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Asymmetry cointegration between the value of the dollar and sectoral stock indices in the U.S

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ABSTRACT

Previous studies that have investigated the effects of exchange rate changes on stock prices, have assumed that such effects are symmetric. Recently, one study addressed the asymmetric effects of exchange rate changes on the S & P 500 index using U.S. data and showed that exchange rate changes have asymmetric effects on the S & P 500 index in the short run but not in the long run. Suspecting that such findings could suffer from aggregation bias, in this paper we investigate the asymmetric effects of exchange rate changes on the stock price indices of eleven different sectors in the U.S. Using asymmetry cointegration and nonlinear ARDL approach, we find that changes in the nominal effective exchange rate of the dollar has significant asymmetric effects in the short run in ten sectors. These effects last into the long run asymmetric effects in six of the eleven sectors. In five of these six sectors, while dollar depreciation has a positive impact on their share prices, dollar appreciation does not.

1. Introduction

The link between exchange rates and stock prices has been deemed significant, both from policy makers and investors since it plays an important role in the development of an economy. Although the relationship between exchange rates and stock prices is bi-directional, most studies have been concerned with the impact of exchange rate changes on stock prices using a model of stock price determination. Since depreciation facilitates export-oriented firms to enjoy increased exports and therefore, profit and their share prices will increase as well. On the other hand, firms that rely heavily on imported inputs will face increased production cost and lower profit and therefore, a decline in their share prices. Thus, the overall stock price index in a given country can move in either direction, depending on the number of firms in each group.

Numerous studies have investigated the relationship between stock prices and the exchange rates using data from different countries and have found mixed results. Concentrating on the most recent studies whereas Boonyanam (2014), Caporale, Hunter, and Ali (2014), Moore and Wang (2014), and Yang, Tu, and Zeng (2014) find no long-run cointegrating relationship between stock prices and the exchange rate, Groenewold and Paterson (2013), Unlu (2013), and Tuncer and Turaboglu (2014) do find a long-run relationship between the two variables. These conflicting outcomes could be attributed to the different sample size of the study period, different methods used by different authors, differences in the investment environment in different countries, different regulations with regard to stock investors in different countries, and different penalties against violators in different countries.

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[1] Valuable comments of three anonymous referees are greatly appreciated. Remaining errors, however, are our own.

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Bahmani-Oskooee and Saha (2015), who recently reviewed the entire literature including the above studies, pointed out that a common assumption behind all of these studies is the symmetric effects of exchange rate changes on stock prices, i.e., if currency depreciation raizes stock prices, currency appreciation should do the opposite. However, since expectations play a major role in the stock market, it is possible for the expectations to move in the same direction regardless of the direction in which exchange rates change. For example, suppose a currency depreciates, which benefits export oriented firms more than it hurts import-oriented firms, if there are a large number of exporters, we would expect the overall stock price index to rize. Appreciation may do the same if many participants perceive appreciation as a sign of increased status and strong standing in the world community and invest more in the country whose currency appreciated, hence an asymmetric effect.

To demonstrate their conjecture, Bahmani-Oskooee and Saha (2015) relied upon a reduced form model and data from the United States. Application of asymmetric cointegration and error-correction modeling revealed that changes in the nominal effective value of the dollar has asymmetric short-run effects on the S & P 500 index, but not long-run effects. We wonder if the lack of asymmetric cointegration could be due to aggregation bias. Composite and aggregate stock indices used in the literature by all the studies suffers from aggregation bias as these data do not reflect how each of the different sectors in a particular country is affected by changes in different macroeconomic variables, including the exchange rate. In a particular country, there are different industrial sectors which may react differently to changes in macroeconomic variables. As mentioned before, following a depreciation of home currency, an export oriented industry will benefit, while any import orientated industry might be hurt. In order to capture the effect of changes in macroeconomic variables on different industries in the U.S. we use stock price index data at the sectoral level (sectoral price indices).

Thus, the main purpose of this paper is to determine if changes in the value of the dollar have asymmetric effects on stock price indices of 11 different sectors in the U.S., after accounting for other determinants. The sectors we consider are those for which sectoral stock price indices are available. They are identified in the Appendix. To this end, we introduce the model and methods in Section II. Results are reported in Section III with a summary and conclusion in Section IV.

2. The model and the methodology

Many macroeconomic variables are said to affect stock prices. In identifying some of these factors for which continuous time-series data are available, we follow the literature and, more specifically, the model by Bahmani-Oskooee and Saha (2015) and modify their notation so that it conforms to secotaral data. As such, the following long-run specification is adopted:

$$LnSP_t^i = a + bLnEX_t + cLnIPI_t + dLnCPI_t + eLnM2_t + \varepsilon_t \quad (1)$$

where SP^i denotes the stock price index for a particular sector i; EX, the Nominal Effective Exchange Rate of the dollar; IPI, the Industrial Production Index (a proxy for measuring economic activity); CPI, the Consumer Price Index and $M2$, the nominal supply of money.[2]

As far as the expected signs are concerned, as discussed before, an estimate of b could be positive or negative depending on the number of export oriented firms versus import oriented firms. An estimate of c is expected to be positive. There is a general consensus that economic activity and stock prices are positively related. With an increase in economic activity, the expected corporate earnings will increase which in turn will increase stock prices.[3] The relationship between stock prices and CPI, a measure of inflation or price level, is expected to be negative (Fama, 1981). With an increase in inflation, input prices increase for firms, leading to a reduction in future profits of the firm and thus stock prices decline. Anari and Kolari (2001) argued and reported that in the short run there is a negative correlation between stock prices and inflation, but in the long run the correlation is positive. When stocks are held over longer time horizons, stocks are considered or expected to be a good inflation hedge and thus a positive relationship between inflation and stock prices can be established. Finally, the relationship between stock prices and money supply can be positive or negative. An increase in money supply leads to a decrease in interest rates, which leads to an increase in the level of investment in the economy and hence an increase in economic activity. Thus the earnings and profitability of the firms increase leading to an increase in stock prices. On the other hand, with an increase in money supply there is an increase in inflation which in turn might reduce stock prices.

As mentioned above, Eq. (1) is a long-run model and its estimate by any method only yields long-run coefficient estimates. In an effort to distinguish short-run effects from long-run effects, we follow the literature and specify (1) in an error-correction modeling format as follows:

[2] Such long run specification at the aggregate level is also used by Eita (2012) and Boonyanam (2014).

[3] The study by Chen, Roll, and Ross (1986) found positive relationship between stock returns and economic activity for the US, using an aggregate index. The same was found for Japan by Mukherjee and Naka (1995).