Real interest rate linkages in the Pacific-Basin region ☆

Philip Inyeob Ji [a,*], Jae H. Kim [b]

[a] Department of Accounting and Finance, Monash University, Clayton, VIC 3800, Australia
[b] Department of Econometrics and Business Statistics, Monash University, Caulfield, VIC 3145, Australia

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ABSTRACT

This paper examines the linkage of real interest rates of a group of Pacific-Basin countries with a focus on East Asia. We consider monthly real interest rates of US, Japan, Korea, Singapore, and Thailand from 1980 to 2006. The impulse response analysis and half-life estimation are conducted in a multivariate setting, adopting the bias-corrected bootstrap as a means of statistical inference. It is found that the degree of capital market integration has increased after the Asian financial crisis in 1997. The overall evidence suggests that the crisis has substantially changed the nature of the short run interactions among the real interest rates. Before the crisis, both the US and Japanese capital markets dominated the region. After the crisis, the dominance of the Japanese market has completely disappeared, while the US market remains as a sole dominant player and the Korean market has become more influential.

1. Introduction

There is growing evidence to suggest that international capital markets have become increasingly integrated. Central to this issue is the real interest rate equalization hypothesis, and testing its empirical validity has been a subject of particular interest. Earlier attempts to test this hypothesis used conventional regression techniques, but the results were overwhelmingly against real interest rate equalization (see, for example, Mishkin, 1984; Mark, 1985; Cumby & Mishkin, 1986; Merrick & Saunders, 1986). However, as Goodwin and Grennes (1994; p.109) demonstrated, the existence of non-traded goods and transaction costs can render the conditions for real interest rate equalization invalid in the regression context, even when capital markets are efficient and fully integrated. Moreover, Goodwin and Grennes (1994) pointed out that statistical inference based on the conventional regression technique might not be valid when real interest rates exhibit unit root non-stationarity (see Stock, 1987).

In view of the points listed above, Goodwin and Grennes (1994) argued that the existence of long run equilibrium among real interest rates should have strong implications for interest parity and efficiently integrated markets. They suggested the use of the cointegration analysis (Engle & Granger, 1987; Johansen, 1988), since it provides a suitable framework to test and estimate long run equilibrium relationships. Their cointegration analysis revealed strong evidence of interest parity and market integration among a number of countries.[1] Subsequent studies by Chinn and Frankel (1995), Hutchison and Singh (1997), Phylaktis (1997, 1999), and Yamada (2002a,b) have adopted cointegration analysis and identified long run relationships among real interest rates.

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[1] Whether the terms 'market integration' and 'interest rate linkages' can be used interchangeably is still an open question mainly because of the absence of consensus on the definition of 'market integration', although high interest rate linkage is conventionally interpreted as a sign of market integration in the literature.

Given the existence of long run relationships among real interest rates, past studies have examined their short run interactions and attempted to determine which rate is leading others as a dominant force. Chinn and Frankel (1995) investigated the relative influence of US and Japanese real interest rates in the Pacific Rim region, where they presented evidence that most East Asian countries are linked with the US and Japan, forming another piece of the consensus in the literature that market integration has been increasing. They also found that the Japanese rate gained significant influence. Another notable example is Phylaktis (1999), who used impulse response analysis to examine the short run dynamics of the real interest rates of Pacific-Basin countries. She found an increasing degree of capital market integration after the financial market deregulation in the eighties. In addition, the US and Japanese capital markets were found to dominate the others, with the latter becoming increasingly more important.

In this paper, we also examine the case of Pacific-Basin countries, with a focus on East Asian countries, using updated data and more sophisticated econometric methods. We consider three representative East Asian countries (Korea, Singapore and Thailand) along with the US and Japan, paying attention to the impact of the Asian financial crisis in 1997. We examine the existence of long run equilibrium relationships, short run dynamics and the issue of dominance among the real interest rates, before and after the crisis. As in Phylaktis (1999), we employ impulse response analysis based on the vector autoregressive (VAR) model. We also attempt to estimate half-lives of the real interest rates in the VAR context, as a measure of persistence. The half-life is defined as the number of periods required for the response of a time series, to its own shock, to be halved. It can be readily estimated from the impulse response function of a time series to its own shock. If a time series in a cointegrated VAR model is found to be mean-averting in the sense that it shows a permanent response to its own shock, it should be associated with a common trend (or a zero eigenvalue) of the system. It can also be regarded as a dominant force, since it acts as a driving force to the other integrated time series that show mean-reverting behaviour to their respective own shocks.

In order to conduct improved statistical inference for the impulse response analysis and half-life estimation, we resort to confidence intervals based on the bootstrap method (Efron, 1979). Bootstrap inference is useful in small samples, especially when the data is non-normal or heteroskedastic, where conventional asymptotic inference based on a normal approximation may perform poorly. In addition, small sample biases of VAR parameter estimators (see, for example, Pope, 1990) can further undermine the reliability of the asymptotic method. In this paper, we use the bias-corrected bootstrap confidence interval of Kilian (1998a,b).[2] It has been found to exhibit much better small sample properties than conventional confidence intervals, especially for VAR models whose characteristic roots are close or equal to one. It can be made applicable to VAR models with non-normal or heteroskedastic innovations using the wild bootstrap of Mammen (1993).

The main finding of the paper is that the degree of capital market integration of Pacific-Basin countries has increased after the Asian financial crisis. The crisis also has changed the nature of short run dynamics among real interest rates. In particular, the dominance of Japan in this region appears to be a purely pre-crisis phenomenon, while the US maintains a strong dominance even after the crisis. In the next section, we discuss the data details and the results of the preliminary analysis. Section 3 provides a summary of the methodologies used in the paper. Section 4 presents the empirical results, and Section 5 concludes the paper.

2. Data details and preliminary analysis

We have selected real interest rates of five countries; Japan, Korea, Singapore, Thailand and the US. This choice is based on the consideration that VAR dimension should be kept manageable for parsimonious parameterization. These countries also represent a good mixture of developed and developing countries in the Pacific-Basin region, with diverse characteristics and different degrees of maturity of capital markets. The Asian financial crisis in 1997 affected currencies, stock prices, and other asset prices of several East Asian countries. Korea and Thailand were the two severely hit, while Singapore was relatively unaffected. Japan was going through a long-term recession in the nineties, which was further exacerbated by the crisis.

We have used 204 monthly observations of real interest rates from 1980:1 to 1996:12 (pre-crisis period; Period I), and 104 for the period of 1998:1 to 2006:08 (post-crisis period; Period II). All observations during 1997 are excluded to eliminate noisy and unstable observations. Most of the East Asian countries hit by the crisis were already in financial distress in the first half of 1997 and they only started to display a sign of recovery in 1998. The starting date (1980:01) reflects the timing of deregulation where most Asian countries started to liberate their financial markets (see Phylatktis, 1999). The above division yields unbalanced sub-samples, with the number of observations in Period I nearly twice as many as in Period II. This is intended as we are interested in the long run relationship among the real interest rates from the timing of the financial liberalization in 1980 to the Asian crisis. We also examine how the Asian crisis altered this long run relationship prevailed before. Note that Phylaktis (1999) considered the period from 1980 to 1993 to examine the effect of liberalization, which is similar to our Period I here.

We use short-term interest rates for these countries. The monthly money market rate is used for Korea and Thailand, and the T-bill rate for the US. For Japan, we use the call rate, while the interbank rate has been used for Singapore. To calculate the rate of inflation, the consumer price index is seasonally adjusted with the X-12 method using geometric weights. All nominal interest rates are then deflated by the ex post inflation rate in order to generate the ex post real interest rate series.[3] All data are obtained from *International Financial Statistic* Database.

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[2] The importance of bias-correction in econometric analysis is well documented. See, for example, Andrews and Chen (1994).
[3] We paired up the nominal rate for a given month with the inflation over the following month, which is a convention in the literature.