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Comment on Hovanov, Kolari and Sokolov: a stable currency numeraire?

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Abstract

This comment discusses the article by Hovanov, Kolari and Sokolov (HKS). The problems with HKS′ definition of their proposed measure NVal are discussed, and how they carry over to the evaluation of the performance of a stable aggregate currency (SAC). Also, besides having unsatisfactory out-of-sample properties, the definition of SAC creates a problem when interpreting the variances and correlations. Finally, I use the results of the paper to construct an index for a sample of stock returns. The results for the stock index are in accordance with HKS′ results, which illustrates that the problem of interpretation needs to be dealt with.

1. Introduction

The issue of currency hedging is an actively pursued topic by international companies and investors. Multinationals are interested in the purchasing power of any surplus cash they have, and in the variability of the profits as stated in the reporting currency. Investors are mostly interested in the currency risk of an internationally diversified portfolio, denoted in the currency of their home country. The literature on this topic involves constructing minimum-variance currency baskets, as well as determining the optimal level of hedging using currency futures.

The article by Hovanov et al. (2004), hereafter HKS, suggests that the issue of exchange rate variation can be dealt with by choosing an appropriate currency invariant index. Based on a measure of *normalized value in exchange* (NVal), a minimum-variance currency basket called 'Stable Aggregate Currency' (SAC) is constructed. The SAC is found to have little or no correlation with the value in exchange of other currencies, with also an extremely small variance. Although the results in the paper are technically correct, it seems that there are serious problems with the interpretation of NVal. The

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question that remains is to determine what an optimal currency basket is or should be, to compare the value of an individual currency.

In the following, I will discuss the problems with HKS′ definition of NVal, and how they carry over to the evaluation of the performance of SAC. Also, besides having bad out-of-sample properties, the definition of SAC creates a problem when interpreting the variances and correlations. Finally, I use the results of the paper to construct an index for a sample of stock returns. The results for the stock index are in accordance with HKS′ results, which illustrates that the problem of interpretation needs to be dealt with.

2. Construction of NVal

Given the currency value c_i defined relative to a base currency, HKS introduce a *normalized value in exchange (NVal)* in their equation (3.2). It can be written as

$$NVal_i = \prod_{r=1}^{n} \left(\frac{c_i}{c_r} \right)^{1/n}, \quad i = 1, \ldots, n. \tag{1}$$

Writing it this way shows that NVal can be seen as a special case of an effective exchange rate index. To cite The Bank of England (1995), "An effective exchange rate is a measure of the value of a currency against a trade-weighted 'basket' of other currencies, relative to the base date. It is calculated as a weighted, geometric average, expressed in the form of an index." The Bank of England (1999) gives the exact formula for the exchange rate index (ERI) of country j as

$$ERI_j = \prod_{i=1}^{20} \left(\frac{curr_j}{curr_i} \right)^{w_i}, \tag{2}$$

where w_i is a weight designed to measure the relative importance of each country's manufacturing sector. Effective exchange rates indices are published in the IMF's monthly International Financial Statistics (IFS), whereas the Bank of England publishes a daily effective exchange rate for the Euro area. The weights are often based on trade flows, reflecting the relative importance of each of the other countries for the country's competitiveness. Comparing (1) with (2) it is clear that NVal can be interpreted as an effective exchange rate index with weights equal to $1/n$. As such, the paper needs to provide a better motivation as for why the weight of $1/n$ should be a sensible choice. With an infinite number of possible weighted means, HKS are not very convincing about the reason their benchmark should be preferred economically to another value index.

3. Interpretation of SAC

To construct a SAC, HKS start by defining a derived measure to measure the growth rate of NVal as

$$RNVal_i = NVal_i(t)/NVal_i(0), \quad i = 1, \ldots, n \tag{3}$$

which HKS call the *reduced normalized value in exchange*. Given RNVal, one can define weights w_i and construct a portfolio of currencies with its own $RNVal_{\mathrm{pf}}$ of

$$RNVal_{\mathrm{pf}} = \sum_i w_i \cdot RNVal_i. \tag{4}$$

With a measure of value given by RNVal, and a portfolio given by weights w_i, the portfolio with minimum variance of RNVal is called a 'Stable Aggregate Currency' or SAC.

The results presented by HKS in their tables 3 and 4, and especially figure 1 are remarkable: not only does the RNVal of SAC have an extremely low standard deviation compared to the RNVal of the five single currencies, but also the correlation of the SAC with each single currency is below 10%. As a result, the authors propose that the SAC could be used to create a currency numeraire, or even 'World Money'.

The results on stability (low variance) and neutrality (low correlation) are correct, and can easily be replicated in a spreadsheet. However, HKS do not give intuition on why the SAC in figure 1 is so close to unity. Intuitively, the result seems to be related to the geometric average in the denominator of RNVal in (1). An appreciation in one currency value c_i increases the NVal of that currency, while decreasing the NVal of the others through the denominator. Thus, the evolution of RNVal will show patterns of opposite movement, which can be exploited in constructing a stable value. More formally, HKS are minimizing the variation of a linear combination of currencies relative to a geometrically weighted average of the same currencies. Since both baskets contain the same elements, it is not surprising that the optimal weights result in a portfolio having RNVal close to 1. The variance is not exactly equal to zero because the linear weights cannot exactly replicate the effect of the geometric weights.

Given the simple mechanisms that seem to drive the results, the problem becomes one of interpretation, as it is unlikely that exchange rate variation can easily be gotten rid of. It is perfectly acceptable to measure the value of one unit of a currency in the value of something else, be it another currency or any other good of value. The only restriction is that the numeraire is worth something that is meaningful to the buyer. This is precisely what seems to be the problem with SAC. It measures the NVal of a currency basket at time t, in terms of the NVal of the same basket at time 0 (the start of the measurement period). But what is the worth of a time-0 NVal? Hence, the problem boils down to the definition of NVal. The issue of numeraire, as mentioned in HKS′ footnote 6, has always concerned finding the right commodity that has a certain timeless *value*, in which the value of money and goods could be expressed. With the current definition of NVal, one can doubt whether a resulting SAC is economically interesting.

4. SAC performance evaluation

Besides the conceptual issues surrounding NVal and SAC, another issue is that of the reported variances and correlations of the SAC. First, the very stable results for the in-sample performance of SAC do not seem to hold out-of-sample. With an added last row, we have reproduced below table 6 of HKS, presenting the correlation coefficients

Table 6 from HKS

	EUR	JPY	USD	MIM	SAC1	SAC2	St.d.
EUR	+1.00	−0.88	−0.77	+0.37	−0.95	+0.01	0.0250
JPY	−0.88	+1.00	+0.38	−0.76	+0.82	+0.01	0.0177
USD	−0.77	+0.38	+1.00	+0.31	+0.78	+0.01	0.0136
MIM	+0.37	−0.76	+0.31	+1.00	−0.28	+0.07	0.0024
SAC1	−0.95	+0.82	+0.78	−0.28	+1.00	+0.28	0.0006
SAC2	+0.01	+0.01	+0.01	+0.07	+0.28	+1.00	0.0002
Abs. average:	0.66	0.64	0.54	0.47	0.69	0.23	

and standard deviations for the single currencies and two SACs. SAC2 is the optimal in-sample portfolio, SAC1 represents the out-of-sample results for the same composition of the SAC as for SAC2. The table shows that the standard deviation of SAC1 is still very low, but now the correlations with the single currencies are of the same magnitude as the correlations between the single currencies. For example, the last row of the table shows that the average absolute correlation of SAC1 is larger than that of USD. This indicates that the in-sample portfolio weights that minimize the variance of the SAC do not give good performance out-of-sample.

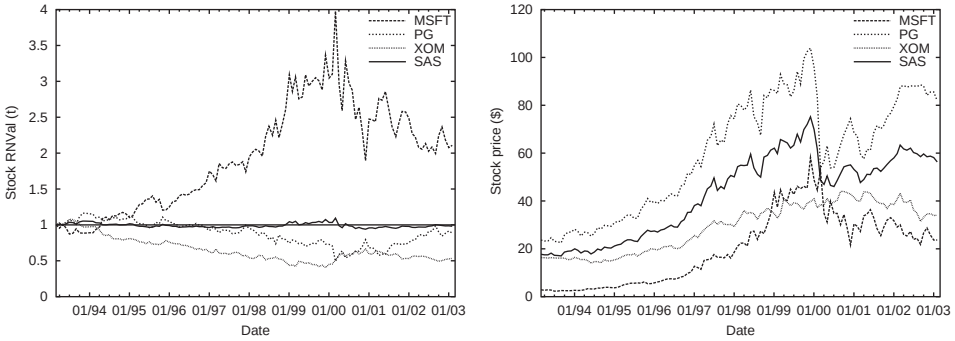
Second, nominal exchange rates are generally found to be nonstationary. This makes variances and covariances of exchange rates levels inappropriate and spurious. A reason why most studies of exchange rates rather focus on cointegration, see for example Mark and Sul (2001). The inappropriateness would hold for the statistics computed in the paper of HKS. Possibly, the SAC is the only stationary series, which explains the favorable results on correlations and variances. However, the interpretation of the found variances and covariances is not clear.

5. Stock index interpretation

To illustrate that the method of construction a SAC is not confined to exchange rates, and to point out the problems with the interpretation, consider the following: We replace exchange rates by individual stock prices and compute a stock price index. One could call this a Stable Aggregate Stock price (SAS).

To construct the SAS, we choose three individual stocks, being Microsoft (MSFT), Procter and Gamble (PG), and Exxon(XOM). Monthly stock price date is obtained from Yahoo stocks, for the period March 1993–March 2003. Computation of the SAS is straightforward, numerically optimizing the portfolio with minimum variance in terms of the $RNVal(t)$. It is found that the optimal portfolio weights are given by [0.17, 0.50, 0.33]. The resulting time series for the RNVal of the portfolio, together with the individual RNVals, is in Fig. 1.

Fig. 1(a) shows that a very stable SAS (solid line) can be constructed, having low variance and, on the sight of it, low correlation with the RNVals of the other stocks. The lines of the individual stocks in the figure show contrarian movement in



(a) RNVal (b) Dollar value

Fig. 1. The SAS (a) shows the RNVals for the stock prices of MSFT, PG and XOM, together with the minimum-variance portfolio SAS (solid line) and (b) shows the dollar value over time for the individual stocks and the SAS.

the RNVals, just as we mentioned that could be expected in Section 2. With respect to interpretation, one can hardly imagine that three different stocks can lead to a portfolio that has such a stable value. The results in Fig. 1(b) shows that it does not indeed. The dollar value of the SAS is not at all stable and moves with the stock market. Of course it is less volatile than the individual stocks, a standard diversification result. But it does not come near the stability as measured by RNVal.

We compared the choice of (geometric) weights for RNVal and SAC in the context of currencies with the trade-weighted basket of effective exchange rates that are in use today. In the context of stocks, the weights of SAS should be compared to the method of constructing real world stock indices. An index like the S&P 500 is capitalization weighted, which makes economic sense. As such, the question needs to be raised why equal geometric weights as proposed by HKS would be preferred for a numeraire.

6. In sum

Although the proposed measure RNVal and constructed currency ‘SAC’ are both interesting in-sample constructions, they are the result of a specific choice of geometric weights for a currency basket. A deeper motivation for the construction of RNVal is necessary to make it economically interesting. In the current setup, it is difficult to see how SAC could be helpful in a practical way when considering the choice of numeraire, diversification or currency hedging issues.

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