

## **A Study on Efficiency and Optimal Portfolio Selection of Selected Currency Pairs Listed in S&P 500 Index**

**Dr. D. Padmavathi<sup>1</sup>**

**T V Nithya<sup>2</sup>**

1. *Head & Associate Professor, Department of Commerce – Sri Ramakrishna College of Arts and Science for Women, Coimbatore.*
2. *Research Scholar, Department of Commerce Sri Ramakrishna College of Arts and Science for Women, Coimbatore.*

### **Abstract:**

*The Foreign Exchange Market (Forex, FX, or currency market) is a global decentralized market for the trading of currencies. The Foreign Exchange Market assists international trade and investments by enabling currency conversion. This study is carried out to analyze the efficiency of the market and to find a suitable portfolio. For this purpose 15 cross currency pairs were taken as sample size and Unit root test, Descriptive Statistics, Sharpe's Single Index Model were used as technical tool for analysis. From the study it was concluded that the degree of predictability of the different exchange rates varies significantly, in spite of the fact that all three exchange markets are known to be flexible and liquid*

### **Introduction and Research Problem**

India started facing balance of payments problems since 1985 and by the end of 1990, it was in a serious economic crisis. The government was close to default, RBI had refused new credit and foreign exchange reserves had reduced to the point that India could barely finance three weeks' worth of imports. The Balance of Payments crisis in 1991 pushed the country to near bankruptcy. In return for an IMF bailout, Gold was transferred to London as collateral, the rupee was devalued and economic reforms were forced upon India. At that time there was a need to transform the economy through badly-needed reforms to unshackle the economy. Controls started to be dismantled, tariffs, duties and taxes progressively lowered, state monopolies broken, the economy was opened to trade and investment; private sector enterprise and competition were encouraged and globalization was slowly embraced. Similarly, the establishment of a new unified market-determined exchange rate and a phased introduction of current account convertibility opened up the Indian economy to a great extent. Further trade liberalization, greater access to foreign capital and finally full capital account convertibility has been certainly on the agenda of the Indian government. India being the second

largest economy amongst Asian countries has seen the greater foreign exchange trades over the years. The trade flows amongst Indian firms have increased exponentially mainly due to integration of international financial markets, increasing cross border trades and huge capital flows.

Currency risk is one of the major risks that investors in emerging markets are facing, as these markets often have a few financial instruments for creating common hedges for such financial exposure. Due to the fall of fixed exchange regime in 1973 has made the market forces of demand and supply leading to the advent of fluctuating exchange rate regime, this lead to the unpredictability in exchange rates. Random fluctuation in exchange rates has made cash flow and asset value of the companies to be at stake of exchange rate between the domestic currency and foreign currency.

Thus leading to foreign exchange exposure risk, as it is associated with unanticipated changes in exchange rate. Currency risk is the bane of foreign investment and trade, as trading products or assets in foreign countries automatically creates exposure to foreign currencies, which left unmanaged can hurt returns. Investors aiming to enhance their risk-adjusted returns should therefore consider the turnover ratio level in their fund investment decisions. The investment portfolio management process consists of an integrated set of steps to create an appropriate mixture of assets. Since it is highly depending on characteristics of the investor, it is possible to stress three main steps: planning, execution and feedback. The most crucial part of portfolio management is the execution step during which a suitable portfolio is built. The procedure takes into account asset allocation, security analysis and investor requirements. The goal of the Most-Diversified Portfolio is not to be an equilibrium model. It can, however, potentially be transformed into an equilibrium model either by adding additional assumptions or by adding fundamental valuation criteria, such as earnings, sales, and so forth. Such additions would allow the model to accommodate different mispricing. To obtain the desired portfolio an investor must perform an analysis that gives the maximum return at a certain level of risk.

### **Objectives of the Study**

- To assess the market efficiency of the currency market on selected currencies.
- To create a suitable portfolio in the long run.

### **Research Methodology**

The present research is empirical in nature. In the current investigation, an extensive usage of secondary data was made in order to achieve the objectives of the present research. The study has taken currency exchange market for the data. The currencies such as US Dollar (USD), Euro (EUR), Japanese Yen (JPY), British Pound (GBP), Australian Dollar (AUD), Canadian Dollar (CAD), Swiss

Franc (CHF), New Zealand (NZD) and Indian Rupee (INR) are used and US Dollar (USD), Euro (EUR) are formed as base currency to find out a profitable portfolio mix for the investors. The study period consists a period of 10 years from 2008 to 2018 on day trading of international currency market.

### **Tools used for the Study**

The data collected from secondary sources, descriptive and analytical research was considered the most appropriate for the study. The data thus collected was presented in a simple tabular form and simple statistical tools like:

- Unit root test
- Descriptive Statistics
- Sharpe's Single Index Model

### **Analysis and Discussion**

Objective 1 - To assess the market efficiency of the currency market on select currencies.

**Hypothesis (H0)** There is no stationary in unit root test

**Table 1 Stationarity Test Using Augmented Dickey Fuller Test on Select Currencies Traded in S&P 500**

Variable	ADF TEST		RESULT
	LEVEL		
	Intercept	Trend and intercept	
<b>LUSD</b>	-3.663 (0.0047)	-5.202 (0.0001)	Level
<b>LEUR</b>	-4.731 (0.0000)	-6.203 (0.0000)	Level
<b>LJPY</b>	-3.303 (0.0148)	-5.062 (0.0001)	Level
<b>LGBP</b>	-3.783 (0.0031)	-4.282 (0.0033)	Level
<b>LAUD</b>	-4.649 (0.0001)	-6.227 (0.0000)	Level
<b>LCAD</b>	-3.357 (0.0126)	-5.006 (0.0002)	Level
<b>LCHF</b>	-6.233 (0.0000)	-6.240 (0.0000)	Level
<b>LNZD</b>	-3.941 (0.0018)	-4.313 (0.0030)	Level
<b>LINR</b>	-3.073 (0.0287)	-6.091 (0.0000)	Level

**Source: Computed Data**

Table 1 explains the result of the Augmented Dickey-Fuller test of select currency in the S&P 500. The ADF test accepts the null hypothesis at level series  $I\sim(0)$  because the values of the probability for the currencies traded are more than five percent and the value of the t-statistic are less than the critical values at any significance level. On the contrary, the ADF test rejects the null hypothesis for the currencies namely, LUSD, LEUR, LJPY, LGBP, LAUD, LCAD, LCHF, LNZD and LINR; the currencies traded are non-stationary, and accept the alternative hypothesis; currencies

traded are stationary, at level series because the probability value is less than five percent and the t-statistic value is larger than the critical value. Then they become stationary at the level series which means all the variables are integrated of order one  $I\sim(0)$ .

**Table 2**

**Stationarity Test Using Phillips Person Test on Select Currencies Traded in S&P 500**

Variable	PHILIPS PERRON TEST		RESULT
	LEVEL		
	Intercept	Trend and intercept	
<b>LUSD</b>	-63.474 (0.0001)	-75.804 (0.0001)	Level
<b>LEUR</b>	-41.605 (0.0000)	-53.655 (0.0000)	Level
<b>LJPY</b>	-98.767 (0.0000)	-108.269 (0.0000)	Level
<b>LGBP</b>	-57.273 (0.0000)	-65.813 (0.0000)	Level
<b>LAUD</b>	-68.352 (0.0000)	-81.436 (0.0000)	Level
<b>LCAD</b>	-27.642 (0.0000)	-39.939 (0.0000)	Level
<b>LCHF</b>	-45.701 (0.0000)	-45.707 (0.0000)	Level
<b>LNZD</b>	-114.424 (0.0000)	-117.429 (0.0000)	Level
<b>LINR</b>	-18.764 (0.0000)	-37.204 (0.0000)	Level

**Source: Computed Data**

Table 2 explains the result of the Philips-Perron test at the level series of volume traded of the companies listed in NIFTY 50 Index. It could be concluded that the PP test accepts the null hypothesis and rejects the alternative hypothesis at level series for all the companies, because of two reasons. Firstly, the probability values are more than 5%. Secondly, the t-statistic values are smaller than the critical value at any significance levels. Even though the PP test accepts the null hypothesis, volume traded are stationary and rejects the alternative hypothesis because the value of the probability is less than five percent and the value of the t-statistic is larger than the critical value. Therefore, the pp test provided additional support for the all volume traded, while they became integrated of order zero  $I\sim(0)$ , at level series (stationary).

Objective 2 - To create a suitable portfolio in the long run for the select currencies.

**Table 3**

**Return, Beta and Variance of Currency Pairs Listed in S&P 500 Index**

	<b>Currency Pair</b>	<b>Mean Return (<math>R_i</math>)</b>	<b>Variance <math>\sigma_i^2</math></b>	<b>Beta (<math>b_i</math>)</b>	<b>Rf</b>	<b>Variance Market (<math>\sigma_M^2</math>)</b>	<b>Excess Return % (<math>R_i - R_f</math>)</b>	<b>Excess Return To Beta (<math>\frac{R_i - R_f}{b_i}</math>)</b>	<b>C*</b>	<b>Status</b>
1.	EUR-USD	21.62	25.03	1.02	5.98	16.98	26.65	26.07	76.74	IN
2.	EUR-GBP	2.63	27.09	1.24	5.98	16.98	-10.31	8.32	77.58	IN
3.	USD-JPY	26.96	19.06	0.99	5.98	16.98	11.35	11.45	68.76	OUT
4.	USD-GBP	26.34	9.78	0.68	5.98	16.98	10.72	15.76	55.01	OUT
5.	EUR-JPY	14.67	15.61	0.94	5.98	16.98	16.08	17.07	51.21	OUT
6.	USD-CHF	19.41	10.73	0.68	5.98	16.98	-10.89	15.93	46.86	OUT
7.	EUR-NZD	13.37	43.94	1.47	5.98	16.98	34.59	23.54	44.91	OUT
8.	EUR-AUD	19.33	30.97	1.17	5.98	16.98	18.03	15.38	42.24	OUT
9.	USD-CAD	39.74	128.05	2.61	5.98	16.98	20.25	7.77	37.38	OUT
10.	EUR-AUD	29.22	13.82	0.88	5.98	16.98	23.24	26.27	37.06	OUT
11.	EUR-CHF	51.41	99.07	2.11	5.98	16.98	45.43	21.55	34.85	OUT
12.	USD-NZD	16.64	25.49	1.18	5.98	16.98	10.66	9.04	33.95	OUT
13.	EUR-CAD	26.25	34.37	1.36	5.98	16.98	20.27	14.87	33.52	OUT
14.	EUR-INR	82.56	154.77	2.95	5.98	16.98	76.58	25.95	33.17	OUT
15.	USD-INR	20.07	50.76	1.49	5.98	16.98	14.09	9.49	32.88	OUT

Source: Computed Data

In Table 3, as proposed by Sharpe, currency pairs which have negative returns should be ignored for selection in optimal portfolio. The currencies on the basis of their returns are ranked from (highest to lowest) for selection. Fischer and Jordan (1995) state that stocks to be included in optimal portfolio are determined on the basis of their 'excess return to beta ratio.' As per the rule of ranking, currencies having highest 'excess return to beta ratio' will be placed in the first position,

followed by the security with second highest beta ratio, and so on and so forth. It is seen from the table that EUR-USD occupies the first place as per ranking, followed by EUR-GBP and USD-JPY. Out of 15 currency pairs considered, only 10 currency pairs were finally selected for consideration.

**Table 4**

**Result of Optimal Portfolio from Select Currency Pairs Listed in S&P 500 Index**

<b>Name of the Company</b>	<b>CI</b>	<b>Name of the Portfolio</b>
EUR-AUD	76.74	<b>FOREXLARGE</b>
USD-CHF	77.58	
USD-CAD	68.76	
<b>Theta</b>	<b>0.469</b>	
<b>Portfolio Risk</b>	<b>11.27</b>	
<b>Portfolio Returns</b>	<b>7.59</b>	
EUR-USD	44.91	<b>FOREXMEDIUM</b>
EUR-GBP	42.24	
USD-JPY	37.38	
USD-GBP	37.06	
<b>Theta</b>	<b>0.359</b>	
<b>Portfolio Risk</b>	<b>6.48</b>	
<b>Portfolio Returns</b>	<b>5.69</b>	
EUR-JPY	33.52	<b>FOREXSMALL</b>
USD-CHF	33.17	
EUR-NZD	32.88	
<b>Theta</b>	<b>0.243</b>	
<b>Portfolio Risk</b>	<b>3.25</b>	
<b>Portfolio Returns</b>	<b>3.18</b>	

Source: Computed Data

From Table 4, out of 15 currency pairs considered for the study, only 24 stocks having their 'excess return to beta ratio' above cut off rate of (37) are eligible for inclusion in optimal portfolio. The portfolio has been divided into three, namely, FOREXLARGE, FOREXMEDIUM and FOREXSMALL. From this, portfolio FOREXLARGE provides a higher risk, with higher returns, this would be most suitable for aggressive investors, while, FOREXESMALL provides a low risk with low returns, this would be more suitable for blooming investors, whereas, FOREXMEDIUM provides a better understanding, which helps the investors to averse the risk.

### **Conclusion**

Investors choose their optimal portfolio every month, according to their preferences. We consider a large variety of different types of investors, ranging from the traditional mean- variance (MV) investor to the more modern conditional value-at-risk investor and to the very recent (linear and quadratic) loss aversion investor. To identify better performing portfolios, in terms of a given (risk-adjusted) performance measure, relative to a benchmark portfolio, this test is one without a potential data snooping bias. The benchmark portfolios, to which we compare the optimal portfolio are the single assets (which compose the optimal portfolio) as well as the equally weighted portfolio, and the performance measures include the mean return, the Sharpe ratio and the Sortino ratio. These results suggest that the degree of predictability of the different exchange rates varies significantly, in spite of the fact that all three exchange markets are known to be flexible and liquid. Note, however, that the situation is different for longer forecast horizons, where the USD based on the random walk actually performs worse than the USD based on the composite forecast. The 'buy low, sell high' trading strategy on the one hand and the carry trade based trading strategy on the other hand are rather different by construction and also yield different results in terms of profitability of the single assets and the resulting optimal portfolio.



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