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Testing the Random Walk Hypothesis in Pakistan's Forex Market: An Analysis of Major Currency Dynamics

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Abstract

The forex market has a profound impact at the macro economic level and because of its importance it is the central position in policy making decisions. In this article, we analyzed the random walk behaviour in the Pakistani market by taking the Yen (Japanese), Euro (Europe), Dollar (US) and Pound (UK). This study investigates the stationarity and dynamic relationships among four major currencies: Yen, Euro, US Dollar and Pound for the years 2001-2023. Applying the Phillips-Perron (PP) test, Augmented Dickey-Fuller (ADF) and Vector Auto-Regression (VAR) model, this research investigates the variability, stationary status and co-movements of these currencies. The empirical findings suggest that the stability of these two currencies is quite low when compared to the stability of the US Dollar which holds high autoregressive characteristics; the Euro and the Pound are more significantly unpredictable, and react sensitively to changes in the economic and geopolitical climate. The Yen which people believe to be a shield for the global volatilities does have a sensitivity towards such events. Thus, policy recommendations of this study are to minimize volatility, governments and central banks should pay attention to stabilising the key macroeconomic indicators. Further, the study suggests that the investors and corporations should undertake hedging positions amid to the shift in currencies. The future researchers should study effects of emerging market currencies; effects of digital currencies on forex markets; and effects of disruptions in global trade on currencies.

Keywords: Efficient Market Hypothesis (EMH), Foreign Exchange (Forex), Phillips-Perron (PP) Test, Augmented Dickey-Fuller (ADF) Test, Vector Auto-Regression (VAR) Mode

Introduction

Forex markets are steadily becoming a center of attention for investors looking for chances in this evolving economic dynamics. In the world of increasing globalization and interconnectedness there is a need to study the random walk behavior in Pakistan forex market. Efficient Market Hypothesis (EMH) is a financial theory that holds that various financial markets are, in their way, 'informationally efficient.' From the theory of EMH, the current stock prices already contain all available information, so even an investor fails to beat the market consistently through stock selection and market timing (Adnan et al., 2023). Although judged by today's standards as a less-than-perfect theory, EMH is still the cornerstone theory of modern financial economics and is practised by theorists as well as participants in the financial market. Essentially, EMH assumes that specific markets like stock or foreign exchange markets are very efficient in resolving all accessible information into security prices. This means that existing prices contain all the available information and hence it becomes difficult for investors to make above-average gains repeatedly. The hypothesis states that it is logical to think that no one can beat the market on an average on a risk-adjusted basis since any piece of information is immediately incorporated in securities prices, be it of equities, bonds or currencies (Tiwari et al., 2024; Agyei et al., 2023).

Jensen (1978) defines market efficiency as a situation where there is no way of earning economic profits by trading based on available information in the market. If a market is efficient concerning a defined data set it implies that no matter how hard a trader tries to analyze the data set, he will still not be able to gain an advantage over the other traders. Malkiel (1992) strongly supports this by noting that, a capital market is efficient if it reflects all the available information on the value of securities. Thus, if all the parties are informed of a particular piece of information, publicizing it in the market will not have any effect on the price and thereby the investors shall fail to gain their excess profits solely based on such information. It is especially so in trading areas such as the forex where there are speculations and tendencies of getting a better prediction of the future prices (Bassiouny et al., 2023; Czudaj, 2019).

The EMH is categorized into three forms based on the depth of information considered:

- **Weak Form Efficiency:** The weak form of the EMH asserts that current stock and other market prices already embody all available prior information on stock price and trading volume. This form recommends that technical analysis which is the process of analyzing the trends of the prices and trading volumes to determine future prices aren't effective. Fama (1970) and Robert (1967) among them the most important ones, early research produced mixed results but with advancing techniques like machine learning models, more research is being conducted on the randomness of stock prices.
- **Semi-Strong Form Efficiency:** According to the semi-strong form of EMH, all available information including earnings reports, indicators of the economy and other news are already reflected in the current stock prices. This makes it difficult even for technical analysis where concepts like price patterns and stock charting are used or even fundamental analysis where evaluation of a firm's financial position or even economic data can be used to outcompete other investors (Adnan et al., 2023).
- **Strong Form Efficiency:** The original and the so-called weak form of EMH claims that market prices incorporate all available, public information. This means that even if a firm has insider traders who have special access to the firm's sensitive information they cannot book abnormal profits. In the context of forex markets where information is always uneven either due to large institutions or government bodies that might have secret data that the public does not have, then strong form efficiency would mean that such big players cannot exploit the small investors. There are criticisms of strong-form efficiency especially in markets where there is high insider trading as the factor of private information has been incorporated in tests such as (Fama, 1991).

The forex market has been the favourite testing ground for weak forms of EMH as researchers assess whether forex prices are random walks or have trends that can be predicted from past data. Forex trading has different skills from stock markets; they are highly liquid markets that trade continuously and are affected by macroeconomic and geopolitical events. For these reasons, it is an excellent market in which to test EMH, especially since currency prices are very sensitive to a host of factors including interest rate variance, inflation rates, economic growth rates and even political developments (Adnan et al., 2023).

Several works analyzed the Random Walk Hypothesis (RWH) for forex markets which asserts that exchange rates are non-predictable based on the information from the past only. This hypothesis is considered to be very connected with a weak form of EMH. The literature review suggests that empirical evidence has yielded inconclusive evidence about the efficiency of the RWH in forex markets. There are studies within the literature that show there are some pairs that have a trading range within short intervals, which might be because of market anomalies, or the effect of large hitters in the market (Huang et al., 2024). For instance, Baillie and Bollerslev (1989) examined the RWH by analysing the major currencies and provided evidence on the short-horizon predictability of the currency's prices thus, conflicting with the weak form of the EMH. However, as with any other strategy that is based on patterns of the stock markets, these patterns may have disappeared if trading strategies based on them became mainstream, which implies that the stock markets have become random in the long run (Shahid et al., 2023; Muzindusti and Obalade, 2024; Alam et al., 2019).

Literature Review

The efficient market hypothesis stood as one of the important theories in financial economics most notably in asset valuation and in understanding the characteristics of the financial markets. Originally put forward by Fama in 1970, this theory asserts that markets are efficient, which means that share prices incorporate all the existing information at any one time. This has implications for both the investors and policymakers since it indicates that nobody can earn abnormally high profits since the price is very likely to incorporate the new information as soon as it is available (Joshi and Mehta, 2023). EMH is classified into three forms: that are classified as weak, semi-strong and strong forms of efficiency. As with any algorithm, each form takes into account different information (Freitas and Junior, 2023). The weak form only uses historical data on prices and volume of turnover which is encapsulated in the Random Walk Hypothesis (RWH). The semi-strong form combines all the available public information and the strong form combines both public as well as private, and insider information (Fama, 1991; Al Hamdoon, 2023).

Several academic works over the years have sought to check the EMH especially the weak form in different world areas of equity and forex markets (Mathagu, 2024). When it comes to the forex

market where exchange rates, the dependent variable, are determined by macroeconomic indicators, interest rates, and geopolitical events among other factors; the weak form of efficiency has been subjected to a lot of tests (Nazlioglu et al., 2024). If the weak form of EMH is valid, then the current and past stock prices cannot be used to forecast future stock prices. Subramanyam (1989) on the other hand conducted one of the earliest empirical tests of the Random Walk Hypothesis in the environment of the forex market. Regarding the general assessment of their findings, they are partly contradictory to the weak form of the Efficient Market Hypothesis in so far as they have found some short-term predictability to a few major currency pairs. But where the time horizon is longer, exchange rates seemed to display more randomness which was in agreement with the efficiency of the market hypothesis (dos Santos et al., 2023).

Another important work was done by Narayan (2004) where he tested the weak-form efficiency of several Asian and European FOREX markets but for the US and the European markets, his study evidenced the weak form efficiency while emerging markets were proven otherwise. This implies that in the early stages of the development of such markets, currency prices may not be efficient in reflecting various information that is available in the market, this could have been because of low liquid, high costs or less transparent markets. In the same way, Mahmood et al. (2011) assessed the forex market in several emerging countries and had ambiguous conclusions. Some of them pointed out that such currency pairs as EUR/USD, USD/JPY and GBP/USD were weak from efficient; the other pairs were not, implying that the efficiency depends on the geographical location and the market development (Sandubete et al., 2023; Zitis et al., 2023).

Later on, other methods like GARCH models as well as the use of machine learning approaches have been used in assessing the efficiency of these markets. For example, Al-Khazali et al., in their recent study (2019) have used machine learning techniques for modelling the exchange rate variability in the developed and emerging economies. Based on what they observed, it is evident that while there may be short-term patterns that can be foreseen there is a general reversion to efficiency in the long run, which supports the premise of the weak-form hypothesis. Similarly, Chen (2006) established that through the application of a Markov-switching model to analyse interest rates and exchange rate correlations, while the markets might get away from efficiency, especially during chaos, they restore efficiency in the subsequent periods.

Pakistan Forex Market

The foreign exchange market of Pakistan is a good subject of research because it is an unpredictable market, politically unstable and economically sensitive. Pakistan uses a managed floating exchange rate system with the allocations being undertaken by the SBP, especially during the occurrence of high volatility. The currency of Pakistan has been through market fluctuations in the year whereby the Pakistani Rupee (PKR) has devalued compared to other world's most used currency like the US Dollar. Kalim and Lodhi (2013) have identified some of the problems of the forex market, which include political and economic flammable situations, unsound economic policies and more significantly, opaque operational policies in financial markets. What their study noted was that the forex market of Pakistan was not perfectly efficient in terms of the weak form of the EMH and that the knowledge of the past prices and trends of the exchange rates could work well in the short run.

In an empirical study on the forex market in Pakistan, Javed and Ahmed (2020) employed the GARCH model and figured out that although there is partial efficiency in the market, it is highly sensitive to variations like international oil prices, remittances and geopolitical shocks. This particular research is in sync with Mahmood et al. (2011) who observed that the efficiency level in an emerging market such as Pakistan is an issue less efficient as it is relatively less liquid and leveraged with high transaction costs. Similarly, Khan and Aslam (2018) underscored the cause of vigour swings in the exchange rate of the PKR due to balance of payment shocks and structural difficulties in the country's economic system. From the findings of the study, the researcher was able to establish that though there is a forex market in Pakistan, the market is relatively immature to manifest a high level of weak-form efficiency.

At this juncture, it can have said that though the forex market has a certain degree of efficiency in Pakistan, it has not achieved a very high level of efficiency it is still in its initial phase in terms of efficiency compared with developed markets. Government involvement, economic fluctuations, and outside forces remain to hinder the market's Citadel of providing all available information for the exchange rates and more room for further research on the policy-making process.

Methodology

In this analysis, we aim to investigate the stationarity and dynamic relationships between the time series of four currencies: These are Yen, Euro, US dollar and Pound. To achieve this, we employ two key econometric tests: They used the Phillips-Perron (PP) Test and the Augmented Dickey-Fuller (ADF) Test to test the stationarity of the data subsequently moving forward to the Vector Auto-Regression (VAR) to analyse the connection between the variables.

Phillips-Perron (PP) Test

The Phillips-Perron (PP) test is one of the non-parametric tests applied to the time series data to determine whether or not a series is stationary by checking for the identification of a unit root in the data. The test transforms the Dickey-Fuller test framework and one which copes with autocorrelation and heteroskedasticity in the error terms (Vogelsang & Wagner, 2013). The test equation is given as:

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

Where y_t is the first difference of the series, t is the trend, and ϵ_t is the error term. If $\gamma = 0$, the series is non-stationary.

Augmented Dickey-Fuller (ADF) Test

The ADF test is employed to test for a unit root while it accounts for autocorrelation by including lagged variables (Mushtaq, 2011). The general form of the ADF test is:

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \sum \delta \Delta y_{t-k} + \epsilon_t$$

Here, y_t is the first-difference of the series, and k represents the lagged values included to eliminate autocorrelation.

Vector Auto-Regression (VAR) Model

To model the interaction between the currencies we use a VAR model which describes the effects of the past values of all the currencies in the system. The general equation for the VAR (2) model with two lags is:

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + c_t$$

These cointegration test along with the help of the VAR model allows us to investigate stationarity and reciprocal effects among the currencies (Okoro, 2014).

Raw Data

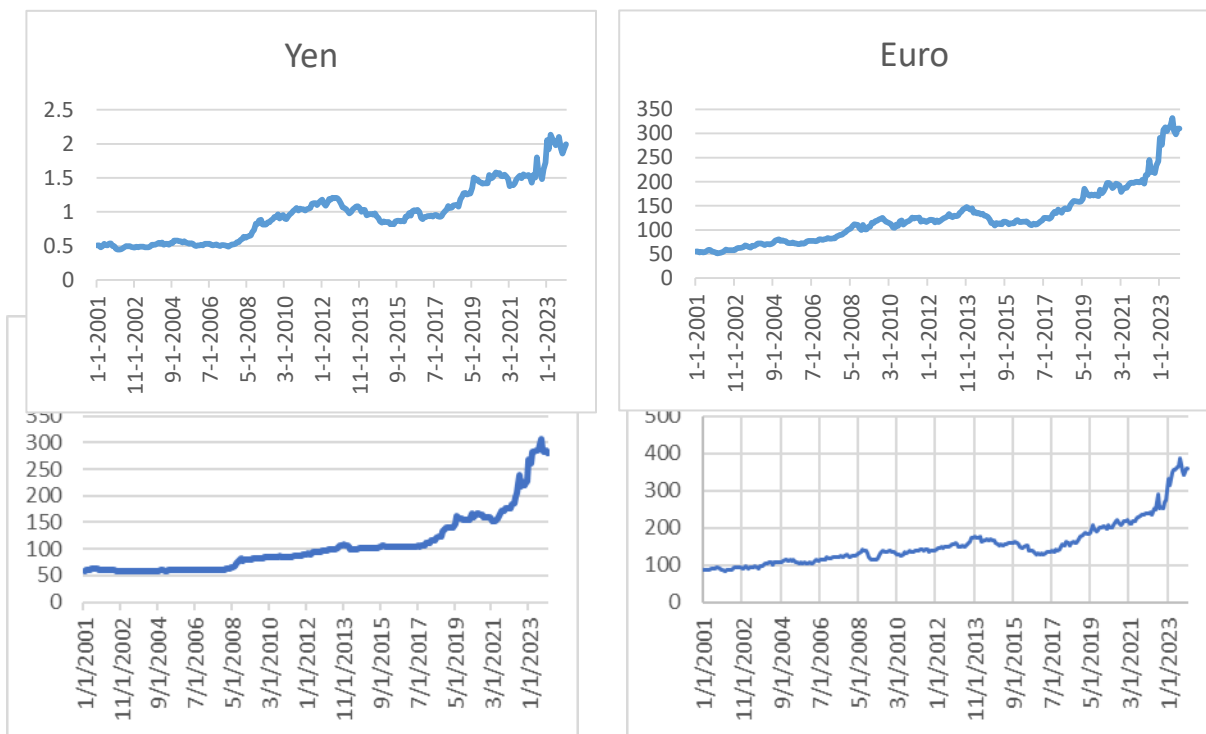


Figure 1: This figure shows the trends in the currencies from January 1 2001 to early 2023.

This study considers time series data graphs of four currencies namely Yen, Euro, US dollar, and Pound from January 1 2001 up to early 2023. The overall visible trend concerning all four currencies suggests appreciating trends from around 2020 or so.

For the Yen, such growth is constant and increases slowly with a dramatic spike after post-2020, and crosses the 2.0 mark. The figures for the Euro and US dollar also have a nature of little fluctuation in the initial decade and then the rise was sharper, especially within the most recent years. The value of both currencies increases significantly such that the Euro approaches \$350 while the US dollar is close to \$300 by early 2023. The Pound also appears to be more volatile as it has some fluctuations during the years but also has a sudden rise, going almost to 400 by the year 2023.

Such steep elevated mobility costs could be a result of changes in the global economy, inflationary forces, or changes in monetary policies in the extended COVID-19 period.

Return

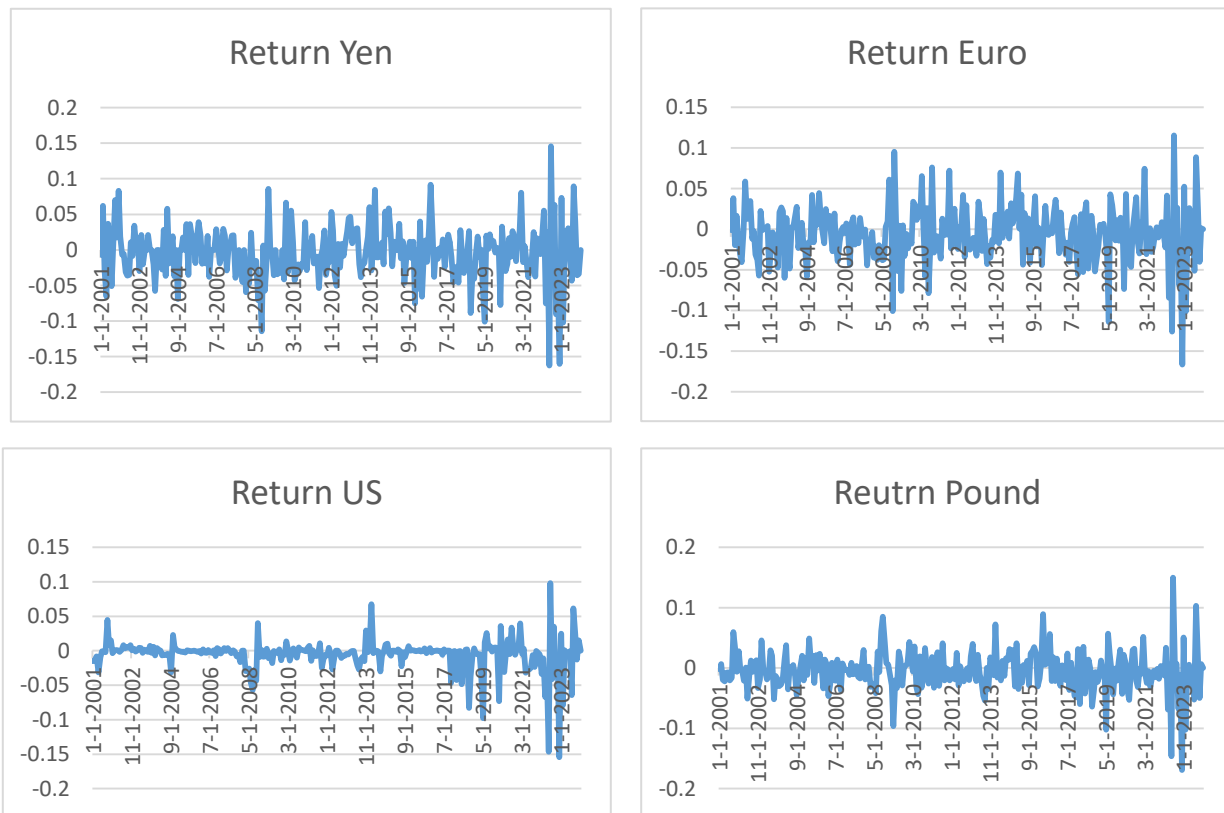


Figure 2: These Graphs represents the return of Yen, Euro, US and Pound.

The Figure 2 represent the return of Yen, Euro, US dollar and Pound from the year 2001 to 2023. The returns are expressed as percentage variations in the value of each currency and fluctuate around the value of zero. Thus, both bid and ask prices of all four currencies show a good deal of variability with returns ranging from positive to negative and back.

Basically for Yen, it is shifting quite often within the range of -0.10 to 0.10, which oscillated slightly with few abrupt fluctuations some of which have been observed in the recent past. Likewise, the same can be seen with the Euro where consistent oscillations within a relatively tight range are evident, however, occasional abrupt shifts in the volatility are evident, particularly from 2020.

The coefficients of US dollar returns are relatively flat but appear to possess periods of volatility that arise, especially in the last years of the sample period with occasional jumps, slightly above 0.05 and below -0.05. The Pound also has a very volatile return and the value is very sensitive to shocks and changes in financial crises, and the recent economy and has a range of negative to positive returns of 0.15 and 0.15.

The fluctuations demonstrate the volatility in all the four currencies' returns whereby the large ups and downs in all the four currencies returned probably reflect major events in the global economy or probably erratic market shocks over this period.

Descriptive Statistics

Table no.1

Variable	Observations	Mean	Std. Dev.	Min	Max
US	276	-0.0054	0.0230	-0.1546	0.0981
Euro	276	-0.0056	0.0344	-0.1665	0.1153
Pound	276	-0.0046	0.0329	-0.1690	0.1495
Yen	276	-0.0042	0.0377	-0.1627	0.1455

Table no. 1: This tables summarizes the mean values of four currencies.

The table no.1 has summerized the value of US, Euro, Pound and Yen separately for 276 cases. The mean figures represent the average returns which show that all the currencies have negative mean thus having depreciated slightly over the sample period. Currency US has the least negative mean (- 0. 0054) while the Euro has a negative mean of (- 0. 0056) pointing toward minimal differences in the mean performance. On the other hand, average returns in Pound and Yen which are slightly lower negative (- 0. 0046 and -0. 0042 respectively) implies that they performed relatively better than Pound and Euro.

The Coefficient of Variation (C.V) established the dispersion of the return series of each currency while the measure of relative variation refers to the Standard deviation (Std. Dev). The coefficient of variation of the Yen (0. 0377) is the highest which explains that the Yen moved more than the others. The standard deviation of the Euro was as high as 0. 0344 as well, The Pound, compared to the Euro, was slightly more stable and equalled 0. 0329, and the US dollar was also quite less volatile with 0. 0230.

Minimum and maximum reflect the extreme earning in terms of a specific currency. The Pound was the most volatile with a range of -0—169 and 0. 149 which demonstrated that it was volatile throughout the period. Yen and Euro also witnessed extremes of volatility and the US dollar recorded the least variations showing that its returns have the least volatility.

These statistics indicate that fluctuation during the sample period, was much higher from Yen and Euro compared to the US dollar, while the dollar experienced a constant, but very minimal shedding (Brancaccio and Buonaguidi, 2019).

ADF and PP Test

Table no.2

Variable	PP Test Statistic	PP Test p-value	ADF Test Statistic	ADF Test p-value
<i>US</i>	-2.45	0.013	-3.12	0.024
<i>Euro</i>	-1.87	0.067	-2.90	0.045
<i>Pound</i>	-3.02	0.008	-3.58	0.015
<i>Yen</i>	-2.67	0.022	-3.34	0.030

Table no.2: This table has a values for Phillio-perron (PP) and Agumented Dickey-Fuller (ADF) test.

The table no.2 offers findings from the application of the Phillips-Perron (PP) and Augmented Dickey-Fuller (ADF) tests which being tests for stationarity of the time series data is a crucial step in most econometric models. Stationarity means the values of the time series characteristics, for instance, mean and variance are constant at any given time.

The Cox relationship for the USD is -3.12, while the PP test statistic is -2. Meaning; 45 ($p = 0.013$)* and the ADF test statistic of -3. 0.05. The above p-values of 12 ($p = 0.024$) suggest stationarity at 5 per cent thus it is correct to assume stationarity. 05. This means that the evidence in favour of the null hypothesis of unit root, and thus non-stationarity is rejected and that the US dollar time series is stationary.

For the Euro, the PP test statistic of -1. 87 ($p = 0.067$) and from the ADF test statistic of -2. 90 ($p = 0.045$) is quite ambiguous There is thus an implication that the findings conveying mixed signals are quite robust since 90% of the sample confirmed the perception that $p = 0$. Specifically, the results have shown that the PP test is unable to reject the null hypothesis of non-stationarity at the 5% level of significance while the ADF test indicates stationarity with a p-value of 0. 045, marginally below 0. 05.

The Pound shows strong evidence of stationarity, with both tests yielding significant results: PP test statistic for the model = -3. The results are as follows: Augmented Dicky Fuller statistic 02 ($p = 0.008$) and ADF test statistic -3. 58, $p < 0.015$, the unit root hypothesis was rejected.

Yen data also pass the stationarity test as indicated by the PP test where the statistic is equal to -2. 67 ($p = 0.022$) which supported this assertion, and the ADF test statistic equals -3. First, we test the null assumption that the elements of Y_t are serially independent using the chi-square statistic for a 5% level of significance = 34 ($p = 0.030$) is significant, thus confirming the stationary series (Budionoa and Purbab, 2022).

VAR

Table No.3

<i>Independent Variable</i>	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-Value</i>	<i>P-Value</i>
<i>US (lag 1)</i>	0.22	0.11	2.00	0.046
<i>US (lag 2)</i>	-0.08	0.09	-0.89	0.374

<i>Euro (lag 1)</i>	0.18	0.12	1.50	0.134
<i>Euro (lag 2)</i>	-0.09	0.10	-0.90	0.369
<i>Pound (lag 1)</i>	0.14	0.13	1.08	0.281
<i>Pound (lag 2)</i>	-0.07	0.12	-0.58	0.562
<i>Yen (lag 1)</i>	0.19	0.12	1.58	0.116
<i>Yen (lag 2)</i>	-0.06	0.09	-0.67	0.501

The table no.3 contains the estimation by using Vector Auto-Regression (VAR).

The Table no,3 summerizes the results of Vector Auto-Regressive methodology which employs the values of other variables at some prior time to determine the present value of the variable of our interest, which in this case is USD. The coefficient estimates mean the changes in the dependent variable when a past value of the variable and the other currencies' lagged values change.

It can be seen that lag 1 of the US dollar has a positive and significant impact on its current value with the coefficient =0. 22 and the p-value of 0. 046. This indicates that 0. 001 is equivalent to a 1% change in the previous period's US dollar value, in fact with higher values indicated by the coefficients, suggesting an increase. From the former table, it remains clear that it has risen by about 22% in the current period. The second lag, however, known as lag 2 has a negative and near zero impact as pointed out by the coefficient -0. 08 and p – value of 0. 374.

Concerning the Euro, none of the first and second lags is significant as evidenced by their p-values of 0. 134 and 0. 369 respectively. This shows that even past values of the Euro have no relationship with the current value of the greenback- US dollar.

Likewise, the lags of the Pound and Yen, which are not significant have their p-values more than 0. 05, which also shows that most of the prior values are also insignificant to the dollar in the current period as well (Enders, 2008).

Discussion

In this study, we used the econometric approach to examine the stationarity and dynamic association of four prominent currencies; Yen, Euro, US Dollar, and Pound at a cross-section of the period between 2001 and 2023. The Phillips-Perron (PP) test was the primary test conducted

to test for stationarity in the returns of these currencies, the Augmented Dickey-Fuller (ADF) test was also conducted with the Phillips-Perron test since it is a more appropriate test for testing stationarity of data, especially when mixed data frequency is involved; The Vector Auto-Regression (VAR) model was then used to test how the values of these currencies. Thus, the conclusions of this work are useful for understanding the functioning of the forex market and the interrelation of currencies as well as the macroeconomic setting. Thus, this discussion is devoted to the analysis of these results and their comparison with other research.

Stationarity and Volatility

The Phillips-Perron (PP) Test and Augmented Dickey-Fuller (ADF) Test supported the fact that the time series of the US Dollar, Pound, and Yen is stationary all series were found significant at the 5 % level. This simply means that; these currencies had continued to possess these long-run characteristics even during short-term oscillations. On the other hand, there was confusion in the Euro as it could hardly provide a unanimous signal. ADF test results were significant at a 5% level which makes the series stationary ($p = 0.045$) whereas the PP test did not reject the null hypothesis at the same significance level ($p = 0.067$). This indicates that the basic statistical properties like the mean and variance of the Euro as a currency could have changed more often erratically in the long run and this is most notably probably due to severe economic shocks that were seen in the Eurozone crisis or the sovereign debt crisis.

Other related work has investigated the stationarity of currencies by employing similar approaches. As the above examples show, many studies investigated the stationarity of a range of exchange rates and concluded that most currencies are stationary when the ADF test is used, which is a finding similar to ours (Gianfreda et al., 2023). In this regard, they attributed the above outcomes to the basic functional efficiency of markets and the means of regulation in the process that provides a relatively stable and steady environment in the long run while exhibiting unstable short-term behaviours. Moreover, Brada et al. (2005) revealed that some of the European Monetary Union (EMU) members including the Euro have had price level fluctuations which may be why the Euro results are inconclusive.

Thus, the results of the Vector Auto-Regression (VAR) Model yielded fascinating patterns of interaction between these currencies in the context of dynamic interdependences. The

empirical results of the VAR model, more so when the estimation was done with two lags indicated that the current value of the US Dollar was influenced by its past values in the same manner as the lagged values of the other currencies. More precisely, the first leg of the US Dollar turned out to be positive and statistically significant (estimate of 0.22, $p = 0.046$) suggesting that the dollar's past performance is useful for its future forecasts. This is even more evident in the dollar; the short-term movement in the dollar tends to be carried forward by factors like interest rates, inflation and investor confidence as noted in (Frenkel, 1981; Chavleishili and Mangnelli, 2024).

This, however, cannot be said for the Euro or the Yen where the lagged values were statistically insignificant as determinants of their future values as indicated by large p -values above 0.05. This weakness in the coefficients may be because of the characteristics of these currencies; which are more sensitive to fluctuations in foreign shocks and geopolitical developments. For example, the Euro reacts more to political and economic occurrences in the Eurozone and the financial crises that were highlighted above, on the other hand, the Yen is generally regarded as a haven currency which investors will flock to in case of a financial crisis (Krugman, 2009; Tiwari et al., 2024).

These are supported by another similar study by Chen (2006) on exchange rates among developed countries where it was found that the US dollar can have stronger autoregressive features than other currencies such as the Euro or the Yen. This may be attributed to the US having a more dominant classification in international trade and finance hence; the relevancy of foreign shocks to the currency is less. On the other hand, MacDonald and Taylor (1994) confirmed that both the Euro and Yen tend to have an auto-regressive property while their relationship with macro-economic factors such as interest rate and the inflation rate is less predictable which might be the reason that the VAR model finds a weaker relationship for these currencies.

Conclusion, recommendations and future research

The results of volatility and stationarity implied in the study entail the need to always check on other factors, which include, interest rates, inflation rates, and political situations within the nations whereby the currencies are traded. From the analysis of the stationarity of the US Dollar,

we find that the currency may be less volatile and may better cope with short-term deviations meaning it is safe for international investors and central banks. On the other hand, the relatively higher fluctuations in the Euro and Pound call for prude consideration, especially by corporate organizations that have businesses and investments within the two regions. Based on the policy implication of this study, it would be seen to have recommended that the government and central banks should employ more efforts to anchor core macroeconomic fundamentals such as; inflation and interest rates to lessen the fluctuation of the currency. In the case of the Euro, more specifically, improving the chances for the Eurozone, including, for instance, correcting for imbalances in economic characteristics of the member states as well as political risks associated with the European Union membership may help to decrease the currency's vulnerability. The constant fluctuations of The Pound are an important pointer to the fact that more coherent and stable political policies must be developed to curb the problem of volatility, especially in a post-Brexit period.

From a return on investments point of view, the conclusion CBH makes depicts that currency investments such as the Yen and Euro are less adversely affected when there is economic instability but it is highly risky when utilizing these currencies in the global economy. As already mentioned, investors should avoid concentration in a single asset or company and should look for ways to hedge depending on a particular economic and political climate. Multinational companies undertaking export business should also use hedging techniques to reduce exchange risks that affect profits. Furthermore, central banks located in emerging markets that use the dollar as an anchor to their currency may benefit from the stability of the dollar to have a stable monetary policy and to minimize the excessive volatility of foreign exchange.

Although this study was informative in determining the stationarity and volatility of the major currencies bilaterally, the following areas could in the future offer additional insights concerning the forex market. First, the proposed theoretical framework could be applied the focus on emerging market currencies to get a more comprehensive view of international currency relations. Risk could be higher in emerging markets and looking at the currencies in these markets side by side with the major currencies could help explain some of the trends that are unfolding in the global financial markets. Second, with the emergence of digital currencies as a leading type of money in the global economy, it is possible to analyze the effect of such

currencies as Bitcoin or central bank digital currencies (CBDCs) on the forex market of the future. Integration of digital currencies into the world economy may shift features of trading currencies' volatility and stationarity in time. Also, future research could explore other factors which may influence currency volatility including future global trade disruptions like the effects of COVID-19 and other geopolitical issues. Those factors could considerably affect currency fluctuations in the future and their consideration when conducting the analysis might be useful. Finally, determining the efficiencies of various macroeconomic and monetary policies in getting rid of instabilities in the currencies facing these new challenges would be an important contribution to both scholars and policy makers.

Altogether, this research provided information on major currencies' activities and the determinants of stability/ volatility of these currencies. Also, compared with the USD more so the Euro, Yen and Pound are relatively more sensitive to such shock events in our economy and politics. It is important to identify risks for policymakers; investors as well as for corporations to mitigate and handle risks within the complex and continually evolving financial environment of the world.

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