International Forex Market Volatility: An Empirical Study of 61 Global Currency Pairs

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Abstract:- **The study offers a theoretical and empirical analysis of the forex volatility amidst the Covid-19 pandemic and explain the repercussions of the same. We have undertaken a study of the underlying causes impacting the volatility to determine where the problem lies with the concept in essence. Having developed a foundation of cause and effect of volatility, we took up 61 pairs of forex currencies and analysed those using statistical tests and measures to recommend policy suggestions.**

Keywords:- Forex Market, Volatility, Standard deviation.

I. INTRODUCTION

Forex markets, the primary subject of this article, is a market in which traders engage in selling, buying and exchanging foreign currency. Both financial institutions as well as individuals take part in this market and trade to hedge or speculate. The Forex market is cited to be the largest financial market in the world. It comprises two levels- the interbank and the OTC (over the counter) market. Large banks trade currencies in the former while individuals in the latter. Based on the type of exchanges, forex markets are- spot, futures and forward. The immediate exchange takes place in the spot market while exchanges are undertaken at a set price decided on a current price on a future date in the forward market. The distinguishing feature of futures markets are centralized exchanges.

Volatility is a term that every investor and anyone having interest and basic financial literacy is familiar with. It is the statistical measure of the dispersions in returns for given security. It is measured as the standard deviation or variance of returns from particular security. Volatility, as a measure of dispersion, is bounded by a given period of time. One important concept to get an idea about the volatility of any market is its liquidity. In the forex market, liquidity is known to fluctuate vigorously as various financial institutions tend to open and close globally, and hence the forex market is traded twenty-four hours on weekdays. This even results in higher volumes of forex being traded each day than the stock market. Forex markets are thus called liquid markets as well. Being highly liquid, this market tends to move in smaller proportions as high liquidity results in lower volatility. However, since the currencies are affected by numerous other factors such as political and social factors apart from just economics, there can be many sudden and unexpected movements in the market, causing the prices to become suddenly volatile

Trading in volatile currencies requires one to deploy sharp and quick moves. One is to wait for such entries to appear but must take the first mover's when it does. Understanding the directional bias helps a trader to choose wisely. Extensive use of technical analysis is required to obtain gains out of volatility. One must utilize both the chart patterns as well as the technical indicators judiciously while trading in volatile currencies or stocks.

Our article aims to analyze the forex volatility amidst the Covid-19 pandemic and briefly explain the repercussions of the same. We have undertaken a study of the underlying causes impacting the volatility to determine where the problem lies with the concept in essence. Having developed a foundation of cause and effect of volatility, we took up 61 pairs of forex currencies and analyzed those using statistical tests and measures to recommend policy suggestions.

II. LITERATURE REVIEW

Forex volatility is primarily determined by the following factors:

A. Derivatives trading and Spot market volatility

One of the most often cited explanations of the apparent rise in volatility is derivatives trading. The arguments for derivatives having a destabilising impact emphasise the participation of speculators and programme trading strategies. In this regard, it is stated that derivatives attract speculators owing to the unique characteristics of these markets, which include high leverage, centralised trading, cheap expenses, and the ease of offsetting positions and selling short (Morton, 2000). Price fluctuations induced by speculators seeking quick and large profits may be unjustified by the current or expected value of economic fundamentals and may spill over into the underlying spot market via arbitrage (Fur et al.,1999). Forex market in 1987 showed concerns regarding derivatives' destabilising influence centred on the impact of program-trading methods such as index arbitrage and portfolio insurance (Ayuso et al., 2002). Price movements can then be overstated, resulting in cascading effects and, in some circumstances, a massive flood of sell or purchase orders on the same side that markets cannot absorb without substantial price fluctuations.

Thus, a plethora of research has been carried out to evaluate the influence of derivatives price fluctuations on the underlying market, notably in terms of increased underlying asset volatility.

Theoretically, price fluctuations are linked; nevertheless, causal links are difficult to assess practically. Volatility increases may imply faster absorption of new information into spot prices, but it may also suggest less liquidity.

The derivative and spot markets are effectively connected by an "elastic band." The theoretical link between prices is determined by a formula such as Black and Scholes, but momentary imbalances in one market have a fast influence on the price level in the other market, pulling or pushing each market back to an equilibrium relationship (Vrolijik,1998).

Concerns about derivatives trading's destabilising influence have led to a number of measures aiming to reduce this unfavourable effect. Among the suggested measures are higher margin requirements for futures and options, the installation of circuit breakers, and restrictions on certain trading strategies such as portfolio insurance or index arbitrage (Scott, 2012).

B. Financial Innovation, Institutional functional factors, and Inflation

Morton (2000) finds evidence that inflation rates and budget deficits are consistently related to financial market variables, which could imply that the markets' pricing of risks is based more on historical averages of inflation and budget deficits than on actual inflation and budget deficits.

A. Fischer (1989) of the Swiss National Bank (SNB) investigates whether monetary policy has exacerbated volatility in Swiss financial markets. On the one hand, Fischer (1989) discovers that the SNB's disclosures of giro holdings had an effect on exchange rate volatility, save prior to 1988 when there was an end-of-month reserve requirement in force. Exchange market interventions by the SNB, on the other hand, have an effect and appear to exacerbate rather than reduce volatility. Fischer also highlights numerous instances in which the SNB intervened in response to increased volatility in financial markets.

C. Transaction Volume in the Forex Market

Volatility and volume appear to have a positive relationship in a variety of market conditions (Karpoff, 1987). Why does the volume-volatility connection exist is an essential topic to consider. Clark (1973), Epps (1976), and Tauchen (1977) are three key contributions to the theory of the volume-volatility connection. Clark (1973) proposes the mixture of distribution theory, according to which the link between volume and volatility develops as a result of new information arriving, which drives both exchange rate fluctuations and volume. Epps (1976) adds another explanation to the mix. They claim that the volume-volatility link arises from the extent to which traders dispute while revising their reservation prices. There should be greater volatility if there are more different types of beliefs.

The tick fluctuations are used to calculate volume in the Forex market. The reasoning behind this is simple: a) Price changes in ticks up and down. b) While the Forex market can't track how many contracts are sold, it can track how many ticks the price goes up or down in a particular time frame (Vacha et al.,2017). This leads to an increase in market volatility in the forex market.

D. Cross-country influences

Regarding country-specific characteristics, Timmermans et al. discover that in the case of Belgium, many monetary policy adjustments had no effect on bond rate volatility, implying that these changes were well welcomed by markets (or, in some cases, that the new policy did not constitute a fundamental change). In contrast, the turmoil in the currency markets in 1992 and 1993 had a significant and long-lasting impact. They also observe that there is a strong negative link between the volatility of the three-month interest rate and the exchange rate in Belgium, whereas this relationship is considered to be positive in the Netherlands.

R. Mader (2000) finds it impossible to explain the large spike in Austrian bond rate volatility in 1994 in terms of domestic policies or the pace of inflation, which is consistent with comparable findings for numerous other nations. In terms of the Austrian equities market, more integration with international markets appears to have increased volatility. In contrast, the underutilization of derivatives and other financial innovations has had a dampening effect.

Overall, the empirical parts of the study offer little evidence that the short-term volatility of the exchange rate and most other financial indicators has increased over time. As a result, there is little evidence to support the case for government involvement. While there was some evidence of speculative and noisy trading, periods of heightened exchange rate volatility appeared to be connected with equilibrating trade activity rather than destabilising market factors. In other words, the currency market is operating as it should and does not appear to be in need of government intervention.

III. RESEARCH METHODOLOGY

The study employs exploratory research design to analyse the trends in forex market volatility.

A. Aim of the Study

The study makes use of nominal exchange rates to calculate volatility and to quantify its change from FY 2018-19 to FY 2020-21. Our study ultimately focuses on the relative change in standard deviation and not the absolute prices themselves.

B. Rationale of the Study

Factors like inflation could have played a role in the increase in absolute values of the exchange rate in between the two years. Besides, owing to the unavailability of daily historical data for inflation, the effects of it cannot be reliably quantified with respect to the daily values of the forex prices. Additionally, the study focuses on mapping the total change in forex volatility as a whole, regardless of the factors that could have induced the change. Hence, we proceed with our analysis by deploying the nominal exchange rate.

C. Statistical Tools used

The standard deviation is the most common metric of volatility used by traders and analysts (White, 2021). This metric measures how far a price has deviated from the mean over a given period of time. The variance is no longer in the original unit of measure because it is the product of squares. Because pricing is expressed in currency values, a metric based on a currency squared is difficult to interpret. As a result, the standard deviation is used, which returns it to the same unit of measurement as the original data set. Some researchers also make use of the Z-score, which is a combination of the standard deviation and arithmetic average of the percentage change in the exchange rate. However, the z-score is used only within the ambit of inferential statistics, which is beyond the scope of this study. We have restricted the methodology to descriptive statistics on the basis of available literature and hence, quantify price volatility on the basis of its standard deviation.

D. Sources of Data

Historical daily data for 61 forex pairs are retrieved from the financial database of a Swiss Banking Group, Dukascopy.

E. Method of Calculation

We find the standard deviation of the daily 'open price' for each currency pair for both FY 2018 -19 and FY 2020-21 using a descriptive statistics data analysis tool on Microsoft Excel.

Daily data is sourced for each fiscal year from 1st April to 31st March. The percentage change in the standard deviation of the currency pair from FY 2018-19 to FY 2020-21.

F. Formula used

Percentage (%) change = [(Current value - Past value)/Past value]*100, where, past value is the standard deviation calculated for FY 2018-19 and the current value is the standard deviation calculated for FY 2020-21.

G. Interpretation

The higher the change in the standard deviation of the daily open price from FY 2018-19 to FY 2020-21, the greater the volatility of that particular pair.

IV. RESULTS AND DICSUSSION

From the percentage change in standard deviation between the periods of 2018-19 and 2020-21, it is evident that a majority of the FOREX rates have fluctuated from their mean position to a large degree, especially the first 20 pairs in the table with change in standard deviation percentages in excess of 100%. This could be seen in Table 1 in the annexure. The Euro- Czech Koruna experienced the highest volatility with a change of 186.8% in standard deviation between the two periods followed by the Euro-Norwegian Krone with a change in the standard deviation of over 163.7%.

While there are pairs towards the end of the table exhibiting negative percentage changes in their standard deviation over the chosen time periods, a majority of the rates have substantial increases in standard deviation, depicting the picture of high FOREX rate volatility as a whole for the FOREX market.

Mean	70.5891
Standard Deviation	6.87287
Median	63.6245
Mode	#N/A
Standard Deviation	49.0821
Sample Variance	2409.05
Kurtosis	-0.86874
Skeweness	0.40993
Range	**186.889**
Minimum	0
Maximum	186.889
Sum	3600.04
Count	51
Largest(1)	186.889
Smallest(1)	0
Confidence Level (95.0%)	13.8046

Table 1: Positive change in Standard Deviation (%)

Source: Computed by authors

Mean	-26.4291
Standard Deviation	6.69772
Median	-31.92
Mode	#N/A
Standard Deviation	22.2138
Sample Variance	493.455
Kurtosis	-0.91595
Skeweness	-0.52902
Range	**62.8729**
Minimum	-62.8729
Maximum	0
Sum	-290.72
Count	11
Largest(1)	0
Smallest(1)	-62.8729
Confidence Level (95.0%)	14.9235

Table 2: Negative change in standard deviation (%)

Source: Computed by Authors

From the tables 1 and 2, the range for the positive percentage change is [0 to 186.8], while the range for the negative change is [0 to 62.8]. Hence, we can establish that the increase in the percentage change of standard deviation has increased at least three times more than the decrease in the standard deviation.
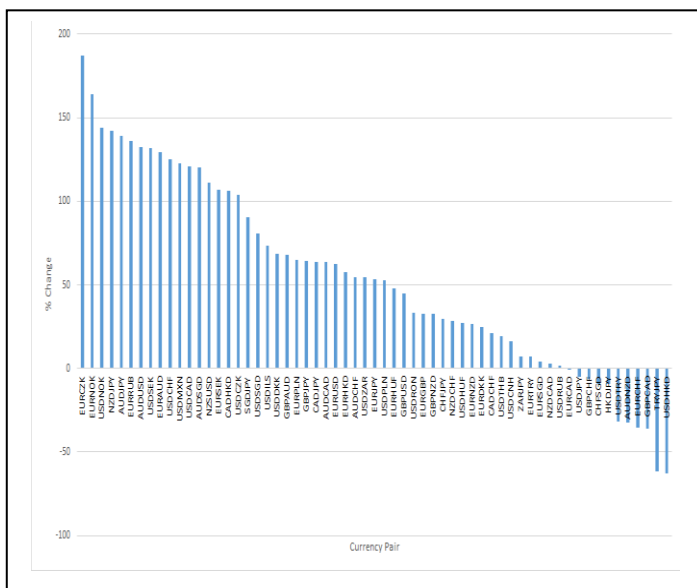
Fig. 1: Change in Deviation
(%,FY2018-2019 to FY 2020-21)

Source: Computed by authors

Only 11 out of the 61 pairs witnessed a decrease in standard deviation between FY 2018-19 and FY 2020-21. The remaining 50 pairs have experienced a significant increase.

V. POLICY IMPLICATIONS

The exchange rate is a significant macroeconomic element that influences international commerce and each country's actual economy. The expansion of international commerce generates circumstances for exchange rate volatility.

The impact of real effective exchange rate volatility on economic development for Central and Eastern European countries, but also to investigate the impact of volatility on economic growth via three separate channels and offer policymakers with information (Moreno,2012). Low volatility promotes economic performance, according to a study that used the Fixed effects model on yearly data from 2002 to 2018. Also included are the effects of macroeconomic factors such as government spending, gross fixed capital creation, and inflation (Turner,2006).

This section of the debate focused on whether and how central banks should react to volatility. Some believe that central banks should not strive to control volatility since it represents the effective functioning of financial markets in general. Others questioned market efficiency, pointing out that speculative bubbles are common. Several participants said that action was only justified when there was evidence of misalignment, however, even in this situation, prudence is required because big asset price fluctuations typically serve to rectify misalignments that have gradually built up.

One member stated that, with most nations' inflation under control, the greatest issue today confronting central banks is containing the dangers provided by asset price volatility. This sparked a broader discussion on the benefits and drawbacks of univariate vs multivariate objective functions for policymakers.

On the one hand, the Japanese experience plainly demonstrated that monetary policies that contribute to stable prices and sustainable growth do not necessarily result in well-behaved asset markets, and it also demonstrated the implications of failing to respond soon enough.

Directing monetary policy in part to asset price fluctuations, on the other hand, entails a trade-off between macro stabilisation and asset price stability (Scott,2002). In other words, unless central banks use other regulatory tools, a multivariate goal function creates an instrument assignment difficulty.

VI. CONCLUSION

The harmful implications of excessive financial volatility have recently been a major source of worry. Although its empirical significance has yet to be proven clearly, compelling theoretical and intuitive grounds support this issue. Our study confirmed the presence of asymmetric volatility connectedness in the forex market. Volatility concerns both the investors and the policymakers but differently. For investors, it's the risk associated and perceived while for the latter it's the concern regarding the spillover in the economy and impact on economic activities. Many efforts have been made to identify which idea of volatility is important and how to quantify it, which variables explain the course it takes, and which actions should be done to reduce volatility.

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