Examining the Weak Form Efficiency in Foreign Exchange Market in Namibia

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Abstract

This paper analyses the weak form efficiency of the foreign exchange market in Namibia using three bilateral exchange rates. Weak-form efficiency is examined using the traditional unit root tests, the Augmented Dickey Fuller, Phillips Perron and Kwiatkowski-Phillips-Schmidt-Shin. The study applied these test on the monthly data for the period covering the year 1993 to 2011. The results from the study showed that there exists weak form efficiency in Namibia’s foreign exchange market. This suggests that the past values cannot be used to predict the current values. The weak-form efficiency on the Namibia stock market is attributable to its correlation with the JSE which was also found to be weak form efficient for the period investigated.

Keywords: Efficient market hypothesis, Namibia, foreign exchange market, parametric tests.
1. Introduction

An important strand of the study addressed the question of whether or not the Namibian foreign exchange market is efficient; that is, whether frequent changes in the exchange rate are attributable to stabilizing speculation which reflects changes in the fundamentals or long-run determinants of currencies; or whether such changes are due to destabilizing behavior of various kinds, driving prices away from fundamentals, and hence creating excess volatility. According to Hallwood and MacDonald (2000) an efficient exchange rate market is the one which:

- Fully utilises all available information, that is, there is no unexploited information.
- All participants in the foreign exchange market utilise all available information to provide a set of exchange rates both spot and forward that do not provide any opportunity for unusual profits.
- Unusual profits cannot be made by speculators.
- There is no room for government intervention in the foreign exchange market because it reflects all available information.
- Both Covered Interest Parity and Uncovered Interest Parity conditions are assumed to hold at all times.
- The forward exchange rate equals the expected spot rate. Therefore, empirically, running the regression, the forward rate is an unbiased estimator of the spot rate. That is, the forward rate should correctly reflect the future spot rate.

According to Shipanga (2009), Namibia officially became a member of the Common Monetary Area (CMA) in 1990 and all member countries of the CMA adhere to the same exchange control regulations. However, Namibia has its own foreign exchange operations (Exchange Control) to manage foreign currency transactions. Day to day handling of exchange control takes place through the commercial banks which act as the authorized dealers in foreign exchange on behalf of the Bank of Namibia and the Ministry of Finance. Within the monetary area, exchange rates between the participating countries are fixed and there are no payment restrictions. The CMA has many of the characteristics of a monetary union, as the exchange rates vis-à-vis other member states are fixed and capital flows are free. As a consequence, interest rates and the money supply cannot be directly influenced by the individual country except for South Africa. Monetary policy in such a system is at best subordinated to exchange rate policy, as domestic credit creation must be kept within limits in order to ensure a sufficient volume of net foreign assets of the banking system. The main advantage of the current arrangement is that it helps to avoid exchange rate fluctuations

1 The member countries are Lesotho, Namibia, South Africa and Swaziland.
between the country’s exchange rate and the South African Rand and reduces the unfavorable effects of exchange rate uncertainty on trade and investment, thus providing price stability in the domestic economy.

The Namibian foreign exchange reserves are denominated into three reserve currencies, the South African Rand (ZAR), European Currency Unit (EURO) and the United States Dollar (USD). In this regard, the role of the exchange rate is crucial in small import-dependent economies with highly concentrated export sector such as Namibia. This is due to the fact that most of these economies are often associated with shallow and underdeveloped financial markets typified by absence of forward markets, and low levels of foreign exchange reserves (Aron, 1997). Hence, policy concerns include: the extent of allocation efficiency in thin markets with a volatile exchange rate; whether volatility deters investment or renders it inefficient and whether the exchange rate can, or should be, smoothed through intervention mechanisms.

In the words of Aron (1997), it is obviously expected to find inefficiencies in a small developing country such as Namibia, characterized by institutional imperfections such as interest rate regulation, credit rationing and exchange rate control. Furthermore, these are frequently thin markets with high transaction costs and are subject to frequent policy and other structural breaks. The question is whether frequent changes in the exchange rate are attributable to stabilizing speculation which reflects changes in the fundamentals (long-run determinants) of currencies or whether such changes are due to destabilizing behavior of various kinds, driving prices away from fundamentals, and hence creating excess volatility. This is critical for Namibia as the Namibia Dollar is linked to South African Rand on a one-to-one basis and it is expected that the fluctuations of the Rand in the international markets are indirectly passed to the Namibia dollar. Therefore, the objective of this study is to examine if there exist any weak form efficiency in the Namibian foreign exchange market. The paper is organized as follows: the next section presents a literature review. Section 3 discusses the methodology. The empirical analysis and results are presented in section 4. Section 5 concludes the study.

2. Literature Review

2.1 Theoretical Literature

Although the Efficient market hypothesis (EMH) is often applied to the stock market, it can also be used to show the foreign exchange rates, like stock price (Ibrahim, Ghani & Salleh, 2011). A great amount of research which makes reference to market efficiency and performance exists. Since the publication of Fama’s seminal work (Fama, 1970), foreign exchange markets especially in the developed countries have been extensively tested for efficiency using different econometric techniques. In general, various international studies
have been done regarding the topic of efficiency of the foreign exchange market. EMH refers to markets where prices fully reflect the information available such that unusual profit cannot be earned through exploiting this available information set. Informationally efficient market price changes must be unforecastable (Samuelson, 1965). Fama (1970) asserts that in an efficient market, prices always fully reflect available information. Accordingly, the EMH has three forms; weak, semi-strong and strong reflecting different degrees of information. When a market is weak-form efficient, its prices reflect all the information available in the past prices or returns. The semi-strong form has the prices of financial assets instantly reflecting all publicly available information. Whereas, in a strong-form efficient market, participants cannot use (i) past prices, trading data such as trading volumes or returns of financial assets; (ii) publicly available information; or (iii) information available to the insiders of the market to devise any method to beat the market consistently. The last form of efficiency, by implication, encompasses both the weak and semi-strong forms of the EMH (Wickremasinghe, 2004).

Inefficiency in the foreign exchange market has policy implications that can be very deterring (Pilbeam, 1992). This argument is further qualified by Wickremasinghe (2004) who argues that inefficiency of a foreign exchange market creates opportunities to capitalize for abnormal profits or it provides for profitable foreign exchange transactions. Furthermore, it forces government intervention because it requires government authorities to determine best practices in order to influence exchange rates, reduce exchange rate volatility and evaluate the consequences of different economic policies. Hence, efficient foreign exchange market requires minimal intervention at most if need be and its participants have no way of gaining abnormal profits from foreign exchange transactions. This argument is in line with the theory of random walk model proposed by Fama (1965). The theory postulates that stock prices follow a random walk and thus, past stock cannot be used to predict future prices. In light of the above, the random walk assumption implies market efficiency in its weak form means no extra profit can be earned by exploiting information about the past exchange rate values (Mussa, 1979).

Palermo (2003) asserts that, historically, there was high confidence in Purchasing Power Parity (PPP) theories and monetary explanations of the exchange rate. Nevertheless, these models have given unsatisfactory results in the explanation of the movements of the major exchange rates, particularly in the short run. Palermo states further that contradicting theories on the cause of the relative strengths or weaknesses of major currencies have been developed and refined in the early 1980’s. These are such as the Keynesian theories, the Mundell-Fleming model and many more. These models though were capable of explaining the high volatility of the exchange rate, they have shown low predictive properties, which considerably
reduce their usefulness. In this regard, Palermo continues to state that, because of the poor econometric performance of economic theories and of the economists’ fondness for market efficiency and rational expectations, the model of random walk for exchange rate has become popular.

2.2 Empirical Literature

There are numerous studies that have empirically investigated the weak form efficiency. Aron (1997) surveyed efficiency tests on various African foreign exchange markets using the cointegration methodology. Specifically for South Africa, Aron tested the weak form of efficiency market hypothesis by a variant of the Martingale model and found that the exchange rate returns were predictable by past values of exchange rates, thus the market is inefficient in its weak form for the period 1979:2 to 1995:3.

Similarly, Aron and Ayogu (1997) assessed the appropriate efficiency tests and also applied the methodologies on the South African foreign exchange market by performing the following tests: the weak form efficiency test, the forward market unbiasedness test and the returns predictability test using macroeconomic variables. The authors surveyed the efficiency tests which used the cointegration methodology. Using monthly parallel market and official exchange rates for South Africa, weak-form efficiency was tested by a variant of the Martingale Model that tests whether the log exchange rate is a martingale, possibly with drift, against autoregressive alternatives. For South Africa, it was found that exchange rate returns were predictable by past values of the exchange rate. Thus, the market is inefficient for the period considered. For the returns predictability test, the null hypothesis was rejected which implied no predictability of excess returns for South Africa.

Palermo (2003), on the other hand, explored the process of determination of the exchange rate between the Italian lira and the US dollar and indirectly, the hypothesis of weak efficiency of the market, covering the period from 14 March 1991 to 30 June 1994 (daily data), applying the Dickey Fuller (DF) and the Augmented Dickey Fuller (ADF) tests. The sample was divided into two sub samples: 14 March 1991 to 17 January 1994, and 18 January 1994 to 30 June 1994 so as to capture the effects of the exit of the lira from the European Monetary System (EMS). The conclusion was not unambiguous; the random walk hypothesis was not rejected for the first sub sample but questionable for the latter.

Moreover, Wickremasinghe (2004) examines the weak and semi-strong forms of the efficient market hypothesis (EMH), using the currency of Sri Lanka as a starting point for six international currencies. In order to examine the weak-form of EMH, he considered the traditional unit root test, while in order to contrast the semi-strong efficiency he utilized the methodology of Engle and Granger, in which the tests of Augmented Dickey Fuller (ADF) and of Phillips-Perron (PP) were applied over the residuals of the cointegration equation. This
is also the same methodology applied in this study. In addition, Wickremasinghe carried out Johansen’s tests, Granger causality and Variance Decomposition. In this work, monthly spot rates were used for the Japanese Yen, the Pound sterling, the US dollar, the French Franc, the Indian Rupee and the German Mark, relative to the Sri Lankan Rupee, for the period of January 1986 until November 2000. The principal results point to the fact that evidence exists for rejecting the semi-strong version of the EMH.

Mlambo and Biekpe (2007) studied the weak form of EMH for ten African stock markets using the serial correlation and run tests. Serious thin trading was observed on all markets, and particularly for Namibia and Botswana, the two markets with considerable dual-listed stock on the Johannesburg Stock Exchange (JSE). In all markets studied, except for Namibia, a significant number of stocks rejected the random walk hypothesis. According to Mlambo and Biekpe the weak-form efficiency on the Namibia stock market is attributable to its correlation with the JSE which was also found to be weak form efficient for the period investigated.

Noman and Ahmed (2008) examined the weak form of efficiency of the foreign exchange markets in seven (7) of South Asian Association for Regional Cooperation (SAARC) countries, an economic and political organization comprising of India, Pakistan, Bangladesh, Sri Lanka, Nepal, Bhutan, and Maldives using monthly return series for each of these markets over a period of 21 years (1985-2005). They applied a battery of unit root tests and variance ratio tests to see whether the return series of the first seven (7) follow a random walk. In a weak-form efficient foreign exchange market, time series of spot rate show the properties of nonstationarity and follows random walk process. Each spot rate at any given time depends upon its own random shock that governs the direction of the rate’s next movement. These random shocks or error term, like spot rate, also constitute a time series in which they are not serially correlated. The results thereof suggest that the increments of return series are not serially correlated. Therefore, the conclusion is that foreign exchange markets in SAARC countries are weak-form efficient.

Sifunjo, Ngugi, Ganesh and Gituro (2008) carried out run tests, unit root tests and the Ljung-Box Q-statistics to test the RWH in its weak form. The rationale was to determine whether foreign exchange rate returns follow a random walk pattern. The data covered the period starting January 1994 to June 2007 for the daily closing spot price of the Kenyan shillings per US dollar exchange rate. The main finding of this study was that the foreign exchange rate market is not efficient.

Kumar (2011) examined the weak form of the Indian foreign exchange market using a family of variance ratio tests. Monthly Nominal Effective Exchange Rate (NEER) data from April 1993 to June 2010 were used for the analysis. The justification for the use of the NEER
series in the analysis was that it has a tendency of capturing more information compared to the bilateral exchange rates. After analyzing the results from both individual and joint variance ratio test, it was concluded that the Indian foreign exchange market does not exhibit weak-form market efficiency for the period under consideration.

In Botswana, Chiwira and Muyambiri (2012) evaluated the presence of weak form efficiency in the Botswana Stock Exchange (BSE) for the period 2004 - 2008. The study used a number of tests to examine the randomness of the BSE stock prices. The testing methods used are the Augmented Dickey Fuller tests, autocorrelation test, Kolmogorov-Smirnov Test, Runs Test and the Phillips Perron unit root test. All the tests show that the BSE is inefficient at the weak-form suggesting the need to improve the efficiency. Furthermore, the random Walk hypothesis is rejected implying that investment analysts outperform the market and they reap higher than expected profits through the use of historic data.

Nawaz et al. (2013) investigated the weak form efficiency of Karachi Stock Market using daily, weekly and monthly stock prices. Data was used ranging 15 years from July 1997 to April 2012. Data was analyzed using unit root tests, run test and Kolmogrov Smirnov Tests. Results of this study showed that monthly returns of Karachi Stock Market were normally distributed while daily and weekly returns were not normally distributed.

Sing and Sapna (2013) examined the weak form market efficiency in five stock exchanges of Asian countries. The data used consisted of daily, weekly and monthly closing values. The results of the run test show that the Bombay stock exchange (BSE) and Singapore stock exchange (STI) do not follow random behaviour in case of daily prices. In case of monthly price, BSE has been found weak form efficient. Further, the results of autocorrelation and Ljung-Box test revealed that all stock exchanges under study follow random walk behaviour in case of monthly and weekly prices except BSE.

Gilani, Nawaz, Shakoor and Asab (2014) study explored the weak form efficiency of Islamabad Stock Exchange (ISE) from January 2013 to December 2013. In testing for the weak form efficiency of Islamabad Stock exchange, different statistical techniques were used in analyzing the data of weekly ISE-10 share index. This includes the popular tests of statistics such as run test and ADF test to check the weak form of ISE. The study also focused on the random walk behaviour of stock market of Islamabad. Run test and autocorrelation test show market inefficiency at specific periods but ADF test descriptive showed market efficiency in weak form.

Chaibi (2014) study investigated random walk in Hong Kong stock exchange. The unit root, autocorrelation and the variance ratio tests are applied, using daily data on returns of two indexes in the period 1997:7 to 2012:12. For two indexes, the null hypothesis of random walk is rejected and therefore the markets are no weak-form efficient.
Evidently, from the literature reviewed above, there have been many studies that investigated foreign exchange market efficiency in many countries around the globe. Nonetheless, besides studies such as Aron (1997), Aron and Ayogu (1997), Mlambo and Biekpe (2007), Norman and Ahmed (2008) and Sifunjo et al. (2008), there still remains a dearth of investigations that involves developing markets. This is in line with Mlambo and Biekpe (2007) assertion that little is known about the efficiency of emerging markets, especially those in Africa.

Clearly, although the concept of EMH has been investigated on the Namibian stock exchange market by Mlambo and Biekpe (2007), to the knowledge of the authors, there have been no previous studies on the examining of the efficiency of the foreign exchange market test specifically for Namibia. There is also a gap of six year between this study and that of Mlambo and Biekpe Therefore, this gap is a sufficient justification for this study and adds to empirical literature for Namibia.

3. Methodology

Empirical literature showed that empirical tests of foreign exchange market efficiency have been carried out using various econometric techniques. These models were mainly aimed at establishing whether (i) spot exchange rates behave as random walk variables; (ii) the forward exchange rate is an unbiased predictor of future spot exchange rate; or (iii) there is cointegrating relationship among a series of spot exchange rates (Wickremasinghe, 2004).

This study used the traditional unit root test to evaluate the weak form efficiency in Namibia as used by (Wickremasinghe, 2004; Chiwira & Muyambiri, 2012 and Chaibi, 2014).

3.1 Econometric or Analytical Framework

The traditional unit root tests can be conducted using specific unit root tests such as the Dickey Fuller (DF), the Augmented Dickey-Fuller (1981) and the Phillips-Perron (1988). The unit root tests provide evidence on whether the exchange rates follow a random walk and ultimately, establish the weak form of efficiency of the foreign exchange market. Although Noman and Ahmed (2008) criticize the ADF, particularly, for its low power, it still remains one of the commonly used techniques or methods used to assess whether a certain foreign exchange market follows a random walk. These tests are explained below.

In order to test or make inferences on weak-form efficiency of the foreign exchange market in Namibia, and to establish whether or not the spot exchange rates follow random walks, the ADF is obtained by:

$$\Delta x_t = \alpha_0 + b_0 x_{t-1} + \sum_{i=1}^{\lambda} c_i \Delta x_{t-i} + W_t$$
where $\Delta$ is the difference operator, $\alpha_0$, $b_0$, and $c_0$ coefficients to be estimated, $x$ is the variable of which time series properties are examined and $W$ is the white-noise error term. The lags of the dependent variables used to obtain white noise residuals are determined using Akaike Information Criterion (AIC). The null and alternative hypotheses are: $b_0 = 0$ (series is non-stationary) and $b_0 < 0$ (series is stationary) (Wickremasinghe, 2005). Most time series in economics exhibit trend over time and when this is the case, it is usually said that these time series are not stationary (contain unit root). Being non-stationary implies that the mean, variance and covariance are not constant over time. In the context of this study, when data contains a unit root it means the data follows a random walk. Hence, the whole idea for unit root test to search for data generating process (DGP) namely:

(a) Pure random walk, meaning no intercept and no time trend items:

$$\Delta y_t = \delta y_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta y_{t-i} + \epsilon_t$$

(b) Random walk with drift, meaning intercept and no time trend item:

$$\Delta y_t = \alpha + \delta y_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta y_{t-i} + \epsilon_t$$

(c) Random walk with drift and time trend, meaning intercept and time trend item:

$$\Delta y_t = \alpha + \gamma t + \delta y_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta y_{t-i} + \epsilon_t$$

The obvious non-stationarity of the time-series implies that the effect which is not carried over to the next period or the value of the current period does not depend on the previous period’s value. In this case, there is no short run effect. If there is an effect on the series, that effect would never be adjusted and there would never be an equilibrium point because the effect is equal to a unit.

Conversely, the PP test suggests a non-parametric method of controlling for higher order autocorrelation in a series and is based on the following first order autoregressive [AR (1)] process:

$$\Delta y_t = \alpha + \beta y_{t-1} + \epsilon_t$$

Where $\Delta$ is the difference operator, $\alpha$ is the constant, $\beta$ is the slope and $y_{t-1}$ is the first lag of variable $y$. The null and the alternative hypotheses tested are the same as for the ADF test described above.

Making reference to the PP model given above (equation 5), the $\epsilon_t$ is the disturbance term that is generated from a white noise process and assumed to be independently and identically distributed with zero mean and constant variance and $\epsilon$ are uncorrelated across time. In each case, the estimated coefficient will then be divided by its standard error to
compute the tau statistic (τ): and refer to the ADF tables. If the computed absolute value of the tau statistic exceeds the ADF, then reject the hypothesis that β = 1, which indicates that the time series is stationary. Alternatively, if the computed absolute value of the tau statistic does not exceed the critical tau value, then do not reject the null hypothesis (Gujarati, 2003).

3.2 Data, Data Sources and Data Measurements

Owing to the fact that the market for forward contracts does not exist in Namibia as yet, and hence, the forward exchange rates are not published by the Bank of Namibia; the scope of this study is limited to the efficiency of the spot foreign exchange market. Therefore, the data used in this paper consists of monthly nominal spot exchange rates of the UK pound (GBP), the US dollar (USD), the European Currency Unit (EURO). The monthly bilateral spot exchange rates covering the period 1993:01 to 2011:12 are obtained from the Bank of Namibia Quarterly bulletin (2012). These spot exchange rates were then transformed into natural logarithms. Although the Namibian dollar is linked to South African Rand, it is expected that the fluctuations of the rand in the international market are indirectly passed onto the Namibia dollar.

4. Empirical Analysis and Results

4.1 Unit Root Test

In testing for unit root the following tests were used: namely, the Augmented Dickey-Fuller (ADF), Phillips-Perron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests. The KPSS was added as confirmatory test due to the fact that the ADF and PP statistic has limitations of lower power and successive or persistent unit roots, respectively. They tend to under-reject the null hypothesis of unit roots. The results of the unit root test in levels are presented in Table 1 below.

Table 1 reports the results of the ADF unit test for the three nominal exchange rates for levels and the first differences of the natural log values. Interestingly, all exchange rates under consideration are non-stationary in levels, that is; their mean is not zero, the variance is not constant and the residuals appear to be correlated over time. When the variables were found to be non-stationary in levels, they were differenced once and became stationary, that is, with a zero mean, constant variance and the residuals uncorrelated over time. The level of significance of the ADF statistics for all currencies is 5%. The relevance of these results is the fact that they inform us about the EMH in Namibia. For instance, the fact that the variables were found to be non-stationary implies that they are consistent with the weak form of EMH which states that financial time series behave as random walks. In other words, past exchange rates cannot be used to predict future exchange rates. In this case, exchange rates at time t-1 cannot be used to predict exchange rates at time t. This implies that the participants in the foreign exchange market cannot devise any statistical technique to gain from the foreign...
Many economists have argued against using the standard unit root test and suggested using other powerful test, such as tests that can be used to test the null of stationarity against the alternative of non-stationarity (Ibrahim et al, 2011). The most popular one is the KPSS. The KPSS test was also then conducted for confirmatory purposes so as to augment the ADF and PP tests conducted earlier. The results in Table 2 above still show that the series were found to be non-stationary in level form as in the case of ADF and PP. The results for the KPSS test also affirm the presence of the weak-form of EMH in Namibia. After differencing exchange market transactions consistently. Table 1 also shows the results of the PP unit root test for the three exchange rates. The PP test procedures are quite similar to those of the ADF test also at 5% level of significance. The results from the PP test also indicate that the series of the exchange rate are non-stationary in levels. Hence, concurring with those of the ADF, and thus further affirming that the weak form of EMH is existent in the Namibia’s foreign exchange market.
the data once, the unit root test shows that the series became stationary, implying that the series are integrated of order 1.

These results are similar to those of Wickremasinghe (2005) who examined the weak and semi-strong forms of the efficient market hypothesis (EMH) of the Sri Lankan foreign exchange market, and also those of Noman and Ahmed (2008) for the seven (7) of the SAARC countries. They are also similar to those of Palermo (2003) who explored the process of determination of the exchange rate Italian lira- US dollar and indirectly, the hypothesis of weak efficiency of the market.

Most importantly, these results are fairly consistent with those by Aron (1997) on the efficiency of the South African foreign exchange market. They are also supported by Mlambo and Biékpe (2007). One can therefore safely conclude that the weak-form efficiency on the Namibian foreign exchange market is attributable to its correlation with the JSE (in that, most stock listed on the Namibian Stock Exchange (NSX) are dual-listed on the Johannesburg Stock Exchange (JSE)) which was also found to be efficient in its weak form.

5. Conclusion

This study examined the weak form efficiency in Namibia’s foreign exchange market. This is due to the fact that any inefficiency in the market would result in investment analysts reaping abnormal gains; results in excess volatility and thus unfavorable effects of exchange rate uncertainty on trade and investment. Furthermore, it may force government authorities to intervene in order to influence exchange rates, reduce exchange rate volatility and evaluate the consequences of different economic policies. The study was based on monthly data covering the period 1993:01 to 2011:12, utilizing the technique of unit root. The results reveal that there exists market efficiency in Namibia’s foreign exchange market. That is to say the past values cannot be used to predict the current value. The weak-form efficiency on the Namibia stock market is attributable to its correlation with the JSE which was also found to be weak form efficient for the period investigated.

References


