Real effective exchange rates comovements and the South African currency

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Abstract

The study analyses comovement between the real effective exchange rate of South Africa and those of a sample of countries that include the world's major economies as well as emerging and developing economies. The comovement is examined over the short and long term as well as pre and post the recent global financial crisis. The results show that, although the real effective exchange rate of South Africa shows some comovement with those of the selected countries, such comovement is mixed and inconsistent. Currencies that belong to a similar grouping in terms of economic development and geographical location display both positive and negative comovement with the real effective exchange rate of South Africa. There is also no consistency in the comovement between the real effective exchange rate of South Africa and those of the selected countries pre and post the recent financial crisis. The results further show that the comovement between the real effective exchange rate of South Africa and those of some of the selected sample of countries is stronger between the trend component than it is between the cyclical component.

JEL Classification: C11, C22, F31, F42,
Keywords: Comovements, Real effective exchange rate , Financial crisis

Introduction

Policy makers are particularly interested to understand how the exchange rate of the domestic currency behaves in relation to those of other currencies over time. This is because the fluctuation of the domestic currency against other currencies reveals the differentials in factors that determine the demand and supply of these currencies. The literature identifies several factors, including the differentials in inflation, interest rates, current account, financial flows, economic performance, foreign exchange intervention and geopolitical stability, among others, as being important in the determination of fluctuations in exchange rates (Engel and West 2004, Global Economic Prospects 2012, Kia 2014). Consequently, the exchange rates of currencies that face similar internal and external shocks are likely to experience similar fluctuation overtime. Thus it is normal practice in economic research and policy analysis to group currencies together based on some criteria, including the countries geographical location, level of economic development, sensitivity to risk aversion and resource intensity, among others, to understand and highlight how they behave overtime as a group.

The extent of the fluctuation in any currency also depends on the type of foreign exchange regime the countries have adopted. Thus pegged currencies may not fluctuate much compared to freely floating currencies overtime, hence the International Monetary Fund (2006) classifies currencies as hard peg, soft peg and freely floating. The fluctuation in a particular currency may also be the result of official foreign exchange intervention which is mainly undertaken to accumulate the foreign exchange reserves, stabilise the exchange rate in periods of increased volatility to counter disorderly market conditions and to correct foreign exchange misalignments (Krieljenko et al 2003,

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Archer 2005, Miyajima 2013). International risk aversion by investors and speculators is also important in determining the flow of capital to and from any country and mainly depends on investors' perception of riskiness and speculative opportunities in any particular currency. Thus some currencies, such as the United States dollar, United Kingdom pound, Japanese yen and Swiss franc, continue to enjoy the save haven status, appreciating considerably during periods of increased volatility in foreign exchange markets, while the opposite is true in periods of tranquillity or low volatility in foreign exchange markets (Habib and Stracca 2013, Botman et al 2013).

The study analyses comovement between the real effective exchange rate of South Africa and a sample of countries that include the world's major economies as well as emerging and developing economies. The comovement is examined over the sample that spans the period since the adoption of inflation targeting in South Africa. The real effective exchange rates are decomposed into their trends and cycle components to examine the comovement in short term as well as in long term. The trends and cycle components are further split around the recent financial crisis period to distinguish their comovement pre and post global financial crisis. Bayesian variable selection introduced by Bartels (1997) and first proposed by Leamer (1978) is used in estimation given the high dimensionality of the data. The advantage of analysing the real effective exchange rates is that the differentials in prices and trade position will cause it to fluctuate overtime even though the exchange rate regime of the particular currency may be a hard peg. Consequently, the study will reveal the group of countries whose real effective exchange rates fluctuations are closely linked to the fluctuations in the South African currency in the short and the long term as well as pre and post the recent global financial crisis. Understanding how the South African currency commoves with other currencies has important policy implications for South Africa.

The literature that examine the comovement between different currencies include Kuhl (2008) who provide evidence that periods of strong comovement of the euro denominated US dollar and pound sterling prevailed during the 1990s while the periods of strong comovement of the dollar denominated euro and pound sterling prevailed since the introduction of the euro. However, the study finds no long run relationships between these currencies. Frankel and Wei (2008) offer a new approach to estimate de facto exchange rate regimes by regressing 20 weekly denominated currencies against the major currencies. They find that declared floaters often intervene heavily to dampen exchange rate fluctuations with reference to an anchor that is not necessarily United States dollar parity. Orlov (2009) examines comovement of exchange rates before and during Asian financial crisis using cross spectral analysis and finds that the Asian crisis manifests in greater comovement of currencies along high frequency components and indicate a contagion for 48 out of the possible 66 pairs of countries. Rangel (2011) characterize the correlation structure of high and low frequency dynamic components of the foreign exchange excess returns of 29 countries and provide evidence of high comovement in foreign exchange markets post the 2008 financial crisis.

Ozer-Imer and Ozkan (2013) use hierarchical clustering to assess exchange rate comovements between weekly data series of 21 currencies and find that historical and geographical factors play an important role in their comovement. Hamori and Tamakoshi (2014) uses dynamic correlations to provide evidence of asymmetric comovement among the major European exchange rates where there is evidence of higher dependency during periods of joint appreciation than during periods of joint depreciation. They further find that the crisis has triggered the shift of fund flows to the Swiss franc in particular, which is perceived to be a safe haven currency. In South Africa, Raputsoane (2008) examines the volatility spillovers between the South African currency and the currencies of selected countries. The results provide evidence of a statistically significant negative volatility spillover effects between the South African currency and the currencies of developed and emerging European markets, while no spillover effects can be established for the currencies of the

Asian and Latin American markets. The results further provide evidence that confirms the hypothesis of changing exchange rate volatility spillovers across currency markets overtime.

The study is organised as follows. Next is data discussion. This is followed by the empirical results and then the discussion with possible policy recommendations. Last is the conclusion.

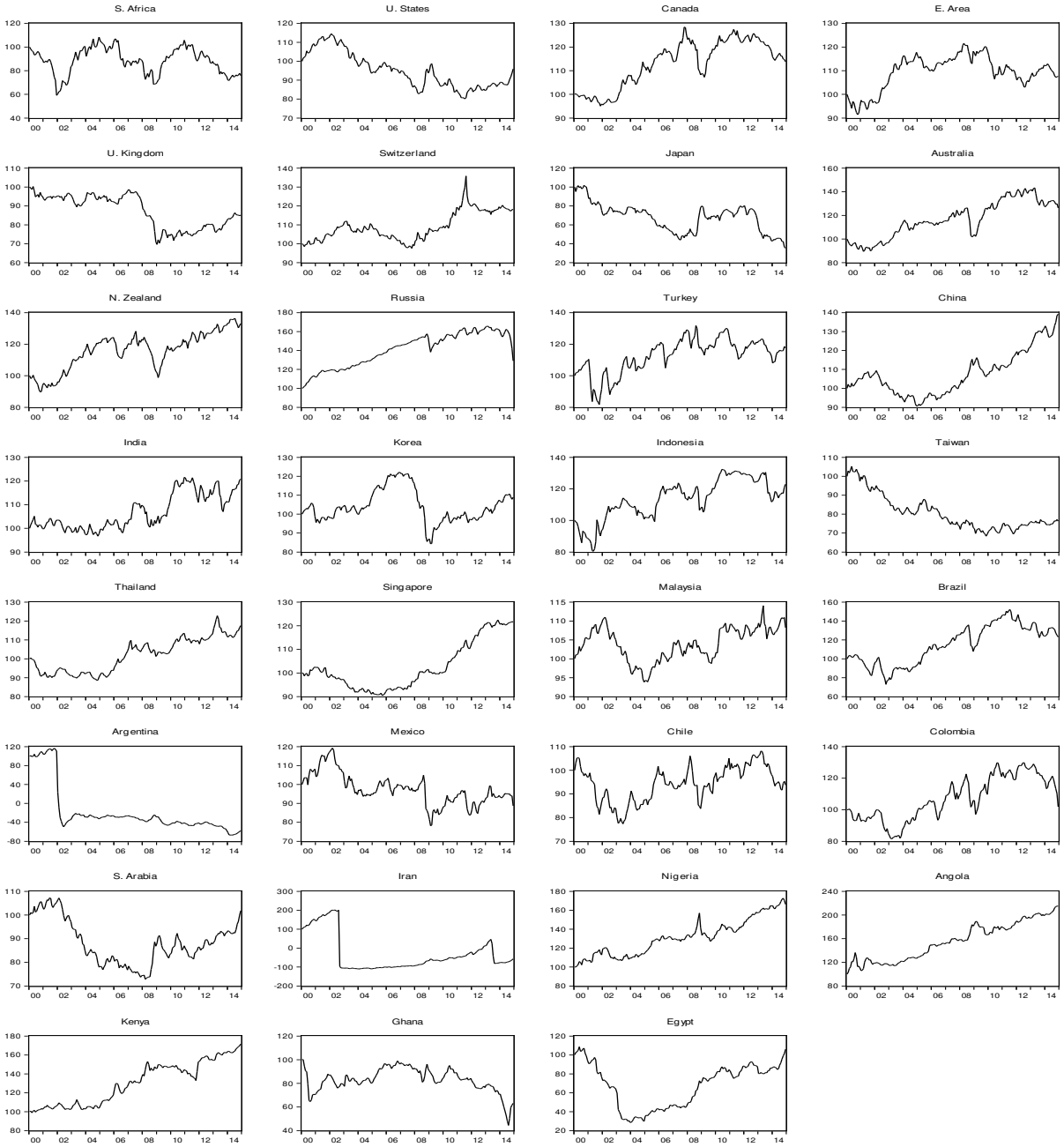
Data discussion

The study uses monthly real effective exchange rates data spanning the period, January 2000 to December 2014. The data is sourced from the Bruegel, which is an independent European think tank, and is available at http://bruegel.org/publications/datasets. The selected sample of countries is shown in table 1. Several databases publish monthly real effective exchange rates for a number of countries. For instance, the World Bank publishes data for 109 countries, the Bank for International Settlements for 61 countries and the OECD for 34 countries. However, the Bruegel database has wider coverage comprising 178 countries. The chosen sample of countries is representative and covers countries in developed, emerging and commodity exporting countries, etc. The real effective exchange rates are trade weighted and consumer price index based. More details on their construction and how they compare to those from similar databases can be found in Darvas (2012a,b,c). The original real effective exchange rates were renormalised to 2000=100 to coincide with the beginning of the sample. The real effective exchange rates were decomposed into the trends and cycle components using the Hodrick Prescott (1997) filter. Additional 12 months were forecasted at the end of each real effective exchange rate data series following Mise et al. (2005) to overcome the end point problem.

The trend and cycle components were standardised using 0-1 scaling, while a straight line smooth spline was further applied to the trend components data series. The sample was slit in 2008 to facilitate the analysis of the comovement pre and post the recent global financial crisis. Figure 1 shows the plots of the real effective exchange rates. The real effective exchange rates of Iran, Argentina and Angola have the highest ranges between their maximum and minimum values during the sample period so that they were the most volatile during the sample period, while those of India and Malaysia have the lowest ranges. Relative to their levels in 2000, the real effective exchange rates of Angola, Kenya, Nigeria experienced the biggest positive change to the end of the sample so that they appreciated most during the sample period, while those of Argentina, Iran, and Japan experienced the biggest negative changes and those of Colombia, Saudi Arabia hardly changed in the same period. The the real effective exchange rates of most African countries, including Russia, had the biggest means so that they were relatively strong over the sample period, while those of mainly countries from Asia, middle and North America stayed relatively range bound. In terms of standard deviations, the real effective exchange rates of Iran, Argentina, Angola, Egypt and Kenya the most volatile during the sample period, while the opposite is true for those of Malaysia, Euro Area, India and Switzerland.

The correlations of the real effective exchange rates trend and cycle components with that of South Africa are presented in Table 1. The trend component data series for the whole sample show that the real effective exchange rate of South Africa is strongly positively correlated with those of Australia and Canada, while it is relatively negatively strongly correlated with those of the United States, China, Nigeria and Kenya. The real effective exchange rates of United Kingdom and Argentina particularly show the little correlation with that of South Africa. The cycle component data series for the whole sample show that the real effective exchange rate of South Africa is strongly positively correlated with those of Canada, while that of China show the strongest negative correlation. The real effective exchange rates of the Euro area, Taiwan and Thailand show the little

Figure 1. Plots of the real effective exchange rates



Notes: Data from Bruegel database. All the real effective exchange rates were re-normalised to 2000=100.

correlation with that of South Africa. The correlation between the real effective exchange rate of South Africa and those of the United States, Canadian, China, Nigeria and Kenya continue to be consistent over the split trend component sample. This is only the case with the China for the split cycle component sample. It is also important to notice that the trend component of the real effective exchange rates here show stronger correlation of the South African currency with more currencies compared to the cycle component over the sample period.

Table 1. Correlations of the real effective exchange rates trend and cycle components

	i) Trend component			ii) Cycle component		
Currency	**2000-2014**	**2000-2007**	**2008-2014**	**2000-2014**	**2000-2007**	**2008-2014**
U. States	-0.6343	-0.7524	-0.5242	-0.3946	-0.6062	-0.1851
Canada	0.6113	0.5821	0.6468	0.5195	0.4961	0.5615
E. Area	0.2372	0.5690	-0.2765	0.0133	0.4451	-0.4693
U. Kingdom	-0.0905	0.3059	-0.5006	0.0462	-0.2189	0.3513
Switzerland	0.1610	-0.1819	0.5899	0.1747	0.0123	0.3139
Japan	0.3991	0.1211	0.8453	0.3043	0.5333	0.0970
Australia	0.7624	0.8390	0.8004	0.4931	0.4546	0.5849
N. Zealand	0.4537	0.7232	-0.0455	0.4455	0.4283	0.4581
Russia	0.2204	0.0530	0.3754	-0.1275	-0.3041	-0.0509
Turkey	0.4803	0.6662	0.2573	0.3223	0.3080	0.3483
China	-0.6148	-0.6349	-0.5893	-0.5843	-0.5755	-0.6083
India	0.1500	-0.5568	0.8584	0.3563	-0.1569	0.7312
Korea	0.1434	0.3702	-0.3567	0.2657	-0.0296	0.5848
Indonesia	0.4371	0.0291	0.9002	0.2105	-0.1254	0.7013
Taiwan	-0.2480	-0.2091	-0.2977	-0.0254	-0.0688	0.0443
Thailand	-0.2347	-0.3790	0.2200	-0.0685	-0.3293	0.2244
Singapore	-0.3626	-0.5003	-0.1112	-0.3083	-0.3357	-0.2797
Malaysia	-0.5460	-0.8926	0.3422	-0.3500	-0.6774	0.1738
Brazil	0.3348	-0.0043	0.7820	0.3063	0.0495	0.5841
Argentina	-0.1152	-0.1379	0.0217	0.1854	0.2576	-0.1245
Mexico	-0.5795	-0.8825	-0.2139	-0.2469	-0.6454	0.2298
Chile	0.2550	0.1129	0.6064	0.2730	0.2001	0.3571
Colombia	0.2066	-0.2033	0.7477	0.0325	-0.2304	0.3390
S. Arabia	-0.4634	-0.6141	-0.1727	-0.3172	-0.5761	-0.0537
Iran	-0.4354	-0.6628	0.2427	-0.3792	-0.5226	0.0178
Nigeria	-0.6179	-0.5286	-0.7515	-0.4141	-0.4249	-0.4072
Angola	-0.4132	-0.2854	-0.6533	-0.1690	-0.0062	-0.3658
Kenya	-0.6144	-0.5574	-0.6879	-0.3229	-0.2029	-0.4379
Ghana	0.3770	0.2797	0.4941	-0.0334	-0.1650	0.1349
Egypt	-0.2727	-0.4347	0.3581	-0.1446	-0.3349	0.1605

Notes: Own calculations with data from Bruegel database. Trends and cycles components were constructed by decomposing the real effective exchange rates using the Hodrick Prescott (1997) filter.

Methodology

The empirical methodology that is used to analyse comovement between the real effective exchange rate of South Africa and those of a sample of countries is the Bayesian variable selection introduced by Bartels (1997). This method was first proposed by Leamer (1978) and its detailed description can be found in Hoeting et al (1999). The method emphasises variable importance when selecting relevant variables in high dimensional data where information may usually be scatters through a large number of potential explanatory variables hence it overcomes the omitted variable bias. More specifically, the method estimates models for all possible combinations of all explanatory

variables and constructs a weighted average over all the possible models. This accounts for the model uncertainty inherent in variable selection by averaging over the best models providing an optimal way to capture the relationships in the data. Thus the method efficiently minimises the estimated parameters towards the stylised representation of the data leading to sound inference. According to Varian (2014), this variable selection method is able to analyse high dimensional data, revealing interdependence among the variables, leading to a new way of understanding their relationships.

The empirical approach is Bayesian Variable Selection model following Zeugner (2012) and is specified as follows

$$y_\gamma = \alpha_\gamma + X_\gamma \beta_\gamma + \varepsilon \quad , \quad \varepsilon_\gamma \sim N\left(0, \sigma_\gamma^2 I\right) \tag{1}$$

where y_γ is the dependent variable, α_γ is a constant, X_γ is a vector of explanatory variables, β_γ are coefficients and ε_γ is the error term with the mean of 0 and variance of σ_γ^2. In the event of high dimensional data in X_γ, the challenge is to identify the variables to include in the model. To circumvent this problem, the variable selection approach estimates all possible combinations of X_γ and constructs a weighted average over them such that if X_γ contains K variables where 2^K variable combinations are estimated and hence 2^K models. The model weights for averaging are derived from posterior model probabilities from Bayes theorem as follows

$$p\left(M_\gamma \middle| y, X\right) = \frac{p\left(y \middle| M_\gamma, X\right) p\left(M_\gamma\right)}{p\left(y \middle| X\right)} = \frac{p\left(y \middle| M_\gamma, X\right) p\left(M_\gamma\right)}{\sum_{s=1}^{2^K} p\left(y \middle| M_s, X\right) p\left(M_s\right)} \tag{2}$$

where $p\left(M_\gamma \middle| y, X\right)$ is the posterior model probability. Posterior model probability is proportional to the product of the probability of the data given the model $p\left(y \middle| M_\gamma, X\right)$ and the prior model probability $p\left(M_\gamma\right)$ and is inversely proportional to the constant integrated likelihood over all models

$$p\left(y \middle| X\right). \;\; p\left(\beta_\gamma \middle| y, X\right) = \sum_{\gamma=1}^{2^K} p\left(\beta_\gamma \middle| M_\gamma, y, X\right) p\left(M_\gamma \middle| X, y\right) \tag{3}$$

which is the posterior distribution assuming that M_γ is the true model. β_γ are the parameters, while the unconditional coefficients are defined as

$$E\left(\beta_\gamma \middle| y, X\right) = \sum_{\gamma=1}^{2^k} p\left(\beta_\gamma \middle| y, X, M_\gamma\right) p\left(M_\gamma \middle| y, X\right) \tag{4}$$

The prior model probability has to be proposed based on prior knowledge or believe. The variable selection method is implemented using the algorithm developed by Feldkircher and Zeugner (2009),

with detailed description and reviews in Zeugner (2012) and Amini and Parmeter (2011, 2012) respectively.

Empirical findings

The comovement between the real effective exchange rates of South Africa and those of the selected sample of countries are estimated using the variable selection method. Since the method is Bayesian, it requires the specification of the prior distributions on the model parameters and the model space, the MCMC, the number of draws that the sampler runs and the number of the first iterations or burnins to be omitted from the estimation results. The number of draws refers to the number of iterations that that the MCMC sampler runs, Burn ins are the number of the iterations to be omitted, MCMC is Markov chain Monte Carlo sampler, while Model prior is the mass on model size and g Prior is the hyper parameter. The pre estimation model statistics are presented in presented in Table 2a. The number of draws and burnins for the MCMC sampler were set to 1 100 000 and 100 000, respectively. The birthdeath sampler was used for the model MCMC sampler. The hyper parameter on Zellner's (1986) g-prior is BRIC. Given that there are 30 real effective exchange rate variables, the model space is 1.1 billion. Similar model statistics were chosen for all the estimations.

The model statistics of the comovement between the trend component of the real effective exchange rates are presented in Table 2a. These are the mean number of regressors, PMP correlation and the shrinkage factor. The mean number of regressors, which is the average number of regressors that are included in the estimated models with a relatively high probability is 19 for the full sample, 10 for the pre financial crisis period and 8 for the post financial crisis period. This means that, out of 30 real effective exchange rates, those of about 19 currencies showed a relatively high comovement with that of South Africa over the whole sample, while this was the case with the real effective exchange rates of 10 and 8 currencies in the pre and post financial crisis periods. The PMP

Table 2a. Model statistics of the trend component of the real effective exchange rates

	i) **2000-2014**		ii) **2000-2007**		iii) **2008-2014**	
Mean Regressors	18.9031		10.1375		8.3715	
PMP Correlation	0.9701		0.8586		0.7392	
Shrinkage Factor	0.9989		0.9989		0.9989	

Notes: Own calculations with data from Bruegel database. Mean Regressors shows the covariates with relatively high probability of inclusion in estimated models, PMP Correlation shows that the degree of convergence between the prior and the posterior model probabilities, Shrinkage Factor is a goodness of fit indicator.

correlation shows that the degree of convergence between the prior and the posterior model probabilities is reasonably high for all the estimated models at 0.97 for the full sample model, at 0.86 for the pre financial crisis model and at 0.73 for the post financial crisis model. The shrinkage factor, which is a goodness of fit indicator, shows that goodness of fit was almost perfect in the models that were estimated for the full sample, the pre financial crisis and the post financial crisis periods.

The results of the comovement between the trend component real effective exchange rate of South Africa and those of the selected sample of countries are presented in Table 2b. In the full sample period, the results show that the real effective exchange rate of South Africa exhibits relatively strong positive comovement with those of Argentina, Chile, Indonesia, Taiwan, Canada and new Zealand, in descending order of importance, while it displays relatively strong negative comovement with those of China, Korea, Ghana, Kenya, Australia and Russia, United States and Nigeria, also in descending order of importance. In the pre financial crisis period, the real effective

Table 2b. Results of the trend component of the real effective exchange rates

	i) 2000-2014		ii) 2000-2007		iii) 2008-2014	
Currency	**Inclusion**	**Sign**	**Inclusion**	**Sign**	**Inclusion**	**Sign**
U. States	0.8814	0.1276	0.8866	0.0103	0.3821	0.2114
Canada	0.9147	0.9909	0.9700	0.9984	0.4694	0.9889
E. Area	0.2833	0.2011	0.1966	0.0618	0.2277	0.0697
U. Kingdom	0.4264	0.7178	0.6599	0.0103	0.1438	0.7908
Switzerland	0.2552	0.6260	0.2091	0.6981	0.2499	0.3136
Japan	0.3257	0.1824	0.1359	0.7789	0.5196	0.9276
Australia	0.9788	0.0018	0.1478	0.2886	0.2617	0.7768
N. Zealand	0.9020	0.9958	0.8684	0.9982	0.1422	0.2679
Russia	0.9015	0.0030	0.1976	0.2961	0.2384	0.7718
Turkey	0.2524	0.3930	0.4109	0.0281	0.4584	0.9711
China	1.0000	0.0000	0.4654	0.0339	0.4069	0.0131
India	0.1687	0.4665	0.1211	0.2913	0.0920	0.6837
Korea	1.0000	0.0000	0.1645	0.3406	0.2921	0.7929
Indonesia	0.9321	0.9990	0.1577	0.5394	0.0862	0.8630
Taiwan	0.9283	0.9981	0.1035	0.6757	0.0597	0.4110
Thailand	0.1610	0.3063	0.1824	0.2467	0.1800	0.4797
Singapore	0.6677	0.8135	0.1309	0.6031	0.1803	0.2748
Malaysia	0.2901	0.6406	0.2567	0.0823	0.3135	0.8730
Brazil	0.1439	0.5818	0.1792	0.1542	0.1083	0.7671
Argentina	1.0000	1.0000	0.9117	0.9992	0.2326	0.5878
Mexico	0.4267	0.0112	0.9353	0.0013	0.2113	0.8769
Chile	0.9803	0.9997	0.1226	0.7097	0.1045	0.3442
Colombia	0.6528	0.9854	0.5625	0.9820	0.1121	0.6454
S. Arabia	0.6307	1.0000	0.1271	0.6628	0.9172	0.9985
Iran	0.3136	0.0550	0.1141	0.8173	0.3618	0.0111
Nigeria	0.8361	0.0058	0.2501	0.6877	0.9499	0.0003
Angola	0.2606	0.9540	0.0766	0.9158	0.1788	0.8845
Kenya	0.9907	0.0000	0.2960	0.9676	0.2323	0.2581
Ghana	1.0000	0.0000	0.1526	0.3536	0.0944	0.3985
Egypt	0.3983	0.0449	0.1446	0.5125	0.1643	0.4934

Notes: Own calculations with data from Bruegel database. Inclusion is the sum of probabilities for models where the covariates where included, Sign is the posterior probability of a positive coefficient conditional on inclusion in estimated models.

exchange rate of South Africa shows relatively strong positive comovement with those of Canada, New Zealand and Argentina, while it shows strong negative comovement with those of United States, United Kingdom, Mexico and Colombia. In the post financial crisis period, it shows positive comovement with those of Japan and Saudi Arabia and a negative comovement with that of Nigeria. Although the trend component of the real effective exchange rate of South Africa shows strong comovement with those of a considerable number of countries, such comovement is no longer sustained when the sample is split pre and post the financial crisis.

The results of the trend component of the real effective exchange rates generally show relatively strong comovement between the real effective exchange rate of South Africa with those of a number of countries in developed economies such as the United States, Canada, Australia and

New Zealand. This is also the case with emerging economies such as Russia, China, Korea, Indonesia, Taiwan, Argentina and Colombia, Oil exporting countries such as Saudi Arabia as well as African countries such as Nigeria, Kenya and Ghana. However, the comovement is limited to the pre financial crisis period for most of these countries, while the real effective exchange rates of only Saudi Arabia and Nigeria show strong comovement with that of South Africa post the global financial crisis period. Furthermore, the comovement between the real effective exchange rate of South Africa and those of developed economies is largely mixed, while is positive with those of emerging economies and mostly negative with those of the African countries.

The model statistics of the comovement between the trend component real effective exchange rate of South Africa and those of the selected sample of countries are presented in Table 3a. As with the model statistics of the models for comovement between the trend components of the real effective exchange rates, model statistics of the models for comovement between the cycle components of the real effective exchange rates show that mean number of regressors, which shows on average number of included regressors with relatively high probability of inclusion in the estimated models, is 10 in the full sample period, 7 in the pre financial crisis period and 7 in the post 2008 financial crisis period. This implies that the real effective exchange rates of about 10 countries exhibit strong comovement with that of South Africa in the full sample period, while those of about 7 countries exhibit strong comovement with that of South Africa in the pre financial crisis period and another 7 in the post financial crisis period. the PMP correlation shows that the degree of convergence between the prior and the posterior model probabilities is reasonably high for all the estimated models at 0.97 for the full sample model, at 0.99 for the pre financial crisis model and at 0.99 for the post financial crisis model. The shrinkage factor shows an almost perfect goodness of fit for the full sample, the pre financial crisis and the post financial crisis models.

Table 3a. Model statistics of the cycle component of the real effective exchange rates

	i) **2000-2014**		ii) **2000-2007**		iii) **2008-2014**	
Mean regressors	10.0163		7.2653		7.2423	
PMP Correlation	0.9754		0.9993		0.9915	
Shrinkage Factor	0.9989		0.9989		0.9989	

Notes: Own calculations with data from Bruegel database. Mean Regressors shows the covariates with relatively high probability of inclusion in estimated models, PMP Correlation shows that the degree of convergence between the prior and the posterior model probabilities, Shrinkage Factor, which is a goodness-of-fit indicator.

The results of the comovement between the cycle component of the real effective exchange rate of South Africa and those of the selected sample of countries are presented in Table 3b. In the full sample, the results show that the real effective exchange rates of Canada, New Zealand and Saudi Arabia, in descending order of importance, show a relatively strong positive comovement with that of South Africa, while those of China, Iran, Mexico and United Kingdom show the negative comovement with that of South Africa, also in descending order of importance. In the pre financial crisis period, the real effective exchange rate of South Africa show strong positive comovement with those of New Zealand, Kenya and Angola, while it shows negative comovement with those of Switzerland, Thailand and Mexico. In the post financial crisis period, the real effective exchange rate of South Africa show positive comovement with that of Saudi Arabia, while it shows negative comovement with the real effective exchange rates of Euro Area China, Japan and Nigeria. The comovement is relatively even over the full sample period as well as pre and post the financial crisis. This is contrary to the trend component where South Africa shows strong comovement with the real effective exchange rate of relatively more countries only during the full sample period.

Table 3b. Results of the cycle component of the real effective exchange rates

	i) 2000-2014		ii) 2000-2007		iii) 2008-2014	
Currency	**Inclusion**	**Sign**	**Inclusion**	**Sign**	**Inclusion**	**Sign**
U. States	0.0872	0.1764	0.0116	0.5314	0.1906	0.9720
Canada	0.9499	1.0000	0.1743	1.0000	0.1737	0.9819
E. Area	0.4336	0.0292	0.0338	0.0618	0.6477	0.0081
U. Kingdom	0.6236	0.0000	0.0370	0.0285	0.0806	0.2769
Switzerland	0.2271	0.9464	0.8649	0.0000	0.4142	0.9998
Japan	0.1077	0.8241	0.0270	0.5938	0.7477	0.0007
Australia	0.0671	0.9656	0.0250	0.3442	0.3694	0.9933
N. Zealand	0.7911	1.0000	0.7679	1.0000	0.0170	0.4384
Russia	0.2507	0.0000	0.0682	0.0449	0.0599	0.0395
Turkey	0.3175	0.9993	0.0111	0.4190	0.0734	0.9165
China	0.9983	0.0000	0.7993	0.0000	0.9881	0.0000
India	0.1982	0.9983	0.0158	0.5247	0.0758	0.9952
Korea	0.0616	0.0664	0.0312	0.9787	0.0646	0.9685
Indonesia	0.1358	0.9882	0.0198	0.9339	0.1995	0.9963
Taiwan	0.2159	0.9986	0.0184	0.2223	0.0211	0.1833
Thailand	0.0977	0.0214	0.9810	0.0000	0.0739	0.0328
Singapore	0.0369	0.4588	0.0161	0.4480	0.0533	0.0425
Malaysia	0.1533	0.0162	0.0328	0.0086	0.0210	0.3356
Brazil	0.1715	0.9964	0.0138	0.1899	0.0570	0.9322
Argentina	0.9990	1.0000	0.0704	0.9986	0.0448	0.2572
Mexico	0.6969	0.0000	0.9979	0.0000	0.1230	0.9804
Chile	0.0936	0.9959	0.0565	1.0000	0.0294	0.1272
Colombia	0.0295	0.5224	0.0623	0.9933	0.1527	0.0001
S. Arabia	0.6046	0.9991	0.0512	0.2189	0.7218	0.9991
Iran	0.8125	0.0000	0.0357	0.0000	0.4522	0.0000
Nigeria	0.4877	0.0000	0.0229	0.8792	0.7020	0.0005
Angola	0.1709	1.0000	0.9232	1.0000	0.1997	0.9876
Kenya	0.0400	0.0170	0.9778	1.0000	0.2411	0.0021
Ghana	0.1258	0.0101	0.1070	0.9961	0.0247	0.2020
Egypt	0.0311	0.7960	0.0112	0.2466	0.2224	0.9919

Notes: Own calculations with data from Bruegel database. Inclusion is the sum of probabilities for models where the covariates where included, Sign is probability of a positive coefficient conditional on inclusion in estimated models.

The results of the cycle component of the real effective exchange rates generally show relatively strong comovement between the real effective exchange rate of South Africa with those of a number of countries in developed economies such as Canada, United Kingdom and New Zealand. This is also the case for emerging economies such as China, Argentina and Mexico and Oil exporting countries such as Saudi Arabia and Iran. There does not seem to be any comovement between the cycle component of the real effective exchange rate of South Africa with those of the African countries over the full sample period, while there is some evidence of comovement pre and post the financial crisis period. The comovement for those countries which show strong comovement with the real effective exchange rate of South Africa is not limited to the pre financial

crisis period for most of these countries as it is the case with the trend component. Furthermore, the comovement between the real effective exchange rate of South Africa and those of most countries is mixed over the full sample period. However, the results show a bias towards a negative comovement for developed economies and emerging economies, while there is a bias towards a positive comovement with the real effective exchange rates of the African countries.

In summary, the results have provided evidence that the cycle component of the real effective exchange rate of South Africa shows stronger comovement with the real effective exchange rates of relatively more countries compared to the cycle component. This implies that the comovement is more important for the real effective exchange rate in the long term compared to short term. Although the real effective exchange rate of south Africa show significant comovement with that of countries in developed, emerging, oil exporting and some African countries, such comovement is mixed with the real effective exchange rates of countries belonging to a similar grouping displaying both positive and negative comovement over the sample period as well as pre and post the recent financial crisis. However, there is noticeable bias towards positive comovement between the real effective exchange rate of South Africa and those of emerging market economies. There is also noticeable bias towards negative comovement with the African countries, while the direction of comovement is not discernible in the case of developed economies. This is particularly the case with the trend component of the real effective exchange rates.

Conclusion

The study has analysed comovement between the real effective exchange rate of South Africa and those of a sample of countries that include the world's major economies as well as emerging and developing economies. The real effective exchange rates were decomposed into their trend and cycle components to examine their comovement in short term and in long term. The trend and cycle component of the real effective exchange rates were further split in to distinguish their comovement pre and post the global financial crisis. The results have shown that, although the real effective exchange rate of South Africa shows some comovement with those of the selected countries, such comovement is mixed and inconsistent. Currencies that belong to a similar grouping in terms of economic development and geographical location display both positive and negative comovement with the real effective exchange rate of South Africa. There is also no consistency in the comovement between the real effective exchange rate of South Africa and those of the selected countries pre and post the recent financial crisis. The results have further shown that the comovement between the real effective exchange rate of South Africa and those of some of the countries is stronger between the trend component than it is between the cyclical component.

References

Amini, S. and Parmeter, C. 2011. Bayesian Model Averaging in R, Journal of Economic and Social Measurement, 364, January

Amini, S. and Parmeter, C. 2012. A Review of the BMS Package for R, Bayesian Model Averaging in R, Journal of Applied Econometrics, 275, August

Archer, D. 2005. Foreign Exchange Market Intervention: Methods and Tactics, Working Paper, 24, Bank for International Settlements

Bartels, L. 1997. Specification Uncertainty and Model Averaging, American Journal of Political Science, 41(2): 641-674

Botman, D., IFilho, I., and W. Raphael Lam, R. 2013 The Curious Case of the Yen as a Safe Haven Currency: A Forensic Analysis, Working Paper, 13/228, IMF, November

Darvas, Z. 2012a. Real Effective Exchange Rates for 178 Countries: A New Database, Working Paper, 2012/06, Bruegel

Darvas, Z. 2012b Compositional Effects on Productivity, Labour Cost and Export Adjustment, Policy Contribution, 2012/11, Bruegel

Darvas, Z. 2012c. Productivity, Labour Cost and Export Adjustment: Detailed Results for 24 EU Countries, Working Paper, 2012/11, Bruegel

Engel, C. and West, K. 2004. Exchange Rates and Fundamentals, Working Paper, 10723, National Bureau of Economic research

Feldkircher, M. and Zeugner, S. 2009. Benchmark Priors Revisited: On Adaptive Shrinkage and the Supermodel Effect in Bayesian Model Averaging, Working Paper, 09/202, Washington DC: International Monetary Fund, September

Frankel, J. and Wei, S. 2008. Estimation of de facto exchange rate regimes: Synthesis of the techniques for inferring flexibility and basket weights. IMF Staff Papers 55 (3): 384-416

Global Economic Prospects, 2012. Exchange Rates, Annex, Global Economic Prospects, 29-35

Habib, M. and Stracca, L. 2013. Foreign Investors and Risk Shocks: Seeking a Safe Haven or Running for The Exit, Working Paper, 1609, European Central Bank

Hamori, S. and Tamakoshi, G. 2014. Comovements among major European exchange rates: A multivariate timevarying asymmetric approach, 31C: 105-113

Hodrick, R. and Prescott, E. (1997). "Postwar U.S. Business Cycles: An Empirical Investigation," Journal of Money, Credit and Banking, 29 (1): 1–16

Hoeting, J. Madigan, D. Raftery, A. and Volinsky, C. 1999. Bayesian Model Averaging: A Tutorial, Statistical Science, 14(4): 382-417

International Monetary Fund. 2006. De Facto Classification of Exchange Rate Regimes and Monetary Policy Framework, International Monetary Fund

Kriljenko, J. Guimaraes, R. and Karacadag, C. 2003. Official Intervention in the Foreign Exchange Market: Elements of Best Practice, Working Paper, 03/152, International Monetary Fund

Kia, A. 2013. Determinants of the Real Exchange Rate in a Small Open Economy: Evidence from Canada, Journal of International Financial Markets, Institutions and Money, 23: 163-178

Kuhl, M. 2008. Strong Comovements of Exchange Rates: Theoretical and Empirical Cases When Currencies Become the Same Asset, Discussion Paper, 76, Center for European Governance and Economic Development Research

Leamer, E. 1978. Specification searches: Ad hoc inference with nonexperimental data, Wiley, New York

Mise, E. Kimand, T. and Newbold, P. 2005. On Suboptimality of the Hodrick-Prescott Filter At Time Series Endpoints, Journal of Macroeconomics, 27(1): 53-67

Miyajima, K. 2013. "Foreign Exchange Intervention And Expectation In Emerging Economies," Working Paper, 414, Bank for International Settlements

Orlov, A. 2009. A cospectral analysis of exchange rate comovements during Asian financial crisis, Journal of International Financial Markets, Institutions and Money, 19(5): 742-758

Ozer-Imer, I. and Ozkan, I. 2013. On the Co-Movements of Exchange Rates, in Mirdala, R. ed., Financial Aspects of Recent Trends in the Global Economy, 21: 12-37, ASERS Publishing

Rangel, J. G. 2011. FX Comovement: Disentangling the Role of Market Factors, Carry-Trades and Idiosyncratic Components, Conference paper, CCA-009, Bank for International Settlements

Raputsoane, L. 2008. Exchange rate volatility spillovers and the South African currency, Conference paper, Trade and Industrial Policy Strategies, October
Accessed:http://www.tips.org.za/files/Leroi_Exchange_rate_volatility_spillovers-24_Oct_2008.pdf

Varian, H. 2014. "Big Data: New Tricks for Econometrics," Journal of Economic Perspectives, 282: 3-28

Zellner, A. 1986. On Assessing Prior Distributions and Bayesian Regression Analysis with g-prior Distributions, in Goel, P.K. and Zellner, A. (Eds), Bayesian Inference and Decision Techniques: Essays in Honour of Bruno de Finetti, Amsterdam

Zeugner, S. 2012. Bayesian Model Averaging with BMS, R-package, 0.3.1, The R Project for Statistical Computing