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# Currency Portfolio Predicting Model

Hasannejad, M.[1], Vaziri, M. T.[2*], Joshan, E.[3]

## Abstract
In this study, using a basket of 5 most traded currencies as the base to measure currencies return (a basket with minimum variance in value) by applying variables affecting the exchange rate. The study designs a model for predicting and determining the best foreign exchange portfolio (in the sense of risk adjusted return). Outputs of the model have competed to the momentum based portfolio which is commonly used in forex and other financial markets. If there is a significant difference between the two models, the model presented in this study will be introduced as a model with the more ability than momentum investing strategy to predict the currency risk adjusted return. The quarterly data from 15 currencies (which includes the 15 most traded currencies) has been used since 1999 to 2018, and the Dynamic Panel method is used to process related data. The research findings indicate the power of the proposed model for predicting risk adjusted return of the currencies Also, the finding shows that the fundamental variables (Interest Rate and Real Exchange Rate) have a positive relationship with the currencies return and the previous lags of currency return has a negative relation with the current return.

**Keywords**: foreign exchange, real exchange rate, International reserve, Momentum Strategy.

**JEL Classification:** C33, C36, E47, F31, G15

## 1. Introduction
Designing a forecasting model that can lead to higher risk-adjusted returns for investors is important and investors are looking for different models to predict this variable to get the most adjusted returns. The purpose of this study is to design a model to predict the risk-adjusted return on currency portfolio and to test the efficiency of this model compared to the momentum model. The sample includes 15 currencies that, in average, had the highest volume of transactions in forex during the period 1999-2008. Similar research has used a specific currency (mostly U.S. Dollar) to measure the returns of other currencies, which has some problems including those mentioned in the Hovanov's study (Hovanov, Kolari & Sokolov, 2004). Using the solution presented in the Hovanov study, a basket was designed to measure currencies fluctuations, which has none of those problems. After calculating the currencies returns against this basket and applying the relevant economic variables, the forecasting model was extracted and the main portfolio (with the best Sharp ratio) was specified based on the extracted

model. Finally, to evaluate the efficiency of the proposed model, the actual risk adjusted returns of the main portfolios were compared with the portfolios shaped based on the momentum strategy.

## 2. Background

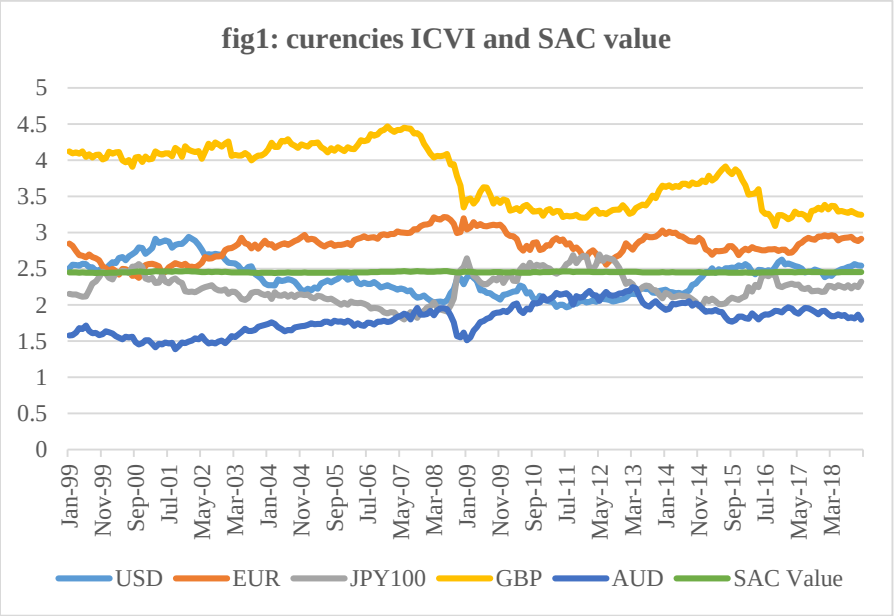
In their study, Liu and He observed that the random walk behavior in the foreign exchange market was rejected (Liu & He, 1991; Ajayi & Karemera, 1996), which is contrary to the findings of the emergence of a random walk in the foreign exchange market (Urrutia, 1992; Costa & Crato, 2010; ; Meese & Rogoff, 1983). Implementation of the momentum strategy has been common in the last two decades (Nunes, 2018) despite identifying assets with a very good Sharp Ratio by momentum strategy, it is necessary to manage the risks involved in applying it. In some cases, the application of this model has resulted in failure (Barroso & Santa Clara, 2015). Variables such as GDP (Hauner, Lee, & Takizawa, 2011), interest rate changes (Kia, 2013), deviations from purchasing power parity (Hafeez & Landau, 2007) are the factors influencing exchange rate changes. Chinn concludes in its research that each presented model may be for a specific period and may not be generalize-able to other periods (Chinn, 2003).

### SAC Design

With the help of the technique presented in the Havanov research (Havanov, Clari, & Sokolov, 2004), Invariant Currency Value Index (ICVI) of currencies was calculated and the portfolio with minimum variance of value (SAC: Stable Aggregate Currency) was designed as a measure of currencies return. The summary of relevant information is presented in Table1 and Figure1.

**Table1: Currencies ICVI and their weight in SAC, SAC value, Currencies and SAC variance**

| date | USD | EUR | JPY100 | GBP | AUD | SAC Value |
|---|---|---|---|---|---|---|
| Dec-18 | 2.5422 | 2.9159 | 2.3199 | 3.2436 | 1.7928 | 2.4537 |
| Nov-18 | 2.5482 | 2.8838 | 2.2457 | 3.2495 | 1.8648 | 2.4540 |
| Oct-18 | 2.5628 | 2.8991 | 2.2692 | 3.2717 | 1.8129 | 2.4536 |
| Mar-99 | 2.5506 | 2.7470 | 2.1459 | 4.1083 | 1.6189 | 2.4482 |
| Feb-99 | 2.5554 | 2.8173 | 2.1443 | 4.0963 | 1.5813 | 2.4507 |
| Jan-99 | 2.5049 | 2.8471 | 2.1535 | 4.1226 | 1.5794 | 2.4501 |
| Weight in SAC | 0.2157 | 0.1903 | 0.2023 | 0.1234 | 0.2684 | 1 |
| Average | 2.3694 | 2.8236 | 2.2355 | 3.7806 | 1.8096 | 2.4526 |
| variance of ICVI | 0.0548 | 0.0319 | 0.0401 | 0.1635 | 0.0411 | 0.0000 |
| Corr C-SAC | 0.0253 | 0.0332 | 0.0296 | 0.0146 | 0.0293 | 1 |




## 3. The Main and Competitor Portfolios

After calculating the returns of each currency (using seasonal ICVI and SAC value), dynamic panel regressions were applied (using seasonal data for the 17 years leading up to the forecast year) to determine coefficients of explanatory variables to predict currency returns in 2016, 2017 and 2018. By means of the outputs of the above three regressions, the coefficients of explanatory variables were extracted to predict the returns. Subsequently, three formulas were used to forecast currencies return in the out of sample period.

2016: $R_{i.t} = -0.35R_{i,t-2} - 0.15R_{i,t-3} - 0.26R_{i,t-4} - 0.13R_{i,t-5}$
2017: $R_{i.t} = -0.33R_{i,t-2} - 0.16R_{i,t-3} - 0.24R_{i,t-4} - 0.14R_{i,t-5}$
2018: $R_{i.t} = -0.1R_{i,t-1} - 0.35R_{i,t-2} - 0.23R_{i,t-3} - 0.26R_{i,t-4} - 0.25R_{i,t-5}$

After forecasting the return of the currencies by the above three relationships for three years (seasonally), the Sharp Ratio values of these currencies were calculated and the three top currencies according to sharp ratio (for each season) constructed the main portfolios applying the momentum strategy (using the three return periods leading to the expected returns and sequential weighting, weight of the nearest date $\frac{3}{6}$ and the second date $\frac{2}{6}$ and the farthest date$\frac{1}{6}$), it predicted currency returns and then the currencies were sorted according to their relevant Sharp Ratio, Then, three top currencies were chosen to construct the competing portfolios. It should be noted that to determine the currencies weights in both main and competitor portfolios, the currencies were ranked (according to sharp ratio). So, the first currency weight was $\frac{3}{6}$, the second was $\frac{2}{6}$and the third one was$\frac{1}{6}$.

## Model Efficiency

Using the real data, the difference between the sharp ratio of the main and competitor portfolios was calculated and presented in Table 2.

**Table 2: Sharp ratio differential between the main and competitor portfolios**

| Date | First currencies | Second currencies | Third currencies | Portfolio |
|---|---|---|---|---|
| 2016Q1 | 0.631 | 0.298 | -0.489 | 0.333 |
| 2016Q2 | -0.274 | 0.828 | 0.144 | 0.163 |
| 2016Q3 | 0.000 | 0.047 | -2.410 | -0.386 |
| 2016Q4 | 0.426 | -0.287 | 0.383 | 0.181 |
| 2017Q1 | -0.509 | 0.052 | 0.649 | -0.129 |
| 2017Q2 | 0.651 | 1.086 | 1.948 | 1.012 |
| 2017Q3 | -0.851 | 1.097 | 1.572 | 0.202 |
| 2017Q4 | -0.490 | 0.929 | 0.430 | 0.136 |
| 2018Q1 | 0.143 | 0.136 | -1.350 | -0.108 |
| 2018Q2 | 0.340 | 1.639 | 0.792 | 0.849 |
| 2018Q3 | 0.821 | -1.011 | 1.687 | 0.354 |
| 2018Q4 | 0.736 | -0.869 | 0.907 | 0.230 |

The results of one-sample t-test of the pointed to the significance of the sharp ratio differential between the main and competitor portfolios (+0.24) at 95% level of significance confirming efficiency of the presented model. Changing the weights of currencies in the main and competing baskets (using equal weighting) and also adding other explanatory variables (real exchange rate and interest rate ratio) yielded similar results.

## 4. Conclusion

In this study, we designed and tested the model using macroeconomic variables in order to form a portfolio with the possibility of earning more risk-adjusted return than the momentum strategy. The variables used in the model included real exchange rate, GDP growth, international reserves, interest rate, past values of dependent variable and capital market return. After analyzing the data, designing the model, and comparing the risk-adjusted returns of the main portfolios and the competitor portfolios, it was found that applying multiple variables in the model could lead to gaining a higher level of risk-adjusted return than applying the momentum strategy .The results showed that past values of currency returns are negatively correlated with current values of returns, and this variable, alone and in combination with other explanatory variables, has the ability to predict risk-adjusted returns of the currency. Real exchange rate and interest rate ratios were positively correlated with currency return and applying the first difference of each

of these variables along with the variable of past values of the currency return had the power to predict the currency return. Despite the positive and meaningful connection between first-difference explanatory variables of the ratio of international reserves and the ratio of GDP per capita to the currency return, applying them either alone or in combination with other variables, had no power to predict the currency return.

## References

Ajayi, R. A., & Karemera, D. (1996). "A variance ratio test of random walks in exchange rates: Evidence from Pacific Basin economies". *Pacific-Basin Finance Journal*, 4(1), 77-91. doi:10.1016/0927-538X(95)00022-D.

Barroso, P., & Santa-Clara, P. (2015). "Momentum has its moments". *Journal of Financial Economics*, 116(1), 111-120.

Chinn, M. D. (2003). Explaining Exchange Rate Behavior. NBER Reporter OnLine, 5-9. Retrieved from The National Bureau of Economic Research: http://www.nber.org/reporter/spring03/explaininge.html#N_20_.

Costa, A. A., & Crato, N. (2010). "Long-run versus short-run behaviour of the real exchange rates". *Applied Economics*, 33(5), 683-688. doi:10.1080/00036840122409.

Hafeez, B., & Landau, D. F. (2007). Currencies:Value Investing. London: Deutsche Bank.

Hauner, D., Lee, J., & Takizawa, H. (2011). In Which Exchange Rate Models Do Forecasters Trust? Washington DC: International Monetary Fund. Retrieved from https://www.imf.org/external/pubs/cat/longres.aspx?sk=24862.0.

Hovanov, N. V., Kolari, J. W., & Sokolov, M. V. (2004). "Computing currency invariant indices with an application to minimum variance currency baskets". *Journal of Economic Dynamics & Control*, 28, 1481–1504.

Kia, A. (2013). "Determinants of the real exchange rate in a small open economy: Evidence from Canada". *Journal of International Financial Markets, Institutions and Money*, 23, 163-178. doi:doi.org/10.1016/j.intfin.2012.09.001

Liu, C. Y., & He, J. (1991). "A Variance- Ratio Test of Random Walks in Foreign Exchange Rates". *The Journal of Finance*, 46(2), 773-785. doi:10.2307/2328848.

Meese, R. A., & Rogoff, K. (1983). "Empirical exchange rate models of the seventies: Do they fit out of sample?", *Journal of International Economics*, 14(1), 3-24. doi:10.1016/0022-1996(83)90017-X.

Nunes, T. (2018). Momentum on commodity futures markets. Carcavelos, Portugal: NOVA – School of Business and Economics. Retrieved from https://run.unl.pt/handle/10362/49542.

Urrutia, J. L. (1992). "Variance ratio tests of random walk for foreign exchange rates". *Economic Letters*, 457-465. doi:10.1016/0165-1765(92)90034-V.