Asian rupee for a common electronic financial market of India and the ASEAN region

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Abstract: Separate Indian and ASEAN stock markets with strong growth deriving from the information and communications technology revolution are seeking to become a more integrated common financial market for the India and the ASEAN countries. This aspiration could be thwarted if currencies and stock prices are excessively volatile. A well-integrated common electronic financial market underpinned by a common currency would reduce this problem. In this paper, we explore the necessity for and practicability of a currency union for India and the ASEAN region. The detected cointegrating relations indicate that an ASEAN and Indian currency union is likely to be developed.

Keywords: common currency; India; ASEAN; Information and Communications Technology; ICT; electronic financial markets.

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Biographical notes: Dr. Jack Penm is currently an Academic Staff Level C at the ANU. His main research interests are in: zero-non-zero patterned vector time-series modelling in investments and financial time series. He is an author/co-author of more than 50 papers published in various internationally recognised journals.

1 Introduction

Separate ASEAN and Indian financial markets with strong growth deriving from the Information and Communications Technology (ICT) revolution are seeking to become a more well-integrated market. But some currencies and stocks in these markets are excessively volatile. Billions of dollars have been invested in hedging against currency and stock market volatility within financial market movements. An integrated financial market underpinned by a common currency would reduce this problem. We explore the necessity for and practicability of a currency union for India and the ASEAN region. The proposed market would assist the investment community and governments both in understanding and managing any transition towards stock market integration.

Inauguration of the Euro and European Central Bank on 1 January 1999 presents a learning model for currency unions. Corbo (2001) suggests a single monetary union covering both North America and Latin America. Grubel (2000) supports a common currency as the 'amero' for Canada, the USA and Mexico. Harris and Courchene (2000) urge a North American Monetary Union. Guillaume and Stasavage (2000) propose regional monetary integration initiatives in Africa. Kwan (2001) advocates a Yen bloc in the Asia-Pacific. Grimes *et al.* (2000) recommend an ANZAC Dollar. However a single currency for the East Asia region is still absent, but so is progress on most of the above proposals.

E-commerce using the internet represents a new and more efficient way of doing business. It has already brought significant organisational changes to corporations and government as they drive to lower costs. Since the beginning of 1999, as countries have deregulated their telecommunications markets and have expanded access to the internet, e-commerce activities are growing and changing at breathtaking speed. In the new economy it has mainly been the ICT that has permitted rapid growth in the use of e-commerce, thus contributing to the evolution of the capital markets. The lower cost in the ICT has especially promoted the rapid increase in investments, in particular in the stock markets where knowledge-based skills matter. The focus of the information economy is to better understand and build upon the synergies surrounding developments in e-commerce.

India is a consumer market of more than 1.2 billion people, and one of ASEANs most active partners. India is an emerging economy of the world with a GDP of more than \$US500 billion, and will grow steadily by 6% in the next few years. ASEAN looks forward to taking advantage of India's capabilities and expertise in ICT technology development. Malaysia, Singapore and Thailand are becoming major investors in India, especially in infrastructure development and venture capital activities.

India is one of the leading information technology economies and its domestic IT expenditure market is currently the fastest growing ICT market in the Asia/Pacific region. Analysts in Gartner Report (2006) have predicted that "total Indian enterprise IT spending (excluding consumer IT spending) will reach around \$25 billion in 2006 growing at an annual growth rate of approximately 23%". By contrast, the worldwide IT market experienced an average growth of 6% from 2005 to 2006. Further, India expects to achieve a trade balance of about \$US30 billion by 2007 with ASEAN. The focus is in the areas of increasing services transactions, investments, project executions and labour flows. Also a diversifying trade basket with manufacturing goods is playing an increasing role.

However, in order to increase the level of involvement in international ICT markets, some East Asian economies are likely to seek to depreciate their currency, even leading to a spate of currency depreciations in those economies. Currency depreciation leads to the products of a country being cheaper when purchased on international markets. Of course, external products become more expensive to the country involved, and this may be incompatible with other economic goals and strategies. It is possible that the quantity of ICT products and services from such economies could be adversely affected, because if less is earned through sale of their own products and services, the quantity of imports may be reduced. If the trend of depreciation becomes a general one, it would help create a need to form a currency union in East Asia in order to achieve such aims as diminishing foreign exchange risks, increasing employment opportunities, and maintaining external

market share. The perceived benefits from depreciation might be reduced if the formation of a currency union between India and the ASEAN region was seen as a productive and realistic alternative.

Recent studies have shown that the action of globalising stock markets significantly increases stock prices without a concurrent increase in stock return volatility (Kim and Singal, 2000). To successfully compete for capital in a global economic environment, capital markets should become more open and transparent, rather than have controls imposed on capital flows. A common currency for India and the ASEAN region would improve cost-competitiveness, and could be considered as contributing to stock market integration in the region. The cost of capital would be lowered by reducing uncertainty, and by reducing the cost of obtaining funds. Hence investment opportunities, employment growth, and potential prosperity would speed up in this region (Penm, 2004; Agarwal *et al.*, 2004).

The cultural diversity of this region should be seen as one of the strengths of India and the ASEAN region, and should be welcomed, as these cultures complement each other and in turn enrich the whole region (Penm, 2004; Agarwal *et al.*, 2004). Therefore there is a need to consider whether it would be desirable and practicable for India to encourage a formal currency union with those ASEAN economies. It is likely that this currency union would lead to an integrated stock market in India and the ASEAN region. The emergence of the Euro gives evidence of the very significant values that could ensue. The common currency of Euro has led towards 'frictionless' financial markets in Europe, in which transaction costs disappear, barriers to entry are reduced, geography becomes far less significant, and markets operate more efficiently.

In this paper we assess whether there exists an increasing influence of the Indian rupees in ASEAN countries in the post-East Asian currency crisis period. Zero-Non-Zero (ZNZ) patterned VECM modelling is utilised to examine currency cointegration. The detected cointegrating relations among the Indian rupees and the selected ASEAN market currencies show the interdependence of the economies of India and the ASEAN region. Consequently an Indian and ASEAN currency union should be considered.

The remainder of this paper is structured as follows. Section 2 examines the possible establishment of a common currency in India and the ASEAN region. Section 3 presents VECM modelling for an I(1) system. Section 4 shows the results of currency cointegration, and Section 5 provides some concluding remarks.

2 Possible development of a common currency for India and the ASEAN region

Currently, there are three important economic regions – the North America Free Trade Zone, the European Union, and ASEAN. The USA has led the countries in the North America Free Trade Zone to undertake free trade activities, and has achieved significant results. The European Union has achieved considerable economic integration, and inaugurated the European single currency (Mundell, 1997). The ASEAN countries comprise Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam. Those ten countries are striving for the establishment of a free trade zone which would include India, although the level of economic integration between India and the ASEAN region is currently low.

The ten ASEAN countries have agreed to strengthen the existing cooperative monetary framework with India. The agreed monetary arrangements will involve a network of monetary exchange within the ASEAN countries and India. Nothing is particularly innovative in these agreements, as they only propose to use the existing monetary framework within the ASEAN countries and India. However, the ASEAN countries have their own problems to resolve. For example, the wealth gap between rich and poor in many ASEAN countries is very large. Also the ASEAN countries experienced the 1997 Asian financial crisis. There has been an inconsistency in the speed of recovery from the 1997 crisis among the ASEAN countries. Overall the ASEAN countries have experienced relatively low economic growth, a somewhat unstable social and political environment, and heavy foreign debt. Since each member country of ASEAN needs to solve its own internal problems, this leads to a lower expectation for immediate regional cooperation, and to disparate collaboration policies with non-ASEAN countries. Notably Singapore alone has signed free-trade-zone agreements with Australia, Japan and the USA. No any other ASEAN country is involved in these three agreements. This is indicative that future cooperative developments within ASEAN are uncertain.

The current optimal development strategy for India and the ASEAN countries could be to plan and establish a common financial market, to be underpinned by a single currency. The currency could be temporarily denoted as Asian rupee. The expected advantage of an Asian rupee is to improve the economic strength of India and each ASEAN member country, and improve the long-term economic growth. The substantial benefits include:

- elimination of the costs of currency exchange, including hedging currency risks
- improvement of market operations by pricing goods and labour using a single currency
- adoption of a single currency to prevent tax cheats and tax avoidance.

After a long period expected to be necessary to foster this concept, India and the ASEAN countries could expect that the inauguration of the Asian rupee would exhibit the following three strengths:

- 1 an integrated regional economic framework
- 2 a forward-looking forward attitude shared by the leaders of India and all ASEAN member countries, whereby those leaders are willing to give up the power of issuing their own currency, and transfer this power to a proposed Central Bank (see Penm, 2004) for India and the ASEAN countries
- 3 an application of advanced forecasting techniques, which can be provided by the authors of this proposal, will establish whether the conditions needed to sustain an Asian rupee community are likely to prevail.

Establishing the qualifications required of countries wishing to participate in the Asian rupee scheme

The economic environment of India and the ASEAN region is different from that of the European Union. In the course of establishing the qualifications required of countries wishing to participate in the Asian rupee scheme, the proposed Central Bank will

encounter many statistical complexities, some currently unknown and some which cannot be fully quantified. It is estimated that at least several years will be required to ascertain exactly what type of statistical information will need to be collected, and to achieve the necessary statistical returns. After data collection, analysis and forecasting, a reliable quantitative model for the Indian and ASEAN economic framework can then be established. It is proposed that India and the original six ASEAN countries will initially participate in the single Asian rupee currency. After a reasonable period to facilitate the development of appropriate systems, the remaining four ASEAN countries may then join the single Asian rupee currency.

Reflecting their varying historic traditions, India and the ASEAN member countries have different economic, monetary and banking frameworks. After the Asian rupee is adopted, central monetary policy will have different impacts on each of the member countries. Thus unexpected difficult economic circumstances may arise. When those difficulties occur, the proposed Central Bank needs to monitor the situation and assist member countries to avoid unnecessary friction.

Those member countries also need to develop policies which encourage a stable monetary situation and which control turbulent domestic circumstances. India and the ASEAN countries should certainly refer to the Maastricht Treaty which stipulates six criteria that countries in the EU must meet to become eligible for adoption of the Euro. All quantitative figures need to be re-assessed to ensure relevance for Indian and ASEAN conditions. These six criteria are:

- 1 The ratio of a country's planned or actual government deficit to GDP must not exceed 3%.
- 2 The ratio of a country's government debt to GDP must not exceed 60 percentage points.
- 3 A country's currency must have stayed within the normal 15% fluctuation margins for at least two years, without devaluing further against the currency of any other member.
- 4 A country's inflation rate must not exceed by more than 1.5% the average inflation rate of the three best performing members.
- 5 A member must have had an average nominal long-term interest rate that does not exceed by more than 2% points that of, at most, the three best performing members.
- 6 Management of the money supply within the Asian rupee community to facilitate the achievement of criteria 1 to 5.

3 Test for currency cointegration using ZNZ patterned VECM

In this section, we apply the Penm *et al.* (1997) approach to select the Vector Error-Correction Modelling (VECM) formed by nominal exchange rates. The approach taken is to study currency cointegration theory and to investigate the long-term relation between just these exchange rate variables. The approach provides an effective search algorithm, in conjunction with a model selection criterion, to determine the optimal subset specification with zero coefficients for a VECM.

Consider a generalised VECM expressed as follows:

$$B^q(1)y_{t-1} + B^{q-1}(L)\Delta y_t = e_t \quad (1)$$

where y_t contains both $I(0)$ and $I(1)$ variables, Δ denotes the first difference,

$B^{q-1}(L) = I + \sum_{\tau=1}^{q-1} B_{\tau}^* L^{\tau}$, L is the lag operator, and the roots of $|B^q(L) = 0|$ lie outside or on the unit circle.

If y_t is cointegrated, then the long-term impact matrix, $B^q(1)$, must be singular. As a result, $B^q(1) = \alpha\beta'$, where the columns of β are the cointegrating vectors, the rows of α are the loading vectors, and $B^{q-1}(L)\Delta y_t$ is the VAR part of the VECM.

In the context of a vector time-series framework, which indicates the dynamic relationships among the relevant economic and financial variables, conventional methods to test for currency cointegration are undertaken in full-order VECM modelling. The advantage of using these VECM models is that they have proved to be more computationally effective tools, and therefore less costly, than conventional financial and econometric time-series techniques. Also, VECM modelling can accommodate both long-term and dynamic responses. This approach is different from scalar unit root based methods.

However, standard full-order VECM models assume nonzero elements in all their coefficient matrices. As the number of elements to be estimated in these possibly over-parameterised models grows with the square of the number of variables, the degrees of freedom will be heavily reduced. In addition, in applications of VECM models to economic and financial data, it may be assumed *a priori* that zero entries are required in the coefficient matrices. Therefore the use of full-order VECM models may lead to incorrect inferences. Specifically, if we wish to test for indirect causality, or Granger non-causality which crucially depends on the positions of zero entries in the coefficient matrices, and we ignore the entries assigned *a priori* to be zero, and employ 'overparameterised' full-order VECM models, we weaken the power of our statistical inferences. Also, if the underlying structure of the VECM and the associated cointegrating and loading vectors contain zero entries, the resultant estimates from full-order specifications can infer different conclusions concerning the cointegrating relationships among the variables.

In addition, a VECM is equivalent to a vector autoregressive model with unit roots (Penm *et al.*, 1997). It seems to us that if the structure is patterned then the ZNZ VECM is a more straightforward, certain and effective means of testing for Granger causality, Granger non-causality and indirect causality as proposed in Penm *et al.* (2002). Further, one deficiency encountered in empirical research using cointegration theory is to provide satisfactory financial and economic interpretation for estimated cointegrating vectors. As demonstrated by Wickens (1996) it is important to introduce *a priori* information, usually to produce ZNZ patterns. To explicitly address this issue Penm *et al.* (1997) presented a search algorithm in conjunction with model selection criteria to identify the optimal specification of a ZNZ patterned VECM for an $I(1)$ system. The optimal patterned VECM is then used as a basis to conduct the currency cointegration testing.

The strength of the Penm *et al.* procedure is that it allows a subset structure with zero coefficients to be incorporated into the error-correction model. If the long-term impact matrix, $B^q(1)$, contains zero coefficients, then the cointegrating and loading vectors may

also contain them. The inclusion of these coefficients could enhance the modelling power of VECMs, especially for finite samples. Although limitations of space and time prevent a discussion of this procedure here, interested readers are directed to Penm *et al.* (1997) for details.

The Penm *et al.* procedure was applied to the VECMs generated from selected nominal exchange rates. We determined the cointegrating relations by examining the ZNZ pattern for the long-term impact matrix, $B^q(1)$. If the $B^q(1)$ matrix is singular, we conclude that these exchange rates are cointegrated and, consequently, that the long-term cointegrating relations for currency cointegration have been met for these exchange rates.

4 Currency cointegration

In the last decade Frankel (1993), Frankel and Kahler (1993), Aggarwal and Mougoué (1996), and Tse and Ng (1997) have examined cointegrating relationships among Asian currencies of the Pacific Basin region. Their findings indicate that at least a single cointegrating relationship exists among these Asian currencies. They have documented that a deepening interdependence of the economies in the Asian region.

In this section the following five currencies are considered: the Malaysian ringgit (MA), Indonesian rupiah (ID), Thai baht (TB), Singapore dollar (SD), and Indian rupee (IR).

The exchange rates of MA, ID, TB and SD against the IR are used. Monthly data are collected from DataStream™ over the period 1 January 1999 through 31 December 2005. The major reason why we choose the first month of 1999 as the beginning period is to avoid the period of the 1997–1998 Asian Financial Crisis.

We utilise the ADF procedure to test for the presence of a unit root in the selected exchange rate series. The 95% critical values for each test using the response surface estimates given in MacKinnon (1991) indicate that all selected series are $I(1)$ for the given period.¹

We then make use of the procedure described in Section 3 to identify the specification for the VECM formed by these variables. For brevity only the results using Hannan-Quinn Information Criterion (HQC) (see Hannan and Quinn, 1979) are presented in Table 1.²

Given the determined specification of this VECM, the SVD method is then applied to the estimated impact matrix B^* as defined in Section 3. The estimated singular values indicate that the rank of the matrix B^* is 2. We then utilise the search algorithm described in Penm *et al.* (1997) to select the optimal loading and cointegrating vectors. The results identified by HQC are presented in Table 1.

Despite the relatively small sample size, the results are generally consistent with economic intuition and prior evidence. Among MA, ID, TB, SD and IR two cointegrating vectors are found. The first selected cointegrating vector supports the contention that $\log(\text{IR})$, $\log(\text{ID})$ and $\log(\text{SD})$ are cointegrated. The second selected cointegrating vector proves that $\log(\text{IR})$, $\log(\text{ID})$ and $\log(\text{TB})$ are also cointegrated with $\log(\text{JY})$. Since IR, ID, SD and TB appear in these two identified cointegrating vectors, this indicates that they have significant weight in the Indian and ASEAN economies.

For Granger causality detected among economies of India, Indonesia, Malaysia, Thailand and Singapore, every economy has causal links with the remaining economies directly or indirectly. No causation does not exist among those economies.

Table 1 The VECM for the relationships, linking the monthly exchange rates of Malaysian ringgit, Indonesian rupiah, Thai baht and Singapore dollars per Indian rupee selected by HQC using the GLS procedure

Variables: $y_t^1 = \log(\text{EXCH}_{\text{Malaysian ringgit/Indian rupee}})$, $y_t^2 = \log(\text{EXCH}_{\text{Indonesian rupiah/Indian rupee}})$,
 $y_t^3 = \log(\text{EXCH}_{\text{Singapore dollar/Indian rupee}})$, $y_t^4 = \log(\text{EXCH}_{\text{Thai baht/Indian rupee}})$,

Sample period: 01 January 1999 to 31 December 2005

The VECM:

$$\begin{bmatrix} \Delta y_t^1 \\ \Delta y_t^2 \\ \Delta y_t^3 \\ \Delta y_t^4 \end{bmatrix} + \begin{bmatrix} 0.0 & 0.0 & 0.0 & 0.0 \\ 0.0 & 0.0 & 0.0 & -0.465 \\ 0.0 & 0.0 & 0.243 & -0.335 \\ 0.0 & 0.0 & 0.0 & 0.0 \end{bmatrix} \begin{bmatrix} \Delta y_{t-1}^1 \\ \Delta y_{t-1}^2 \\ \Delta y_{t-1}^3 \\ \Delta y_{t-1}^4 \end{bmatrix} + \begin{bmatrix} 0.0 & 0.0 & 0.0 & 0.0 \\ 0.829 & 0.0 & 0.0 & 0.0 \\ (2.06) & & & \\ 0.0 & 0.0 & 0.0 & 0.0 \\ 0.0 & 0.0 & 0.0 & 0.0 \end{bmatrix} \begin{bmatrix} \Delta y_{t-2}^1 \\ \Delta y_{t-2}^2 \\ \Delta y_{t-2}^3 \\ \Delta y_{t-2}^4 \end{bmatrix} +$$

$$\begin{bmatrix} 0.0 & -0.0165 & -0.992 & 0.0 \\ (2.35) & (4.10) & & \\ 0.0 & 0.0 & 0.0 & 0.0 \\ 0.0 & 0.0 & 0.0 & 0.0 \\ 0.0 & .369 & 0.0 & -0.178 \\ (10.2) & & (4.50) & \end{bmatrix} \begin{bmatrix} y_{t-1}^1 \\ y_{t-1}^2 \\ y_{t-1}^3 \\ y_{t-1}^4 \end{bmatrix} = \varepsilon(t)$$

$$\hat{\alpha} = \begin{bmatrix} 1.0 & 0.0 \\ 0.0 & 0.0 \\ 0.0 & 0.0 \\ 0.0 & 1.0 \end{bmatrix} \quad \hat{\beta}' = \begin{bmatrix} 0.0 & -0.0165 & -0.992 & 0.0 \\ (2.35) & (4.10) & & \\ 0.0 & .369 & 0.0 & -0.178 \\ (10.2) & & (4.50) & \end{bmatrix}$$

Long-term Cointegrating Relationship Identified:

$$-0.166 \log(\text{EXCH}_{\text{Indonesian rupiah/Indian rupee}}) = \log(\text{EXCH}_{\text{Singapore dollar/Indian rupee}})$$

$$\log(\text{EXCH}_{\text{Indonesian rupiah/Indian rupee}}) = 0.482 \log(\text{EXCH}_{\text{Thai baht/Indian rupee}})$$

Causality Pattern:

Notes: T-values in parentheses; Δ denotes first difference

Since the 1997–1998 Asian Financial Crisis, the South Asian and East Asian markets, including the Indian and ASEAN markets, have been officially liberalised. With less capital controls, more investments from the developed countries have begun to flow into these emerging economies. The amount of trade flows between the Indian and ASEAN markets also show an overall increasing trend which indicates the improving economic relationships among the Indian and ASEAN markets. As research has shown that economic and financial relationships are linked, this overall trend of increasing importance of trade links can at least be partly accounted for by the observed increase in significant causal links and co-movements between the Indian and ASEAN financial markets in this period. This rise in economic activity between the Indian and ASEAN markets has resulted in an impact on the financial markets, with an increase in significant relationships between most of the Indian and ASEAN markets. This situation would also give evidence to support the establishment of an ‘Asian rupee’ currency to apply in India and the ASEAN region. Clearly the present rupee in use by most of the South Asian and East Asian countries, it constitutes the largest part of the ASEAN common currency programme, and is representative of the largest section of the population base in the region.

5 Conclusion

In this paper the value of a common financial market for India and the ASEAN region is discussed. An evaluation of the necessity for and practicability of a currency union to underpin an integrated stock market in the Indian and ASEAN countries is undertaken. The long-term cointegrating relationships identified among selected South and East Asian currencies, which include the India rupee, are promising, and could lead to a feasible currency union in India and the ASEAN region. The proposal outlined can be expanded to consider other important aspects of an integrated common financial market. Before pursuing such additional options we seek constructive responses to this proposal. Any such comments may be incorporated into this proposal, so that an effective and efficient plan can be provided to meet the challenges arising from the knowledge economy.

This new approach is particularly useful in complex relationships where the relevant time series have been generated from structures subject to evolutionary changes in their environment. Further evaluations will be undertaken to apply the proposed algorithms in the relevant publications (see Brailsford *et al.*, 2006a; Lin *et al.*, 2005; Penm, 2006; Brailsford *et al.*, 2006b; Wong *et al.*, 2006).

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Notes

- 1 For simplicity, and to keep the paper to a reasonable size, the relevant test results are not presented but can be supplied to readers upon request.
- 2 The results are obtained using GLS estimation on a SUN 7800 running Unix.

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and publications are welcome.

- High quality papers to keep you at the forefront of the latest thinking and research in e-Finance
- Case studies and practical applications to illustrate e-Finance design, development, management and implementation

Subject Coverage

Although the possible set of paper topics is large and we encourage submission on any area within the scope of e-Finance, the following areas are particularly suitable (but are exhaustive):

- Computerised automated trading systems
- Consumer value creation in mobile banking services
- Coordination in e-Finance networks
- Cultural, social and political issues in e-Finance
- Customer channel management in e-Finance
- E-cash flow in SCM
- E-finance and social exclusion
- E-finance for banking strategy
- E-finance impacts on market efficiencies, effectiveness, and transparency
- E-finance in SMEs
- E-finance performance measurement
- E-finance process models
- E-finance workflows management
- E-finance: privacy and trust
- E-finance: the electronic revolution
- E-finance: where do we go from here?
- E-payment strategy and implementation
- E-procurement channel management
- E-procurement in SCM
- Industrial financial chain management
- Interactive e-Finance study
- IT risk analysis and operational risk
- Knowledge management in financial institutes
- Managing online trading risks
- Mobile banking: hope or hype
- Mobile payment services
- Multi-channel banking
- Network ROI
- Online auction strategy
- Quality management in e-Finance
- Reengineering administrative process via e-Finance
- Strategic sourcing in banking
- Strategies to motivate brokers adopting online trading

Specific Notes for Authors

Submitted papers should not have been previously published nor be currently under consideration for publication elsewhere.

All papers are refereed through a double blind process. A guide for authors, sample copies and other relevant information for submitting papers are available on the [Submission of Papers](#) web-page.

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