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Comment on Johnson and Soenen (2004): The US stock market and the international value of the US dollar

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ABSTRACT

Is there a relationship between the performance of US equity markets and the value of the US dollar? The question is of practical and regulatory significance. Previous attempts to answer the question relied upon on the lagged-causality approach of Clive Granger and his coauthors. Given that financial markets are efficient, most of the correlation would be undetectable by such methods. In groundbreaking work, Johnson and Soenen (2004) used an estimator by Geweke (1982) that allows for contemporaneous or instantaneous effects, and found that there was always and everywhere an instantaneous link between the US equity and currency markets. Given the importance of Johnson and Soenen's results, we attempted to replicate their study. We argue that Johnson and Soenen's results hinge on a simple substitution error. After recalculation, we find little evidence of consistent instantaneous correlation between returns in the US equity markets and the value of the US dollar.

1. Introduction

What is the relationship between the US stock market and the value of the dollar? This question is important and relevant to investors and policy-makers alike. Answering this simple question,

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however, is complicated by the fact that financial markets are efficient so that much of the relationship between these two variables may be contemporaneous, and thereby rendered untestable using traditional methods (such as VARs) which require lagged causality. Financial markets, however, are efficient so the correlation between equity markets and exchange rates is likely to escape detection by models using the traditional approach. To circumvent this problem, Johnson and Soenen (2004) use an estimation procedure developed by Geweke (1982) that allows for instantaneous and lagged correlation between variables. Geweke's procedure provides a measure of the size (but not the sign) of the instantaneous correlation between two variables. Johnson and Soenen (henceforth, JS) attempt to implement Geweke's procedure and conclude that "using Geweke measures of feedback, we find a high percentage (92% at the 1% level) of contemporaneous association between daily movements in the S&P 500 index and changes in the value of the dollar against seven foreign currencies" (p. 480). We argue that these seemingly powerful results stem from a simple substitution error. Below, we identify the error and recalculate the instantaneous correlation measures indirectly from Johnson and Soenen's tables, as well as directly from US financial data. In contrast to Johnson and Soenen, we find little evidence of instantaneous correlation between returns in the S&P 500 and the relative value of the US dollar.

This paper is outlined as follows. First, we provide a mapping of notations between JS and Geweke. The models used by JS and Geweke are compared in the second section. Statistics for the contemporaneous feedback measure and details of the error are provided in the third section. Revised results are provided in section four.

2. Notation comparison

The objective of this commentary is to compare the econometric models of JS against those of Geweke and explain an error in the conclusion drawn by JS.

The following is a mapping of notations used by JS and by Geweke.

Geweke		JS
$\mathbf{x}_t$	$\leftrightarrow$	r_t
$\mathbf{y}_t$	$\leftrightarrow$	y_t
$\boldsymbol{\Sigma}_1$	$\leftrightarrow$	$\sigma^2_{\mu r}$
$\boldsymbol{\Sigma}_2$	$\leftrightarrow$	$\sigma^2_{\epsilon r}$
$\mathbf{T}_1$	$\leftrightarrow$	$\sigma^2_{\mu y}$
$\mathbf{T}_2$	$\leftrightarrow$	$\sigma^2_{\epsilon y}$

3. Model comparison

Geweke's instantaneous correlation measure is constructed by comparing two pairs of models: two unrestricted models and two restricted models. In this section we will reproduce both JS's and Geweke's models.

3.1. Un-restricted models

In the unrestricted models, the dependent variable y is regressed on lags of itself and of the exogenous variable x.[1] Then, the causal ordering is reversed, with x regressed on lags of itself and of y.

$$\mathbf{y}_t = \sum_{s=1}^{\infty} \mathbf{G}_{2s}\mathbf{y}_{t-s} + \sum_{s=1}^{\infty} \mathbf{H}_{2s}\mathbf{x}_{t-s} + \mathbf{v}_{2t}, \quad var(\mathbf{v}_{2t}) = \mathbf{T}_2 \qquad \text{(Geweke: 2.8)}$$

[1] Geweke provides the infinite lag models in this theoretical section. In his inference section he notes that "We shall begin by supposing that for purposes of estimation, all lag lengths in the canonical form have been truncated at p, and that the equations. . .have been estimated by ordinary least squares. Geweke (1982), p. 309″ Thus the infinite number of lags in the following Geweke models are replaced with finite lag number p.