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Order flow and rand/dollar exchange rate dynamics

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1. Introduction

This study investigates the impact of order flow on the rand/dollar exchange rate over the short and long term. It uses a hybrid model which combines microeconomic and macroeconomic determinants of the exchange rate in the short and long term. The analysis uses monthly series from January 2004 to December 2016. We find that order flow explains movements in the exchange rate, both in the short and in the long term. Consistent with the literature, our results show that the rand/dollar exchange rate reacts to fundamental variables only in the long term. Unlike Meese and Rogoff (1983), who postulate that the best way to estimate the exchange rate over the short-term is with a random walk model, our study shows that we can exploit information from the microstructure approach to explain short-term dynamics in the rand.

Since the seminal paper of Meese and Rogoff (1983), there has been a rising interest in the factors explaining the movements in the exchange rate over the short and long term. Long-term models include mostly fundamental factors such as the interest rate differential, money supply differential and measures of risk. These authors show that traditional macroeconomic models do not sufficiently explain changes in exchange rates in the short term, though they are more successful in the long term. Subsequently, Evans and Lyons (2002) address the macro-puzzles using microeconomic reasoning based on asset pricing theory. This microstructure approach addresses the exchange rate puzzles such as excess volatility, the forward bias, and the determination puzzle. It is worth mentioning that transaction flows convey information at a micro level that is essential for the explaining exchange rate movements which are not captured by macroeconomic fundamentals. Instead of using either the microstructure approach or models based on macroeconomic fundamentals, it is appropriate to use the hybrid model which combines the two approaches into a single model.

In South Africa, only Mokoena, Gupta and Van Eyden (2009) attempt to use the hybrid model of Evans and Lyons (2002) for South Africa. They use the autoregressive distributed lag (ARDL) model of Pesaran, Shin and Smith (2001) which includes the short-term interest rate differential between South Africa and the United States (US), commodity prices, and a measure of risk for EMEs. However, they use the dollar-denominated net average turnover on the South African foreign exchange market as a proxy for order flow. Instead, the study uses order flow data submitted by Authorised Dealers to the South African Reserve Bank (SARB), which consist of the spot, forward, and swap transactions. It is worth noting that we exclude swap transactions since currency swaps are the equivalent of securitized funding, and therefore they do not affect significantly order flows.

2. Order flow is different from turnover

Turnover is sometimes used as a proxy for order flow. However, the main difference between the two concepts is that order flow ascribes a sign to transactions depending on whether it is a purchase or a sale of foreign exchange, while turnover does not. Table 1 portrays this difference. When compiling order flow data, identifying the initiator of the transactions is essential to allocating the correct sign. For example, in

transaction 1, customer 1 is the initiating party, placing an order to sell R5 million to market maker A. In this regard, a negative sign is assigned to the R5 million, reflecting the initiator's decision to sell currency, while turnover is regarded as volume and therefore no sign is ascribed to it. Hence, the cumulative order flow after five transactions is evaluated at -R16 million (negative/selling) compared with R18 million recorded as turnover.

Table 1: The difference between order flow and turnover

Transaction	Initiating party	Passive party	*Order flow	*Cumulative order flow	*Total turnover
1	Customer 1	Market maker A	-5	-5	5
2	Market maker A	Market maker B	+1	-4	6
3	Customer 2	Market maker C	-4	-8	10
4	Customer 3	Market maker D	-4	-12	14
5	Market maker D	Market maker E	-4	-16	18

*R millions

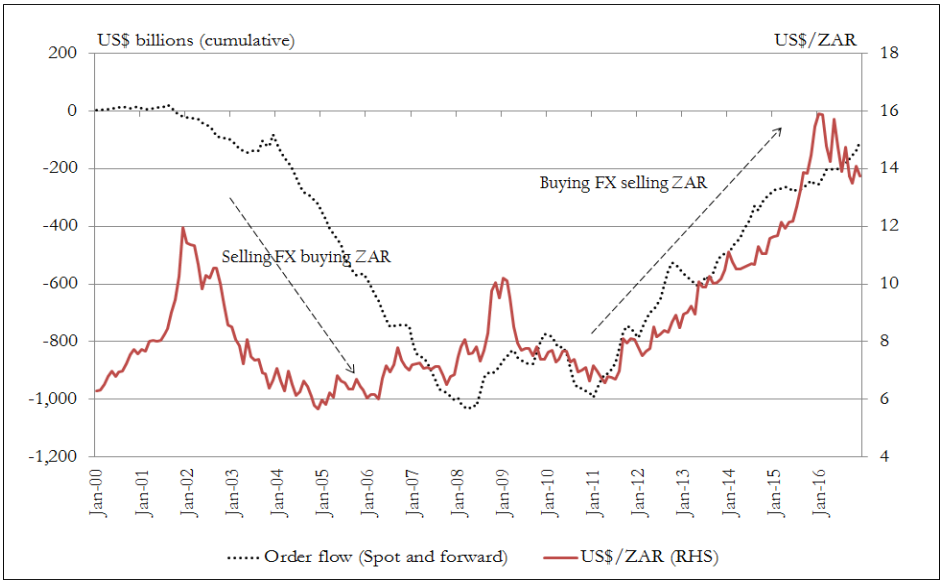
3. The empirical results

The study uses a dataset containing four monthly time series obtained from the SARB and Bloomberg. The dataset consists of:

- Microstructure variable, order flow;
- Financial variable, interest rate differential between the South African nominal 3-month Treasury bill rates and the US 3-month Treasury bill rates;
- Risk variable, we use the South African sovereign JP Morgan Emerging market Bond Index (EMBI+) spread which represents risk aversion of investors toward the country.
- The dependent variable, nominal rand/dollar exchange rate.

We use an Error Correction Model (ECM), which combines the long- and short-term model. We use natural logarithms for all variables, except for interest rate differentials and order flow. The short-term model includes the order flow at the level and the change in the exchange rate, whereas the long-term representation follows closely Evans and Lyons (2002) and Cheung and Rime (2014) in that it contains the cumulative order flow and the exchange rate at level.

Figure 1: Historical trend in aggregate cumulative order flow data



The key variable featuring in the microstructure approach in empirical studies is the order flow. Figure 1 depicts a positive and long-term relationship between the rand/dollar exchange rate and the aggregate measure of the order flow. An increase in order flow is indicative of buying pressure in foreign exchange, resulting in an appreciation in the case of the US dollar, which is accompanied by the depreciation of the rand. However, the fact that this relationship exists does not necessarily mean that order flow alone drives the exchange rate. In fact, Rime, Sarno, and Sojli (2010) state that neither of the two approaches to exchange rate determination seems to be plausible in isolation, instead they propose a hybrid approach to exchange rate determination. This is consistent with the earlier work by Lyons (2002).

The long-term model, as depicted in column (3) of Table 1, shows that order flow explains 84% of the movement in the exchange rate. In addition, when we control for interest rate differentials (i.e. column (2) of Table 1) the explanatory power of the regression increases to 87%. Finally, the explanatory power increases further to 90% when the risk indicator is added. Unlike Meese and Rogoff (1983), short-term estimations in Table 2 shows that order flow is the only variable that is statistically significant across different specifications. It accounts for 5% of the movement in the exchange rate. But the extremely low explanatory power of the short-term model indicates that order flow alone is unable to capture all the movements in the exchange rate over the short-time horizon. It means that other factors such as uncertainty, political factors, bad and good news about the country, and global factors play important role in explaining short-term movement in the rand/dollar exchange rate. The ECM which combines the long-run dynamics of the exchange rate and the short-term deviations is represented in Table 3. Importantly, the order flow portrays the expected sign and it is statistically significant at 1% across all regressions. The estimated error-correcting term (EC_{t-1}) indicates that the pace of adjustment is rather slow. This slow pace of adjustment is consistent with the literature, in that the price effects from order flow are persistent in nature.

4. Conclusion

This study uses a hybrid model which combines a microstructure model and a fundamental model of the rand/dollar exchange rate. The results show that both the order flow and fundamental variables explain a large proportion of movement of the exchange rate in the long term. However, in the short term macroeconomic variables fail to explain the dynamics in the rand/dollar. Only the order flow captures movement in the rand/dollar exchange, albeit small. It is therefore essential to examine the determinants of order flow. An analysis of a disaggregate measure of order flow is the first step in unfolding information embedded in the microstructure of the South African exchange rate. This provides a basis for future research.

References

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Table 1: Long-term Model

	(1)	(2)	(3)
$CUMOF_t$	0.0038***	0.0045***	0.0046***
	(0.0002)	(0.0003)	(0.0003)
$(i - i^*)_{t-1}$	-0.0162*	0.0245	
	(0.0089)	(0.0008)	
$EMBI_t$	0.2193***		
	(0.0468)		
N	155	155	156
Adj. R^2	0.90	0.87	0.84
*,**,*** denote significance at 10%, 5% and 1% respectively.			
Values in parentheses are standard errors.			

Table 2: Short-term Model

	(1)	(2)	(3)	(4)
OF_t	0.0041***	0.0041***	0.0041***	0.0041***
	(0.0009)	(0.0009)	(0.0009)	(0.0009)
$\Delta(i - i^*)_{t-1}$	0.0173	0.0166	0.0154	
	(0.0120)	(0.0119)	(0.0121)	
Δs_{t-1}	-0.0319	-0.0566		
	(0.0791)	(0.0787)		
$\Delta EMBI_{t-1}$	-0.0140			
	(0.0309)			
N	154	154	154	155
Adj. R^2	0.066	0.064	0.061	0.049
*,**,*** denote significance at 10%, 5% and 1% respectively.				
Values in parentheses are standard errors.				

Table 3: Error Correction Model

	(1)	(2)	(3)	(4)
EC_{t-1}	-0.1099***	-0.1030***	-0.1056***	-0.1012**
	(0.0403)	(0.0383)	(0.0358)	(0.0377)
OF_t	0.0046***	0.0047***	0.0047***	0.0047***
	(0.0011)	(0.0011)	(0.0011)	(0.0011)
$\Delta(i - i^*)_{t-1}$	0.0188	0.006	0.017	
	(0.011)	(0.0046)	(0.011)	
Δs_{t-1}	-0.0234	-0.0238		
	(0.0850)	(0.0846)		
$\Delta EMBI_{t-1}$	-0.025			
	(0.0317)			
N	154	154	154	154
Adj. R^2	0.067	0.093	0.075	0.066
*,**,*** denote significance at 10%, 5% and 1% respectively.				
Values in parentheses are standard errors.				