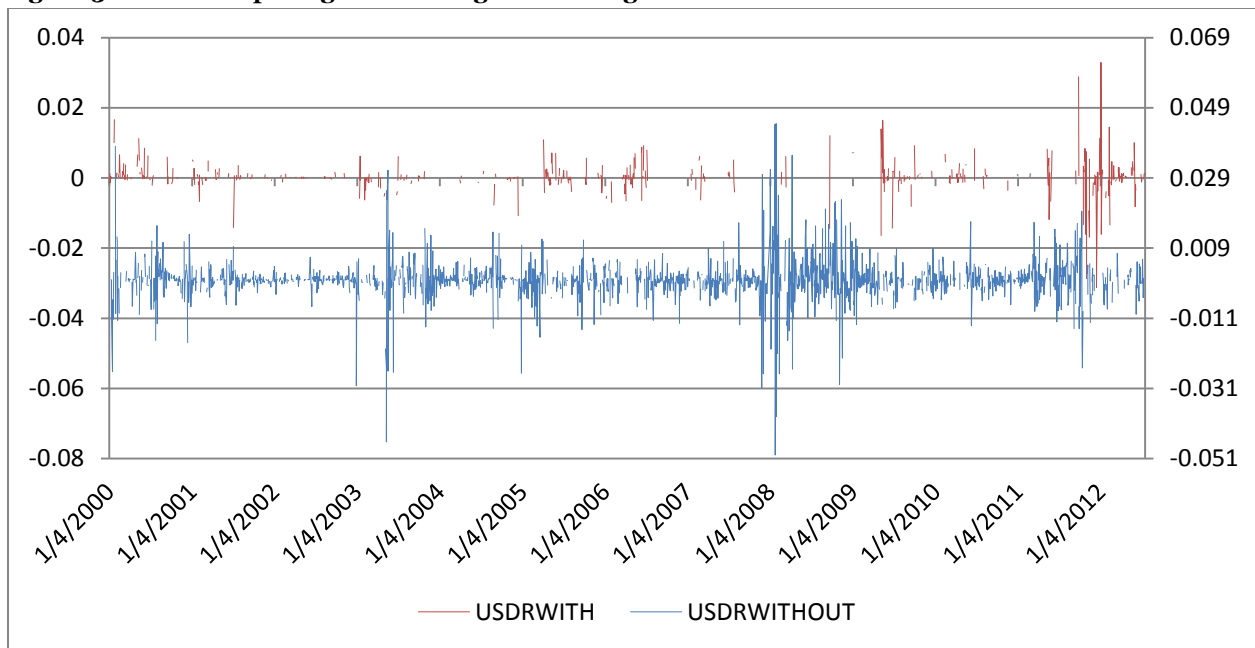


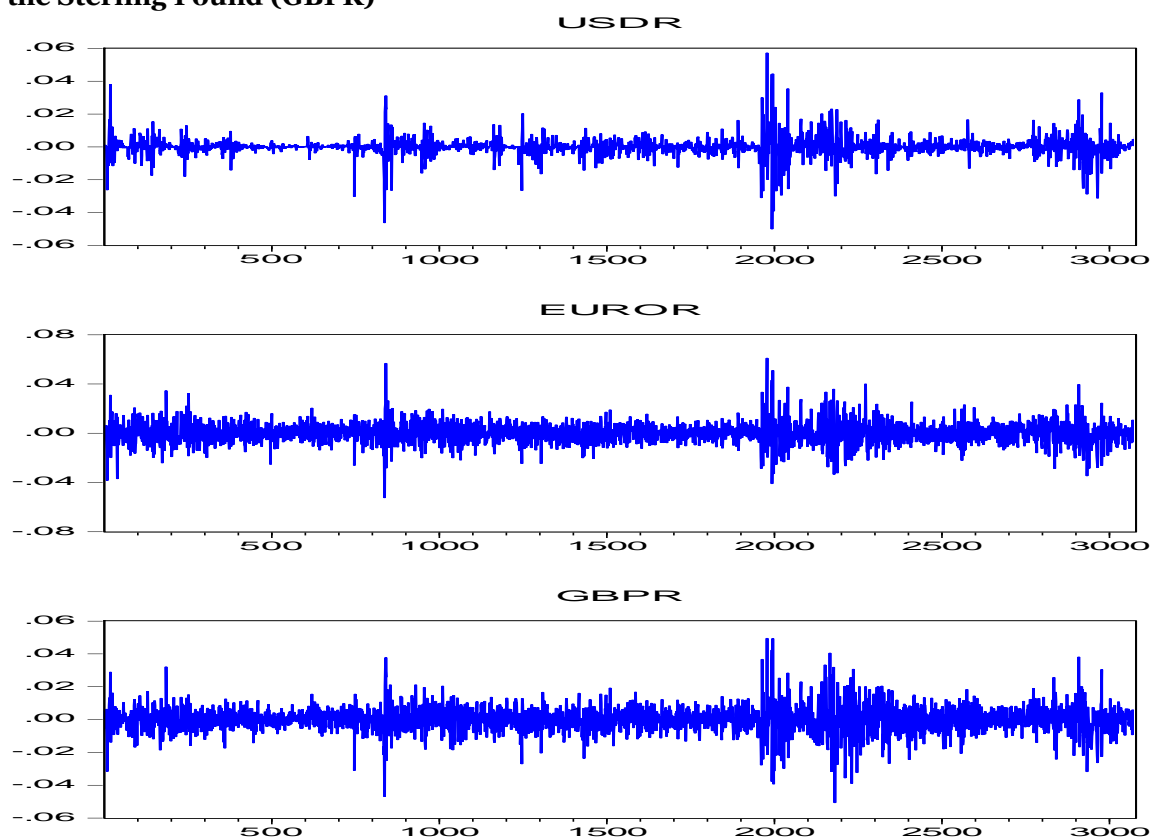
Figure 3 Comparing the exchange rate changes with and without central bank in the market



We attempted to categorize the information gathered in terms of the objective of the policymakers, implicitly or explicitly. We considered the key objective as changing the direction of the exchange rate which could be to see an appreciation or depreciation of the local currency. The stability component is sometimes silent but we assume within the broad objective of the central bank, the issue of price stability is a continuance objective and inherent in any policy pronouncement and actions. In some situation though, the stability aspect is explicitly brought out clearly in the MPC statements. A key question that arises is whether the news in the policy pronouncement is brought out clearly. It was difficult to deal with this kind of categorization of messages as it would mean a lot of subjectivity.

We analyze exchange rate of the shilling to US dollar (USDR), Sterling pound (GBPR) and the Euro (EUROR). These are the three currencies that dominate the international transactions in Kenya. At the same time it is noted in the 23rd September 2010 MPC statement that the central bank builds its foreign reserve through either the purchase of the US\$ or the Euro. Further, when trend line is analyzed, see Figure 4, the exchange rates provide different patterns of changes that seem to reflect that they respond differently to same or different aspects in the market. Furthermore, the central bank market participation is dominated by the dollar and the expectation is that participants may shovel their portfolio to meet the demand for the dollar if that is what the market demands. In addition, the participants watch the international trading with the currencies and we expect that this would influence their portfolio changes. However we assume that the policy news affects the movement in exchange rate in the event window.

Figure 4: Trends in exchange rate returns for US Dollar (USDR), Euro (EUROR) and the Sterling Pound (GBPR)



3. Empirical methodology

Various methodologies have been used to analyze the implications of news contained central bank statements on exchange rate movements. For example, Rosa and Verga (2007) use simple methods of OLS and ordered probit to confirm that the ECB'S statements influenced the market. Guthrie and Wright (2000), use Seemingly unrelated regression (SUR) and choleski decomposition to establish that anytime the interest rate moved out of line of the expectations of monetary authority, a statement issued would take it back to required level. A tightening announcement was followed by an increase in interest rates and appreciation of exchange rate in New Zealand. Kohn and Sack (2003), check the volatility of the financial variables on the day the statements were released. It was expected that volatility would be higher if the statements had any impact on the financial variables. (Fratzcher, 2006 and Beine et al 2009) make use the GARCH models in analyzing the success of oral and actual intervention in influencing the exchange rate movement in the market. Event study methodology has also been used in for instance Fratzcher, (2008) and Rosa (2011), who use it to analyze the impact policy communication in influencing exchange rate movement. The idea behind using event studies is that policy makers tend to intervene in the market at certain periods of time and then stop for a while and then get into the market again thus forming

windows/clusters that can be analyzed. The event study methodology further makes it possible to observe the movement of financial variables over a longer period of time for instance, 10 day window as opposed to the observance of daily or intraday changes of financial variables as is the case for GARCH models. Evidence from literature shows that GARCH studies have been able to find that interventions influence the exchange rate movement one or two days after intervention, whereas the event studies offer a longer post intervention window to observe effects, hence their preference. GARCH models are most suited for capturing volatility of financial variables and are widely used to represent non-uniform variance in time-series data. The purpose of this paper is to analyze whether exchange rate moves/responds to policy news and not analyze the volatility of exchange rate. Event study methodology is found most appropriate for the kind of analysis undertaken in the paper. Event studies assume that the market is efficient in processing information. In this case, the forex market accurately reflects movement of exchange rate when policy is pronounced in the market by MPC, government and Central bank actions in the market.

In this study we use the event study method to analyze the ‘success’ of policy pronouncements, news and central bank participation in the market over a longer time period. Assuming that policymakers’ pronouncements and actions take place at certain times when the situation warrants it and then allow the market time to respond. We treat these as news that market participants use in their decision making. This could happen as a one-off event or a series of several events that are taken until the policy objective is achieved. For instance when the central bank is in the market with an objective of building reserves it will be in the market on a number of successive days to purchase foreign currency till the objective is attained. Other times there may be a shortage of foreign currency, when the central bank makes a one day sale to stabilize the exchange rate market. We define the event, event window and the diagnostic method.

Event

We define an event as a cluster of news with successive policy pronouncements and actions or a single event of news. A cluster of news is defined by successive news that occurs in less than 10 days. This means we have an event with different news/policy actions in more than one day period. Table A1 provides a summary of these events when the central bank is in the market. We note that of the 58 events, only 8 have a single day events, implying that when the central bank is in the market especially purchasing, it does so for successive days. A negative (-1) implies an expected appreciation while a positive (+1) is an expected depreciation. Table A2 reports the policy pronouncements with the shaded areas reflecting the non-MPC pronouncements. We have 30 events of MPC policy pronouncements. We note that when the exchange rate started depreciating

in late period of 2011, the policy pronouncements and monetary policy stance were mainly aimed at achieving an appreciation of the shilling while also targeting the high inflation pressures.

Event window

An event window is defined as 10 days before and after an event. This means we have a 21 days event window. In Appendix Figure A1, A2, A3, A4 we track the movement of exchange rate in the 21 days event window capturing the period before, within and after the event. We find mixed movements with spikes not necessary in the event period and the magnitude of the spikes vary indicating differences in dynamics of exchange rate movements in the event window. For example, we find that even when a depreciation is expected there are some days when we have appreciations and vice versa.

Defining a successful event

We define a successful event as an event where movement in the exchange rate is in the desired direction given the policy pronouncements or action. We assume that when there is policy news and the information is used in the market immediately then we have the desired response immediately. However, there could be lags in the way information permeates the market so that market response may be expected some days after. It is also important to note that market participants may have anticipated the policy action much earlier and incorporated such information so that we don't see any spike in the event period.

We need to understand that under this analysis there is an assumption that the movement is caused by the actions being taken more specifically. However, we may find that the exchange movement may be a coincidence of what is happening because of other events. It is also possible that the market participants are responding to misinterpretation of the policy actions. As such it is a bit difficult to disentangle the other aspects playing a role in this. In addition, the channel of events may not be clearly captured, it is possible that when monetary policy committee increases the policy rate, it takes some time for the market participants to reallocate their portfolio. It is possible that the magnitude of change matters, for example, in policy rate or volume traded, for any significant impact to occur.

Measuring success of an event

We follow Fratzscher (2008) and use his notations, to identify the various criteria to use in measuring the success of an event. We use three criteria including “*event*” criterion, which tests whether the direction of the exchange rate change (Δs) at the event is consistent with the interventions themselves, i.e. whether an intervention to, e.g.,

strengthen the Kenya shilling to the US dollar, indeed leads to such a change during the event:

$$(\Delta s^{eve} > 0, 1 > 0) \text{ or } (\Delta s^{eve} < 0, 1 < 0) \quad [1]$$

The second criterion is ‘*direction*’ criterion tests whether the exchange rate moves in the desired direction in the post-event window.

$$(\Delta s^{post} > 0, 1 > 0) \text{ or } (\Delta s^{post} < 0, 1 < 0) \quad [2]$$

The third criterion is the ‘*reversal*’ criterion that tests whether the news succeeds in reversing the trend prior to event in the post event window period. For instance if appreciating/depreciating the currency after the event whereas n it was depreciating/appreciating before.

$$(\Delta s^{post} > 0, 1 > 0 \text{ iff } \Delta s^{pre} < 0) \text{ or } (\Delta s^{post} < 0, 1 < 0 \text{ iff } \Delta s^{pre} > 0) \quad [3]$$

Fourth, the ‘*smoothing*’ criterion which looks at whether the news manages to reduce or level the strength of the pre-event exchange rate movements:

$$(\Delta s^{post} > \Delta s^{pre}, 1 > 0 \text{ iff } \Delta s^{pre} < 0) \text{ or } (\Delta s^{post} < \Delta s^{pre}, 1 < 0 \text{ iff } \Delta s^{pre} > 0) \quad [4]$$

We use the sign test to test whether the number of ‘successes’ is larger than 50%, or equivalently larger than the number of ‘failures’. The sign test is based on the direction of sign changes either minus or plus and not on the numerical magnitudes. The sign test is a non-parametric test that is used to test small samples that may not follow a normal distribution. The null hypothesis H_0 is that the median difference is zero. Thus the H_1 : the median difference is positive $\alpha = 0.05$. The sign test approach analyzes only the signs of the changes. The test statistic for the Sign Test is the number of positive signs or number of negative signs, whichever is defined as success. In this study, success is defined in four criterion as the event, direction, reversal and smoothing discussed before. Where success is the number of times the exchange rate moves in the desired direction when policy is pronounced or when intervention is undertaken on the event day and after the event day. Further, we check how many times the exchange rate reverses from the desired direction or is smoothed in the post event window. If there is no change, then the differences are zero. If there are changes, depending on the criteria of analysis, the positives or the negatives signs are considered as the test statistic for success.

To determine the p-values, we use the observed test statistic which represents the success or events of interest (x), number of sample observations (n) and probability which is 50% or $p = 0.5$. By using the binomial distribution model we compute the probability of observing different number of successes during the experiment. The binomial distribution is computed as follows: $\rho(X \text{ successes}) = \frac{n!}{x!(n-x)!} \rho^x (1 - \rho)^{n-x}$.

The p-values are then used to assess the rejection or acceptance criteria compared to the significance level of 0.05.

4. Empirical results

This section discusses the empirical results capturing the benchmark results and factors that may help us understand the results obtained.

a) Benchmark results

Table 2 reports the results for the three exchange rates to US dollar (USDR); Sterling Pound (GBPR) and Euro (EUROR). We discuss the four criteria each at a time.

Event criterion: When the central bank is in the market, only the USDR shows successful significant changes at the event day. Of these changes 84 percent were depreciation in exchange rate. Further, in 32 percent of the time, successful changes in USDR were accompanied by successful changes in GBPR and EUROR. Half of the time USDR changed alone implying that the three exchange rates to some extent respond differently to the same news. Further, the British pound-shilling and Euro-shilling would be influenced by the cross rates between the US dollar and the pound, and between the US dollar and the Euro partly explaining the differences in the results. In the case of MPC and other policymakers' pronouncements, only GBPR has successful significant changes, of which 50 percent showed appreciation.

Direction Criterion: considering the central bank participation in the market, we find only the USDR has significantly higher number of successful events. Although the successful changes in GBPR and EUROR are insignificant, they were over 50 percent of the total events. At the same time, 50 percent of the time USDR has successful changes this is accompanied by successful changes in GBPR and EUROR. This implies that in the post-event period, there is a growing tendency for the exchange rates to respond together to the news. The policy pronouncements results were generally insignificant for the three exchange rates.

Reversal and smoothing criteria: None of the exchange rates shows significant successful changes with the reversal criterion. For the smoothing criterion the GBPR shows significantly successful lower volatility with central bank participation in the market. For the USDR and EUROR although successful changes are insignificant, in over 50 percent of the time lower volatility is achieved.

Table 2 Success criteria of event study (10 days window)

Success criteria type	US dollar (USDR)			Sterling pound(GBPR)			Euro(EUROR)		
	Success proportion	p-value	Exchange rate change/return	Success proportion	p-value	Exchange rate change/return	Success proportion	p-value	Exchange rate change/return
Event criterion									
Oral intervention	61.5	0.200	-0.1001	69.2	0.024	-0.0873	64.1	0.108	-0.4852
Actual intervention	65.5	0.012	0.2765	50.0	0.552	0.0392	44.8	0.256	0.1068
Direction criterion									
Oral intervention	38.5	0.200	-0.0097	51.3	1.000	0.2222	46.2	0.749	0.1218
Actual intervention	69.0	0.004	0.003	55.2	0.256	0.0903	58.6	0.119	0.0875
Reversal criterion									
Oral intervention	38.5	0.200	-0.0563	53.9	0.749	0.0168	46.2	0.749	0.0085
Actual intervention	41.4	0.119	0.0171	56.9	0.179	0.0749	53.4	0.256	0.0610
Smoothing criterion									
Oral intervention	46.2	0.749	0.4202	43.9	0.522	0.0781	46.2	0.749	0.7176
Actual intervention	51.7	0.448	0.3022	60.3	0.074	0.5553	52.2	0.256	0.6330

Note: Total events were 39 for oral interventions and 58 for actual interventions; the exchange rate returns are defined as the first difference of logarithm of exchange rate x 100; p-value are defined for sign test

b) Comparing success criteria with varying policy actions

'Sales' versus *'purchases'* of foreign reserves: In most cases sales are aimed at stabilizing the market while purchases are meant to build foreign reserves which may indirectly have implications on the stability of the market given the market perception on level of accumulated foreign reserves. We try to find out whether it makes a difference distinguishing the *'purchases'* and *'sales'* events. Table 3 gives mixed results both across the exchange rates and the success criteria. For the USDR, purchases have significant successful changes with the *'event'* and *'direction'* criteria while the *'sales'* have insignificant successful changes. For the GBPR and EUROR we have significant successful results with the *'direction'*, *'reversal'* and *'smoothing'* criteria. Thus, even though the benchmark results showed insignificant successful changes, we cannot reject that *'purchases'* have significant impact on exchange rate changes. Thus, it is critical that the central bank communicate the objective of participating in the market to avoid any unintended movements in exchange rate.

'Loose' versus *'tight'* monetary policy stance:- MPC pronouncements aim either to tighten or loosen monetary policy stance and there is expected impact on exchange rate as noted in Table 1. We thus compare the results for the two strands given the differences in expected outcomes. In Table 4 we find GBPR has significant successful

changes at the event day for both tight and loose monetary policy stance. The USDR and EUROR show insignificant changes.

Table 3 Success criteria during central bank sale and purchases of foreign reserves

	Sales		Purchases	
US Dollar				
	Success proportion	p-value	Success proportion	p-value
Event criterion	54.5	0.500	68.1	0.000
Direction criterion	63.6	0.274	70.2	0.000
Reversal criterion	27.3	0.032	44.7	0.256
Smoothing criterion	72.7	0.113	46.8	0.162
Sterling Pound				
	Success proportion	p-value	Success proportion	p-value
Event criterion	63.6	0.274	45.8	0.162
Direction criterion	54.5	0.500	55.3	0.010
Reversal criterion	63.6	0.274	55.3	0.010
Smoothing criterion	63.6	0.274	59.6	0.001
Euro				
	Success proportion	p-value	Success proportion	p-value
Event criterion	45.5	0.500	44.7	0.256
Direction criterion	63.6	0.274	56.3	0.004
Reversal criterion	54.5	0.500	53.2	0.024
Smoothing criterion	54.5	0.500	55.3	0.010

Table 4 Success criteria with tight and loose monetary policy stance

	Tight		Loose	
US Dollar				
	Success proportion	p-value	Success proportion	p-value
Event criterion	53.3	.500	60.0	.3036
Direction criterion	40.0	.3036	46.7	.500
Reversal criterion	40.0	.3036	40.0	.3036
Smoothing criterion	46.7	.5000	46.7	.500
Sterling Pound				
	Success proportion	p-value	Success proportion	p-value
Event criterion	73.3	.0592	73.3	.0592
Direction criterion	53.3	.500	60.0	.3036
Reversal criterion	46.7	.500	33.3	.1506
Smoothing criterion	33.3	.1506	60.0	.3036
Euro				
	Success proportion	p-value	Success proportion	p-value
Event criterion	66.7	.1506	60.0	.3036
Direction criterion	53.3	.500	46.7	.500
Reversal criterion	26.7	.0572	40.0	.3036
Smoothing criterion	26.7	.0572	60.0	.3036

c) Does the length of the event window matter?

We look at the success rate of changes in the three exchange rates at various points in 11 days event window rather than considering the average results for the post-event period. We find evidence of successive changes in various days as presented in Figure 5a, 5b and 5c. For the USDR in two days (4th and 6th days) we find significantly successful reversals. In addition, we find five days having significantly successful smoothing and in one day we have significantly successful changes for the direction criterion. Similarly, for the GBPR and the EURO we find evidence of significantly lower volatility in different days. We thus find analyzing the dynamics in the event window provides valuable information that is not captured when we consider the benchmark results.

Figure 5a Movement of exchange rate in an eleven days window-USD

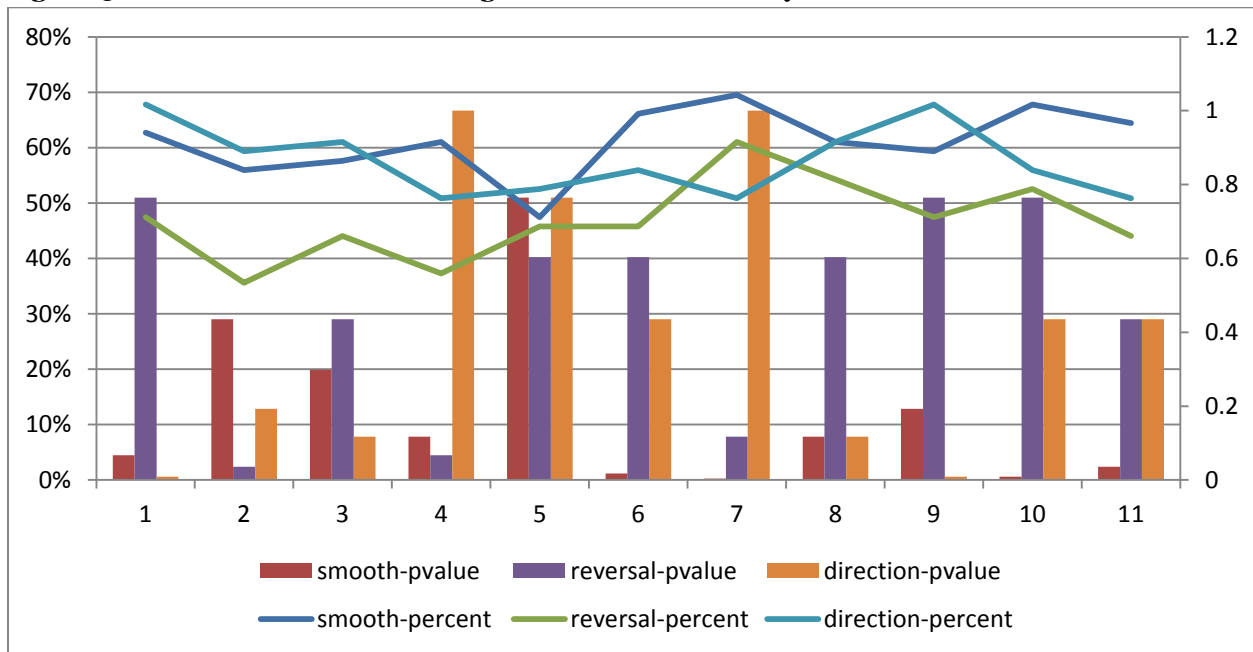


Figure 5b Movement of exchange rate in an eleven days window-Sterling pound

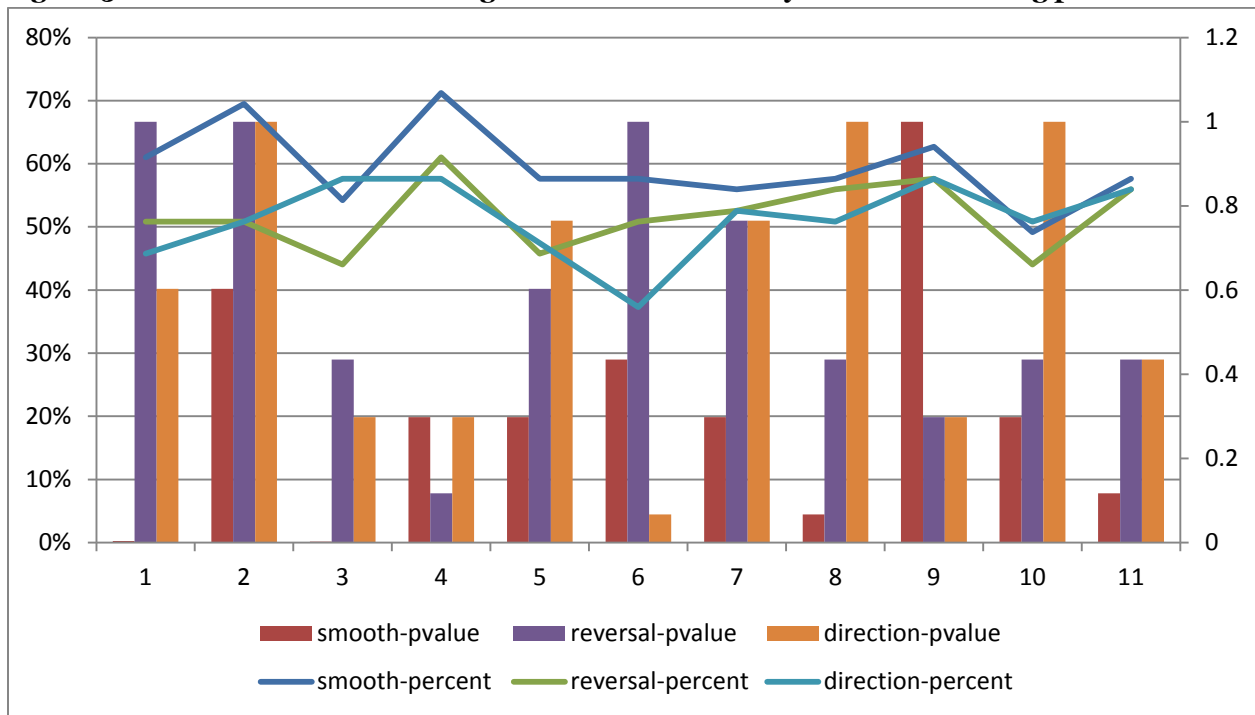
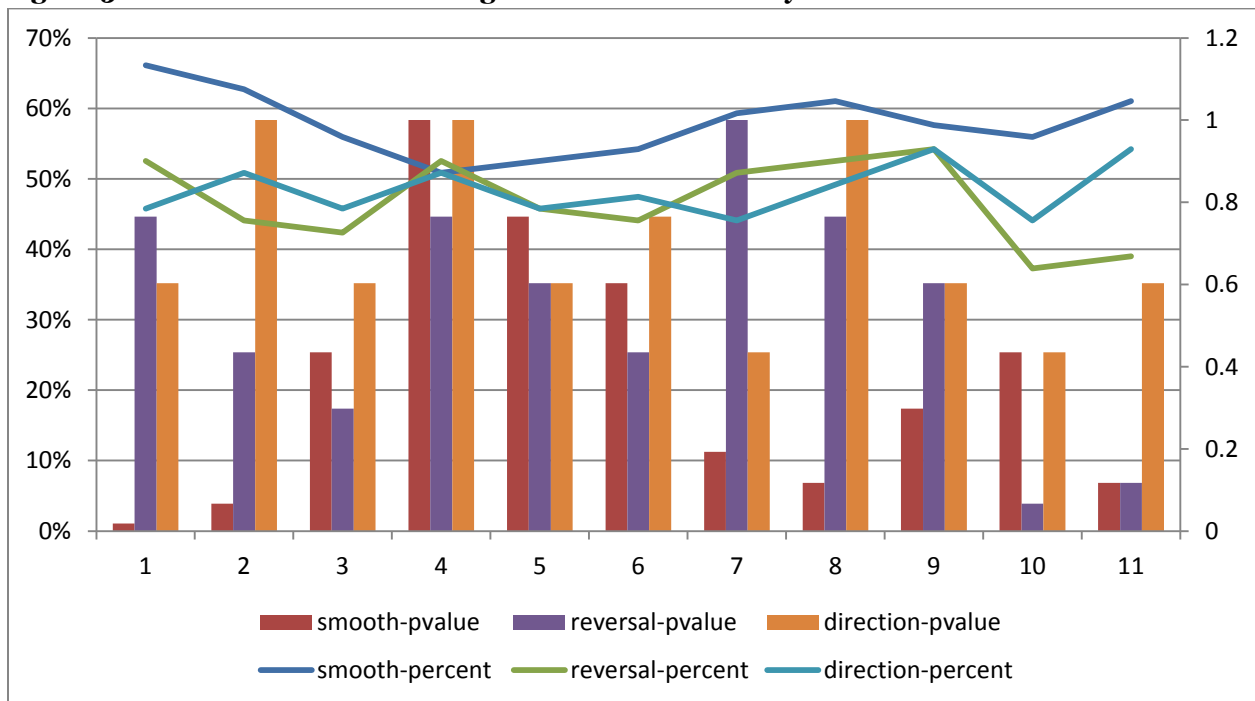


Figure 5c Movement of exchange rate in an eleven days window-Euro



d) Coordination of policies

After the monetary policy committee announces its policy stance, the activities of the central bank in the market may influence the impact on the exchange rate movement. We find that in all situations with loose monetary policy stance, central bank participated in the market to accumulate foreign reserves (Loose and Purchase). With tight monetary policy, central bank participated in the market to accumulate (Tight and Purchase) and also stabilize the market (Tight and Sale). Table 5 provides results showing that when we have a loose monetary policy accompanied by purchases of foreign reserves, the exchange rate tends to depreciate while tight monetary policy accompanied by sale of foreign reserves resulted in appreciation. When we have tight policy stance accompanied by purchases (Tight and Purchase) we have more appreciation in the event day. This is a period when the market saw an accelerated tightening of monetary policy, and thus the effects of monetary policy tightening seem to override the effects of purchases. Further, the results show more smoothing with (Tight and Sale). Thus it is critical to sequence the policies to get the desired results.

Table 5 Success criteria of event study when policy pronouncements are accompanied by participation in foreign exchange market (percentages).

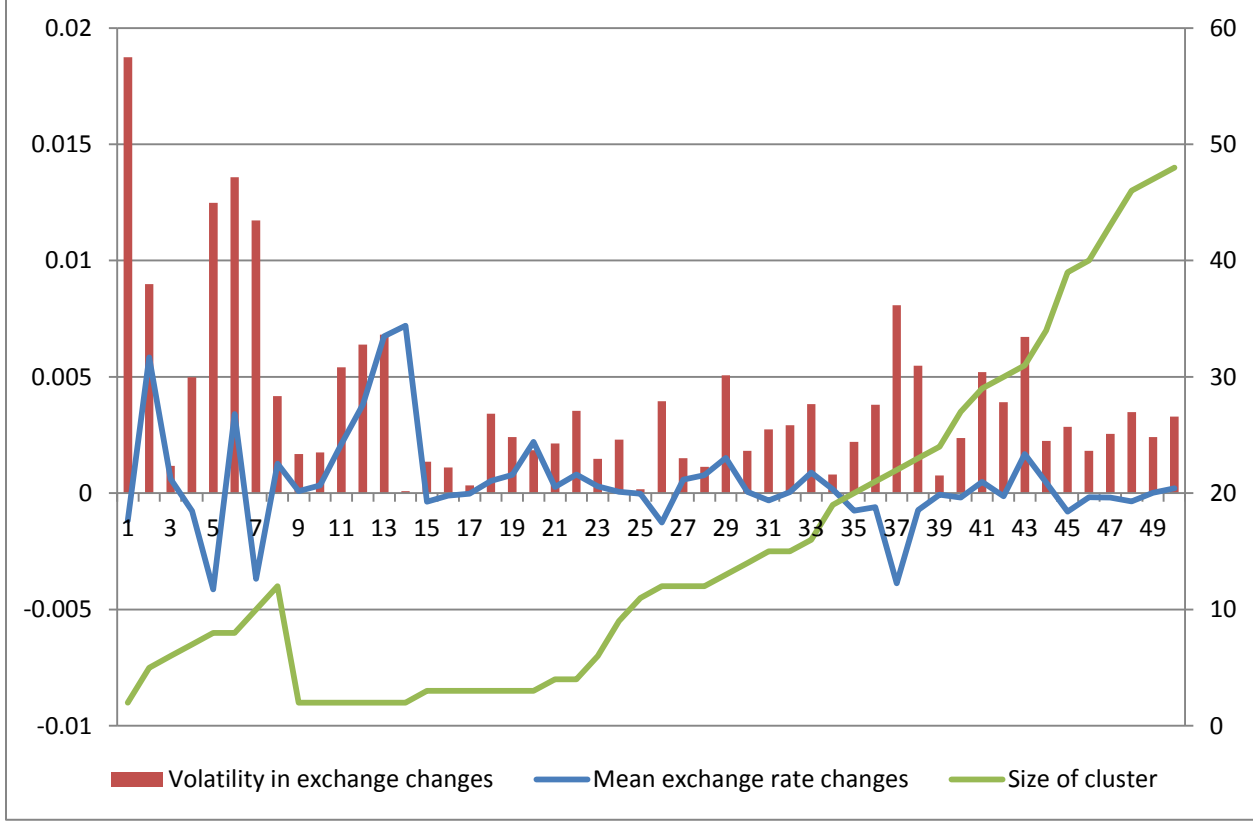
	Event	Direction	Reversal	Smooth
USDR				
Loose and purchase	63	63	38	38
Tighten and sale	50	75	25	75
Tighten and purchase (case for appreciation)	64	46	18	27
GBPR				
Loose and purchase	63	50	38	50
Tighten and sale	75	50	100	75
Tighten and purchase (case for appreciation)	73	46	55	18
EUROR				
Loose and purchase	63	38	13	50
Tighten and sale	75	50	25	50
Tighten and purchase (case for appreciation)	55	55	64	18

e) Dynamics in the cluster of events

We explored the changes in exchange rate within clusters when we have more than one intervention. Figure A1, A2, A3, and A4 shows variations in exchange rate changes even similar intervention, in terms magnitude of the spikes, direction of change and the point at which this happens in the cluster period. Figure 6 compares the mean value of exchange rate changes with the number of interventions in a cluster. It shows that the fewer the number of actions the larger the changes in exchange rate. As a result we have higher volatility with fewer actions in the cluster. Sales events tend to have fewer actions and thus higher volatility. These results are to some extent explained by the average

volumes traded which tends to be negatively correlated with the number of interventions in a cluster. The observed movements though do not seem to give a clear guide on when is the right time to cease consecutive actions.

Figure 6 Relationship between the cluster size and movement in exchange rate



f) Analyzing the period before MPC and comparing to period after MPC

When we consider the success criteria for the actual interventions in the period ‘before’ and ‘after’ the establishment of MPC, the results show similar pattern as when we consider the total period with more significant changes in the ‘after’ period. For the USDR significant changes are noted for both the event and direction criteria. In the case of GBPR we have in addition significant changes with the direction criteria in the ‘after’ period. We also find for the EUROR significant changes with the direction criteria in the ‘after’ period, and smoothing criteria in the ‘before’ period.

Table 6 Success criteria of event study before and after the establishment of MPC

	US dollar (USDR)			Sterling Pound (GBPR)			Euro (EUROR)		
	Success proportion	p-value	Change in exr	Success proportion	p-value	Change in exr	Success proportion	p-value	Change in exr
Event criteria									
Before	59.5	.1620	.1099	37.8	.0939	.4012	40.5	.1620	.3845
After	77.3	.0085	.1488	72.7	.0262	.0160	54.5	.4159	-.1717
Direction criteria									
Before	62.2	.0939	.0301	48.6	.5000	.1174	54.1	.3714	.0982
After	81.8	.0022	.0795	68.2	.0669	.0763	68.2	.0669	.0875
Reversal criteria									
Before	37.8	.0939	.0117	54.1	.3714	.0640	48.6	.5000	.1020
After	50.0	.5841	.0200	63.6	.1431	.0098	63.6	.1431	-.0698
Smoothing criteria									
Before	59.5	.1620	.2793	64.9	.0494	.5162	64.9	.0494	.6113
After	40.9	.2617	.3652	54.5	.4159	.6656	40.9	.2617	.7268

5. Conclusion

This paper looks at the response of the exchange rate to policy pronouncements related to exchange rate by monetary policy committee and other policymakers, and central bank participation in the foreign exchange market. We find mixed results for the three exchange rates across four criteria of analysis which tend to show that exchange rates changes vary in terms of magnitude, direction, and timing even with the same news. Only USDR has significantly successful changes with event and direction criteria following central bank participation in the market. GBPR show significant successful changes with monetary policy committee and policymakers pronouncements in the event day. While the smoothing and reversal criteria tend to show on average insignificant results, when we considered the event window in post-event period, results show that there are days when the smoothing and reversal criteria are significant. At the same time when we distinguished between the ‘sales’ and ‘purchases’ events results show that there are more significant successful changes with purchases alone across the four criteria and for the three exchange rates. Thus we conclude that central bank participation in foreign exchange market has implications on exchange rate changes. Further, when we distinguish between the loose and tight monetary policy stances we find both policy stances have implications on exchange rate movement. Combining this with the central bank participation in the market, we find that a loose policy stance accompanied by ‘purchases’ tend to depreciate the exchange rate while tight policy accompanied by sales result in appreciation. An accelerated tightening of monetary policy accompanied by purchases also results in appreciation of exchange rate. Finally, when we consider the dynamics in the cluster we find that the fewer the number of interventions in a cluster, the larger the exchange rate changes and so the higher the

volatility. However, the mixed dynamics in the cluster does not guide the timing when the consecutive actions can cease.

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Figure A1 Exchange rate changes when policy pronouncements aim to depreciate

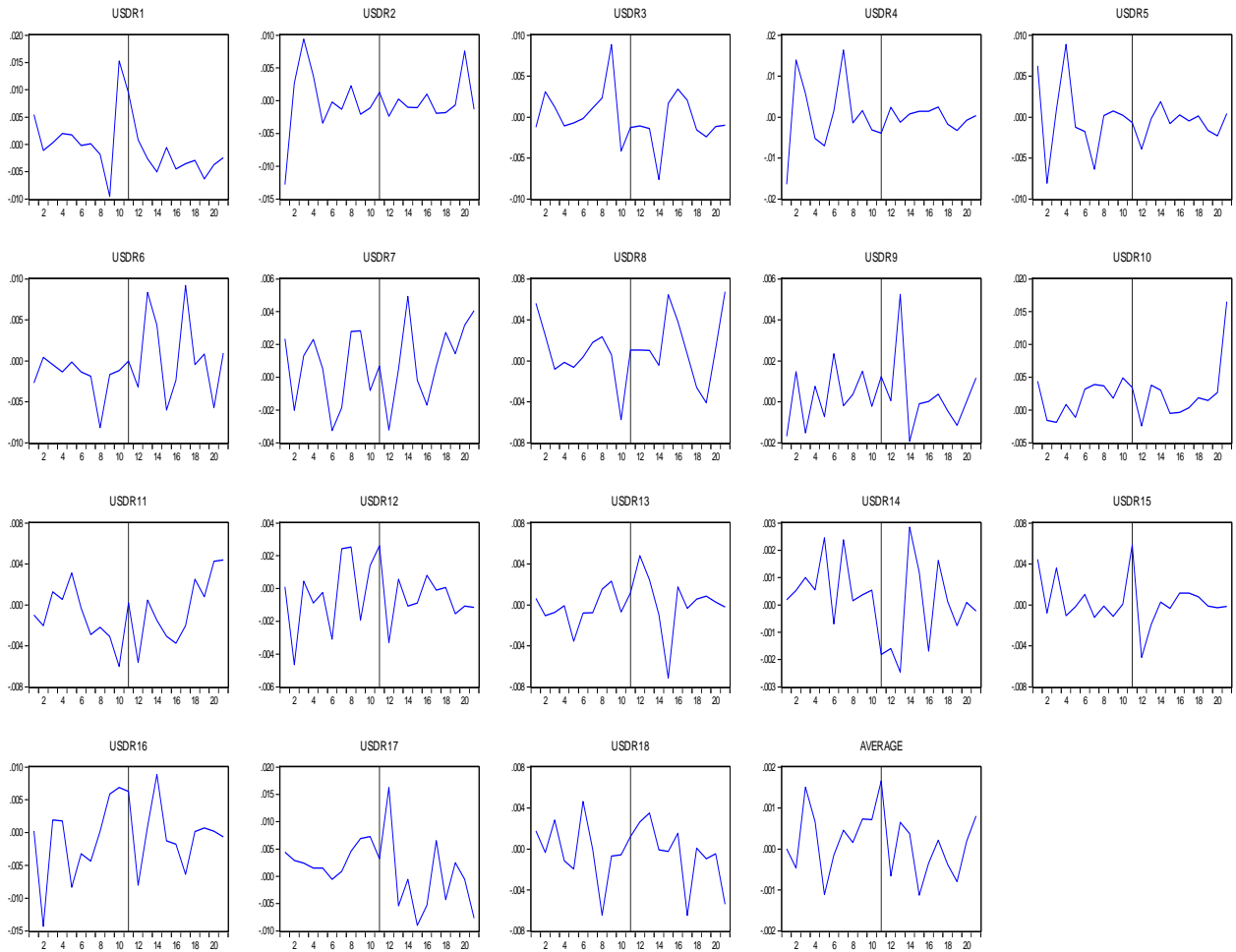


Figure A2 Exchange rate changes when market participation aim to depreciate

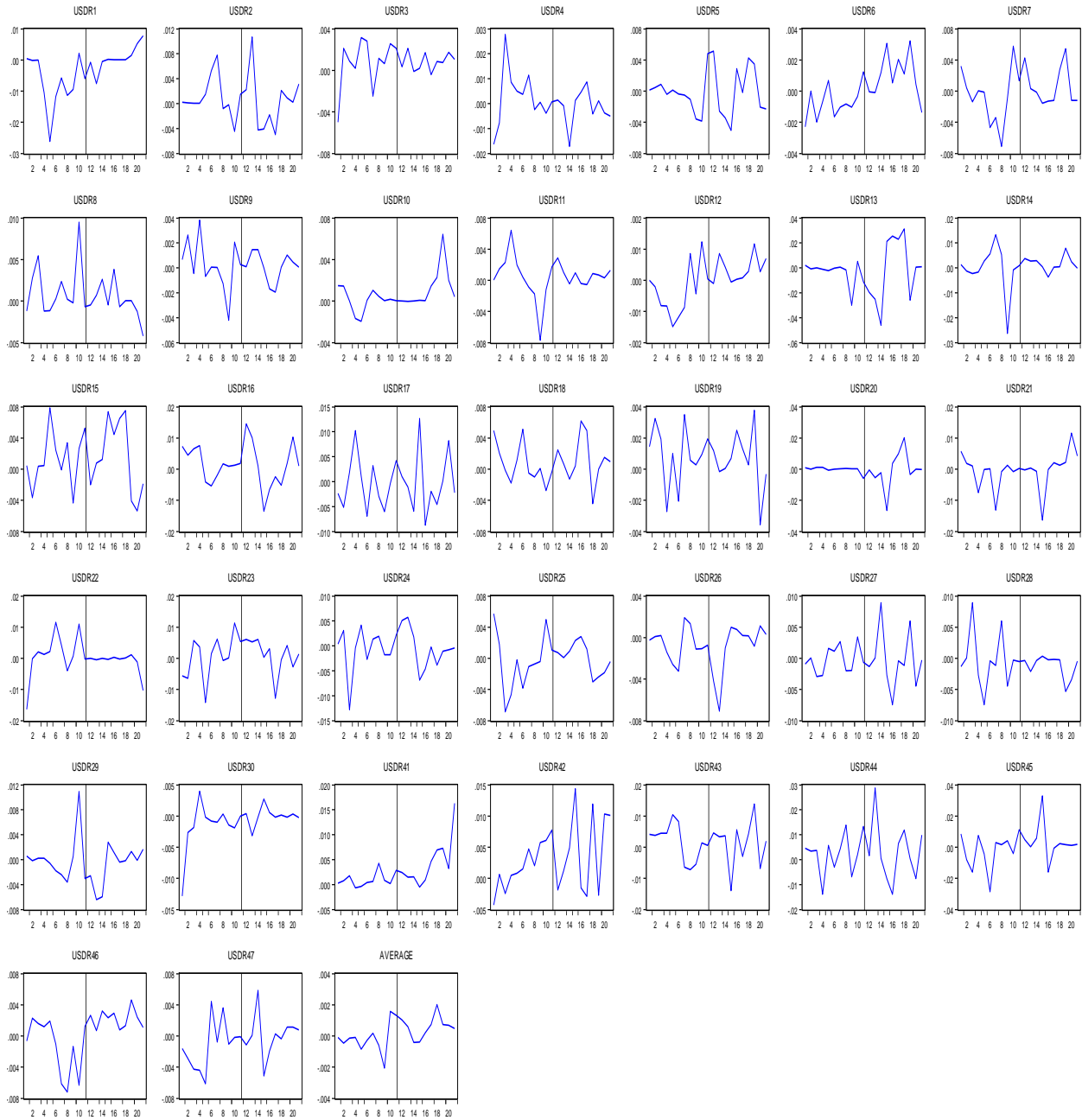


Figure A3 Exchange rate changes when policy pronouncements aim to appreciate

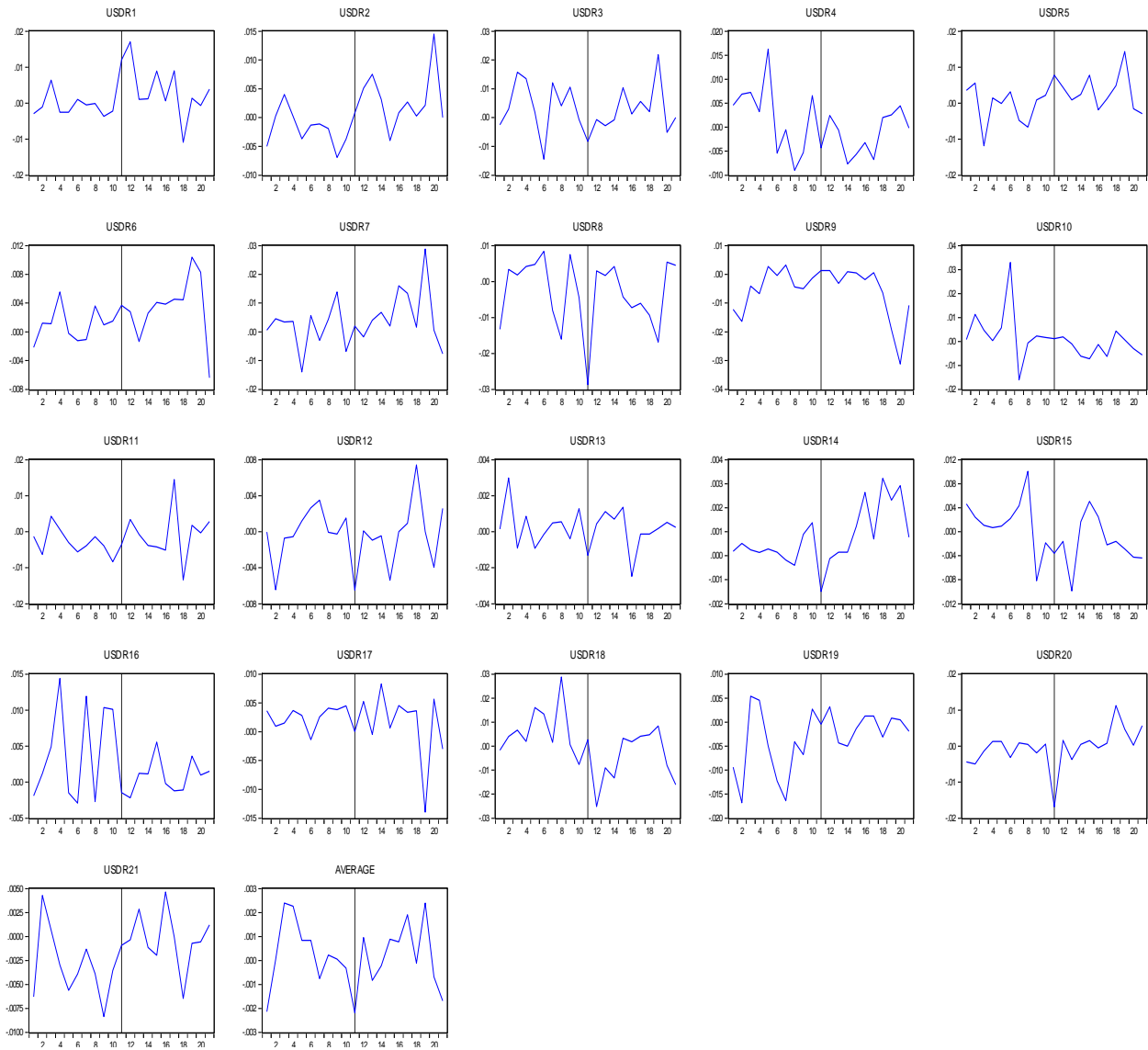


Figure A4 Exchange rate changes when market participation aim to appreciate

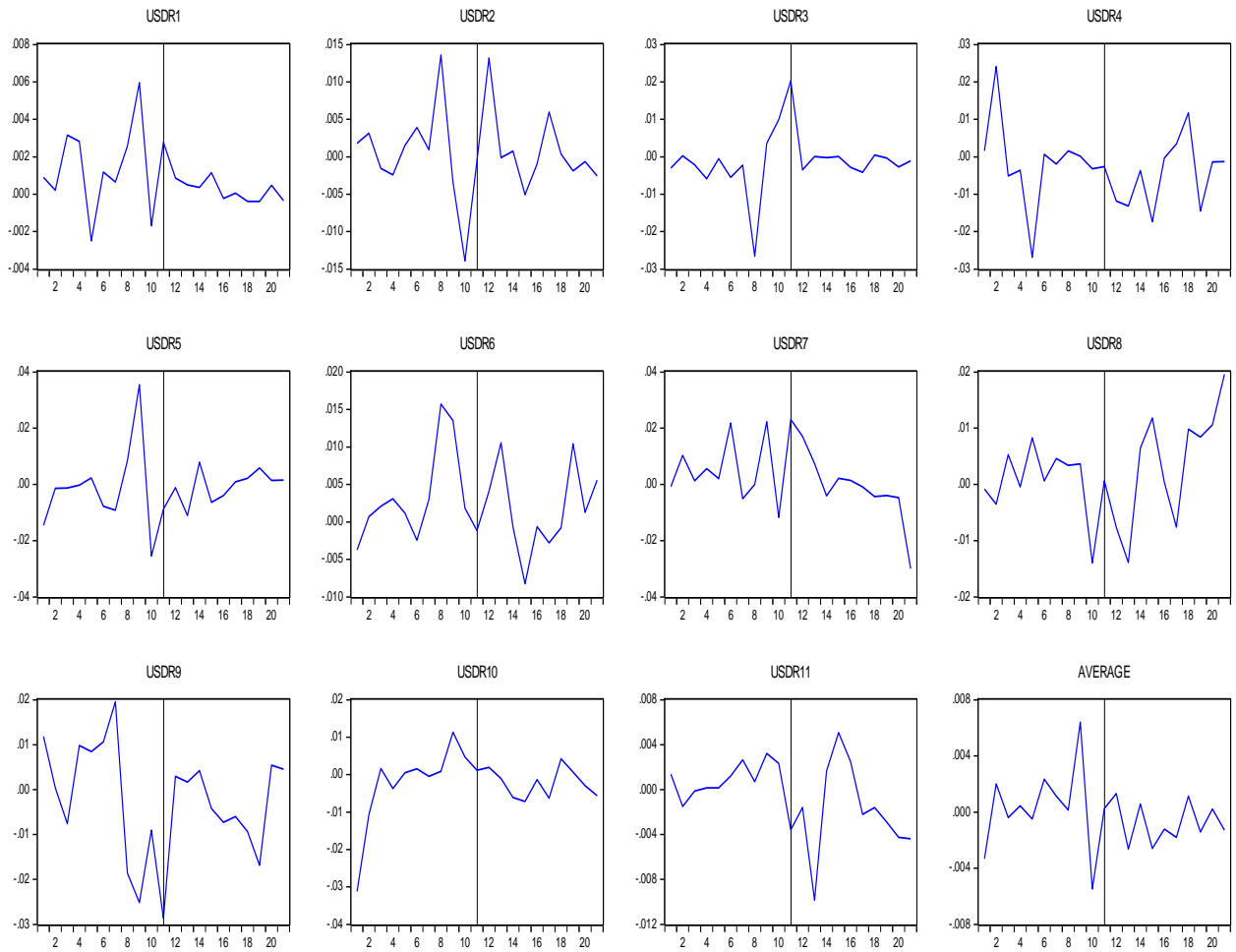


Figure A5 Exchange rate movements in the Cluster event

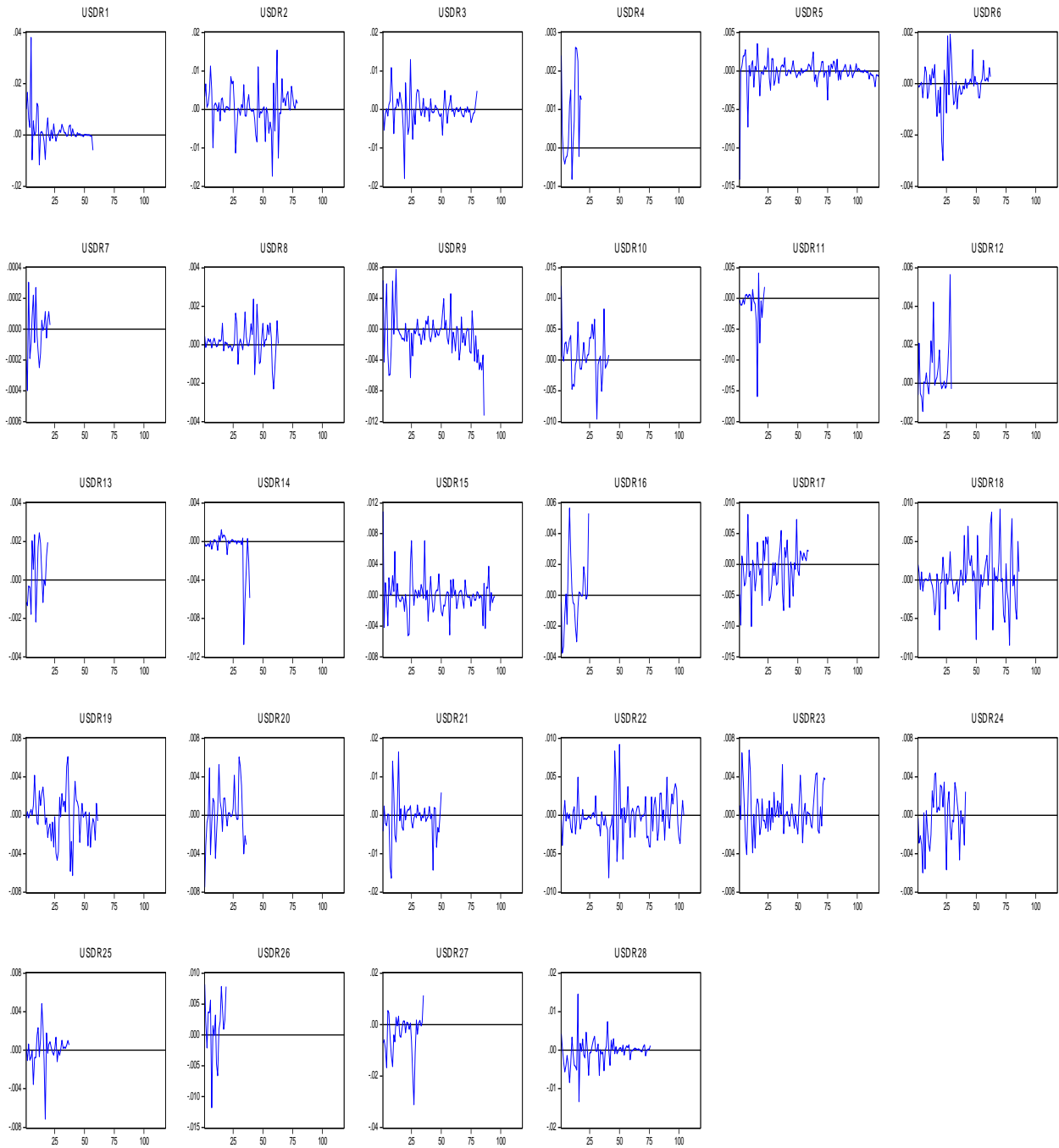


Table A1 Central bank participation in the foreign exchange market

Serial #	Event end date	Number of days in the event	Event type	Number of news	USDR			GBPR			EUROR		
					before	during	after	before	during	after	before	during	after
1	4/12/2000	57	1	31	-0.725	-0.6024	0.062	-0.705	-0.3995	-0.038	-0.810	-0.8146	-0.450
2	8/24/2000	79	1	29	0.096	0.1509	0.042	-0.064	0.4305	-0.268	-0.600	0.9763	-0.314
3	9/18/2000	2	1	2	0.061	0.2130	0.083	-0.295	-0.0185	0.605	-0.344	-0.0675	0.412
4	10/11/2000	16	-1	6	0.132	0.2776	0.020	-0.322	0.7791	-0.132	-0.426	0.5255	-0.518
5	10/31/2000	6	1	3	0.026	0.0071	-0.014	-0.002	-0.3548	-0.064	-0.371	-0.1259	0.217
6	3/16/2001	80	1	30	-0.082	0.4832	0.002	-0.220	-0.0493	-0.056	-0.157	-0.8058	-0.182
7	5/11/2001	18	1	12	-0.092	0.1249	0.101	-0.070	-0.0474	0.032	-0.066	-0.4652	-0.122
8	6/14/2001	6	1	4	-0.082	0.1310	0.063	-0.255	1.0809	0.230	-0.346	0.3163	0.089
9	12/21/2001	118	1	40	0.168	-0.0694	0.002	0.097	-0.0998	-0.072	-0.078	0.0778	-0.096
10	4/11/2002	62	1	24	0.027	0.0263	0.010	-0.019	-0.0463	0.110	0.186	-0.1171	0.158
11	5/28/2002	21	1	11	0.011	0.0028	0.127	0.133	-0.0500	0.241	0.204	0.0308	0.418
12	6/24/2002	4	1	2	0.011	0.1723	0.066	0.116	0.0478	0.295	0.062	0.6799	0.221
13	11/8/2002	63	1	19	-0.037	0.0043	0.037	-0.341	0.9755	0.053	-0.355	0.3550	-0.014
14	5/8/2003	86	1	39	-0.288	-1.1226	-0.150	-0.188	-2.1342	0.079	-0.105	-1.8565	0.120
15	8/11/2003	41	1	16	-0.043	0.0811	0.171	0.180	-0.8140	-0.011	-0.022	-0.5993	-0.205
16	9/5/2003	6	1	3	0.095	0.5283	0.145	-0.162	1.4635	0.326	-0.326	1.6105	0.418
17	10/28/2003	22	1	12	0.185	0.1855	0.114	0.547	0.0702	-0.023	0.395	-0.0796	-0.092
18	11/19/2003	1	1	1	-0.073	0.4255	-0.025	0.026	0.9958	0.103	0.198	1.9618	0.059
19	5/11/2004	29	1	12	0.073	-0.0310	0.116	0.117	-0.2710	0.211	-0.052	-0.0229	0.252
20	7/15/2004	19	1	6	0.081	0.1954	0.058	0.069	-0.0239	-0.101	-0.090	0.4818	-0.195
21	9/20/2004	16	-1	7	0.036	-0.0554	0.090	-0.070	-0.3413	0.104	-0.051	-0.2975	0.227
22	12/22/2004	39	1	20	0.036	-0.5889	-0.049	0.363	-1.5164	-0.269	0.439	-0.8876	-0.098
23	1/3/2005	1	-1	1	-0.322	2.0265	-0.144	-0.399	0.9172	-0.315	-0.169	0.7601	-0.393
24	3/5/2005	1	1	1	-0.126	0.0253	0.043	-0.104	-0.4487	-0.139	0.019	-0.4967	-0.292
25	8/22/2005	95	1	47	0.124	-0.0176	-0.108	-0.110	0.3663	0.155	-0.277	0.1006	0.209
26	11/8/2005	24	1	9	0.015	0.5330	0.105	-0.277	-0.0823	0.012	-0.199	-0.1310	0.172
27	2/23/2006	59	1	21	-0.087	0.2154	-0.052	-0.191	0.1494	-0.101	0.030	0.1103	-0.041
28	7/17/2006	86	1	48	-0.053	0.1058	0.003	-0.143	-0.0623	0.131	-0.065	-0.2814	0.091
29	11/8/2006	9	1	3	-0.061	-0.0743	-0.095	-0.011	-0.0074	-0.115	-0.044	-0.0098	-0.029
30	4/2/2007	61	1	27	-0.016	-0.0614	-0.027	-0.082	0.1508	0.186	-0.030	-0.0190	0.154
31	4/19/2007	1	1	1	-0.027	-0.0528	-0.123	0.186	-0.3849	-0.202	0.154	-0.0781	-0.143
32	8/1/2007	36	1	15	0.038	-0.3050	-0.087	-0.015	-0.5363	-0.283	-0.027	-0.6473	-0.265
33	9/11/2007	6	1	3	-0.183	-0.0018	0.003	-0.009	-0.1523	-0.063	-0.070	0.0159	0.223

34	10/2/2007	1	1	1	-0.005	-0.0431	-0.059	0.182	-0.4358	-0.094	0.251	-0.3184	-0.080
35	10/26/2007	1	1	1	0.052	-0.0796	-0.063	0.119	0.2362	0.214	0.212	0.5836	0.188
36	3/14/2008	14	-1	8	-0.127	-0.2612	-0.484	-0.247	0.6659	-0.735	-0.198	1.3768	-0.409
37	4/11/2008	1	-1	1	-0.138	-0.8771	-0.029	-0.280	-0.9267	0.032	-0.126	-1.2356	-0.115
38	9/23/2008	2	-1	2	0.349	-0.1178	0.187	0.618	1.2203	-0.554	0.293	1.8983	-0.617
39	10/22/2008	1	-1	1	0.459	2.3147	-0.200	0.152	-3.1657	-0.438	0.053	-1.4784	-0.158
40	1/5/2009	2	1	2	-0.021	0.7204	-0.012	-0.403	0.8877	0.230	0.416	0.0859	-0.428
41	7/7/2009	50	1	23	-0.173	0.5856	0.064	-0.157	0.5498	0.210	-0.169	0.5452	0.235
42	12/18/2009	104	1	43	-0.003	-0.0004	0.018	0.189	-0.4725	-0.020	0.234	-0.1887	0.064
43	1/15/2010	3	1	2	-0.040	0.0340	0.059	0.050	0.4865	-0.060	0.033	-0.1072	-0.282
44	5/18/2010	73	1	34	-0.001	0.3695	0.158	-0.281	1.1657	0.332	-0.330	1.1373	0.026
45	6/25/2010	2	1	2	-0.117	0.2437	-0.021	0.145	0.0011	0.120	0.146	-0.1763	0.271
46	9/20/2010	41	1	15	0.036	0.0547	0.006	0.153	0.7008	0.090	0.278	-0.1792	0.523
47	1/3/2010	37	1	14	-0.007	0.0058	0.022	0.205	-0.0913	0.216	-0.081	-0.1080	0.033
48	3/1/2011	4	1	3	0.081	0.2879	0.441	0.154	1.2312	0.348	0.120	0.5848	0.529
49	6/8/2011	19	1	13	0.153	0.7779	0.439	0.091	1.1889	0.322	0.065	1.0932	0.246
50	9/12/2011	11	1	4	0.178	0.0624	0.137	0.199	-0.9069	-0.185	0.285	-0.7893	-0.345
51	9/28/2011	15	-1	5	0.070	0.0613	0.380	-0.255	0.1910	0.376	-0.161	0.1484	0.446
52	9/23/2011	6	1	2	0.137	1.3374	0.304	-0.185	0.9073	0.332	-0.345	0.9214	0.271
53	11/2/2011	11	-1	10	0.003	-2.8722	-0.249	0.181	-3.1776	-0.392	0.392	-3.4579	-0.458
54	12/29/2011	35	1	22	-0.367	1.1284	0.339	-0.324	-0.1473	0.282	-0.476	0.0423	0.298
55	1/12/2012	8	-1	8	-0.257	0.1195	-0.238	-0.275	-0.7111	-0.029	-0.293	-0.1749	0.072
56	5/10/2012	76	1	46	-0.157	0.1217	0.220	-0.151	0.1136	-0.072	-0.013	-0.0868	-0.072
57	6/6/2012	14	-1	12	0.102	-0.3593	-0.176	-0.061	-0.1384	0.015	-0.285	-0.4854	-0.036
58	7/3/2012	3	1	3	-0.132	0.0000	0.008	-0.078	0.1997	-0.022	-0.179	0.2188	-0.249

Table A2 Policy pronouncement by MPC and other policymakers

Serial #	Event date	of number days	Event type	of number news	USDR			GBPR			EUROR		
					before	during	after	before	during	after	before	during	after
1	6/6/08	1	-1	1	-0.080	1.205	0.317	-0.165	1.526	0.387	-0.241	2.401	0.270
2	8/7/08	1	-1	1	-0.191	0.078	0.322	-0.372	-0.328	-0.061	-0.365	-0.294	-0.048
3	9/30/08	1	-1	1	0.432	-0.827	0.319	0.760	-1.678	-0.130	0.705	-0.978	-0.367
4	12/2/08	1	1	1	0.122	0.938	-0.309	0.474	-1.738	0.199	0.187	0.472	0.806
5	2/2/09	1	1	1	-0.027	0.128	-0.012	-0.433	1.277	-0.144	-0.294	-1.109	0.002
6	3/23/09	1	1	1	0.093	-0.127	-0.091	0.275	0.688	0.158	0.880	-0.010	-0.170
7	5/21/09	1	1	1	0.061	-0.395	0.017	0.342	1.370	0.250	0.287	0.858	0.324
8	7/9/09	1	1	1	-0.064	-0.806	0.001	-0.256	0.209	0.162	-0.165	-0.537	0.240
9	7/23/09	1	1	1	-0.003	-0.067	-0.066	0.189	0.764	0.219	0.234	0.278	0.034
10	9/24/09	1	1	1	-0.185	-0.001	0.059	-0.151	-0.190	-0.190	0.141	-0.402	0.053
11	11/25/09	1	1	1	0.041	0.069	0.124	-0.008	0.367	-0.088	-0.057	0.424	-0.043
12	2/1/10	1	1	1	0.059	0.105	0.138	-0.060	-1.017	-0.061	-0.282	-0.328	-0.083
13	3/23/10	1	1	1	0.021	0.123	0.033	-0.101	0.864	0.118	-0.048	0.265	-0.120
14	5/21/10	1	1	1	0.181	0.342	0.263	-0.311	0.823	0.276	-0.170	2.306	-0.272
15	7/29/10	1	1	1	-0.126	0.021	-0.035	0.134	0.085	-0.030	0.109	0.085	-0.145
16	9/24/10	1	1	1	-0.039	0.260	-0.077	0.111	0.283	0.044	0.504	-0.208	0.363
17	11/26/10	1	1	1	-0.032	0.120	0.021	-0.274	-0.075	0.059	-0.371	0.028	-0.017
18	1/12/11	1	1	1	0.075	-0.182	-0.008	0.130	0.304	0.109	-0.142	0.112	0.521
19	3/14/11	1	1	1	0.319	1.629	-0.264	0.275	1.896	-0.335	0.410	1.431	-0.161
20	3/23/11	1	-1	1	0.246	-0.428	-0.125	0.310	-0.062	-0.149	0.417	-0.809	-0.058
21	6/2/11	1	-1	1	-0.064	0.779	0.297	0.119	-0.216	0.148	0.093	0.587	0.081
22	7/13/11	15	-1	3	0.386	-0.219	0.128	0.268	0.974	0.329	0.194	0.978	0.385
23	7/28/11	1	-1	1	0.093	0.368	0.332	0.393	-0.142	0.254	0.444	-0.674	0.256
24	8/19/11	14	-1	3	0.239	0.528	0.097	0.228	0.226	-0.155	0.072	0.540	-0.315
25	9/15/11	1	-1	1	0.123	0.199	0.638	-0.296	0.207	0.575	-0.522	0.985	0.564
26	10/13/11	10	-1	3	0.605	-2.515	-0.266	0.553	-2.186	-0.066	0.548	-2.207	0.014
27	11/2/11	1	-1	1	-0.118	-2.872	-0.249	0.038	-3.178	-0.392	-0.147	-3.458	-0.458
28	11/25/11	1	-1	1	-0.530	0.324	-0.131	-0.805	0.736	-0.064	-0.684	0.396	-0.121

29	12/2/11	1	-1	1	-0.446	0.129	-0.694	-0.490	0.090	-0.814	-0.489	0.212	-1.042
30	12/19/11	4	-1	2	-0.256	0.163	0.229	-0.218	0.361	0.305	-0.368	0.084	0.256
31	1/12/12	1	-1	1	0.429	0.120	-0.238	0.318	-0.711	-0.029	0.182	-0.175	0.072
32	2/2/12	1	-1	1	-0.288	-0.355	-0.050	-0.037	0.378	-0.169	-0.054	0.521	-0.162
33	2/14/12	8	-1	2	-0.291	-0.034	-0.024	-0.053	0.130	0.054	-0.060	0.120	0.201
34	2/28/12	1	1	1	-0.007	0.265	-0.094	0.022	0.864	-0.289	0.123	0.477	-0.351
35	3/7/12	1	-1	1	0.008	-0.650	0.003	0.022	-1.477	0.100	-0.042	-1.096	0.097
36	4/5/12	1	-1	1	0.040	-0.132	0.018	0.047	-0.064	0.151	-0.016	-0.463	0.047
37	5/4/12	1	-1	1	0.032	-0.150	0.140	0.196	-0.176	-0.132	0.054	-0.127	-0.236
38	6/6/12	1	-1	1	0.163	-0.359	-0.176	-0.111	-0.138	0.015	-0.045	-0.485	-0.036
39	7/6/12	1	1	1	0.047	0.587	-0.046	-0.004	0.083	0.072	-0.075	-0.516	-0.154