CARDIFF BUSINESS SCHOOL
WORKING PAPER SERIES

Cardiff Economics Working Papers

Lucun Yang

An Empirical Analysis of Current Account Determinants in Emerging Asian Economies

E2011/10

Cardiff Business School
Cardiff University
Colum Drive
Cardiff CF10 3EU
United Kingdom
t: +44 (0)29 2087 4000
f: +44 (0)29 2087 4419
www.cardiff.ac.uk/carbs

ISSN 1749-6101
March 2011

An Empirical Analysis of Current Account Determinants in Emerging Asian Economies[1]

Lucun Yang[2]

First Draft: February 2010

This Version: Feb 2011

Abstract

Limited empirical work has been done to the diverging current account balances of the individual emerging Asian economies. Based on the intertemporal approach to current account, this paper empirically examines both the long-run and short-run impacts of initial stock of net foreign assets, degree of openness to international trade, real exchange rate and relative income on current account balances for eight selected emerging Asian economies over the period 1980-2009, making use of the cointegrated VAR (Vector Autoregression) methodology. This paper finds that current account behaviours in emerging Asian economies are heterogeneous. Initial stock of net foreign assets and degree of openness to international trade are important factors in explaining the long-run behaviour of current accounts. Moreover, the current accounts of all sample economies have a self-adjusting mechanism except China. Short-run current account adjustment towards long-run equilibrium path is gradual, with the disequilibrium term being the main determinant of the short-run current account variations.

JEL Classification: E21, F10, F32, F41

Keywords: Current account; Emerging Asia; Structural and macroeconomic determinants; Saving-investment balance; Cointegration

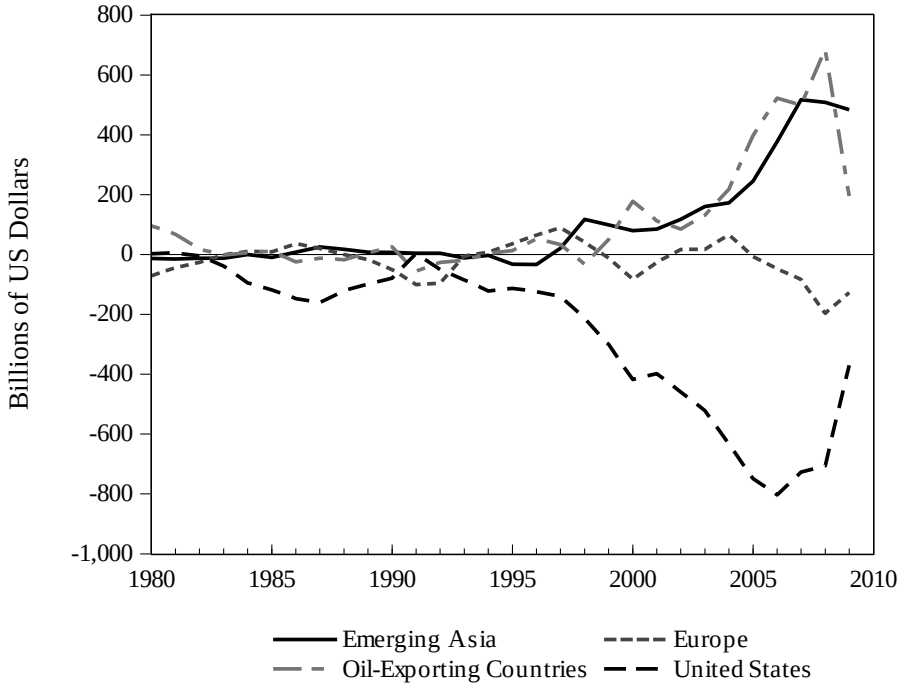
[1] The first draft of this paper has been presented at the Cardiff Business School, Economics Section seminar in February 2010, the BMRC-QASS Conference on Macro and Financial Economics held at the Brunel University in May 2010 and the Macroeconomics for Young Economists 2010 Conference held at the Tsinghua University, Beijing, China, in June 2010. I am grateful to Prof. Patrick Minford, Prof. Kul Luintel, Dr. Michael Arghyrou and Dr. Vito Polito for their valuable comments. I also want to acknowledge the Julia Hodge Bank for the financial support.

[2] Economics Section, Cardiff Business School, Cardiff University, UK. Author's contact E-mail: lucun_yang@hotmail.co.uk.

1 Introduction

Due to the existence of large and persistent global current account imbalances in the last two decades, economists and policymakers have paid more attention to the issue of current account. Determinants of current account balances are of considerable interest in open economy macroeconomics. The behaviour of the current account balance contains important information about an economy's economy performance, and also provides valuable macroeconomic policy recommendations. There are several theoretical models existing in the literature that try to explain the behaviour of the current account balance. Each of them gives different predictions about the elements determining the current account balance and the sign and magnitude of the relationships between the current account fluctuations and its determinants. Therefore, undertaking an empirical analysis could help discriminate among competing theories. Understanding the elements that influence the current account balance in both short-run and long-run can have important policy implications.

Figure 1: Global Current Account Balances



Data Source: International Monetary Fund (IMF), World Economic Outlook Database, October 2009.
Note: 2009 data are IMF estimates.

As shown in figure 1 above, before the 1997 Asian financial crisis, the current account

balances of emerging Asia[3], Europe[4] and Oil-exporting countries[5] were very close to zero. Although United States (US) kept running a current account deficit during that period, the size of the deficits was relatively small. However, the US current account deficit started to widen sharply as import growth surged right after the Asian crisis. Meanwhile, emerging Asia and oil-exporting countries started to run large current account surpluses. This phenomenon has been known as 'global imbalances' in the recent years. From figure 1, it is clear that the global imbalances have narrowed considerably in 2009 according to the IMF estimates. IMF predicts that the large US current account deficit would be reduced by nearly a half in 2009 due to the sub-prime mortgage crisis, which was triggered by a dramatic rise in mortgage delinquencies and foreclosures in 2008 in the US. On the other hand, due to a dramatic decrease in the value of oil revenues, the current account surpluses would diminish sharply for the oil-exporting countries in 2009. However, the IMF estimates predict only a small fall in the current account surplus of emerging Asia. Therefore, by the end of 2009, the remaining large current account surplus of emerging Asia would become the main counterpart to the current account deficits of US and Europe. After looking at the world picture of the global current account imbalances, it is clear that emerging Asia a whole has been an important and growing contributor to the recent global imbalances. Therefore, the analysis in this paper has a special focus on the emerging Asia economies.

Although there has been a growing body of empirical literature on the behaviour of current account balances in emerging Asia, most of the studies have been carried out in a multi-country framework[6]. To be more specific, the methodological approaches that have been adopted widely in the existing empirical literature have a major focus on cross-section and panel data analysis. The main limitation with this kind of estimation approach is that the corresponding results can only provide a generalized picture for emerging Asia economies and could only be able to explain the 'average' behaviour of current accounts in these economies. In this paper, I try to go beyond these generalizations by adopting a linear vector autoregressive (VAR) approach and empirically investigating the factors that may influence

[3] Emerging Asia includes China, Hong Kong, India, Indonesia, Korea, Malaysia, Philippines, Singapore, Thailand, Taiwan and Vietnam.
[4] Europe contains the 27 member states in the European Union in 2009.
[5] Oil-exporting countries are Algeria; Angola; Azerbaijan; Bahrain; Congo; Ecuador; Equatorial Guinea; Gabon; Iran; Kazakhstan; Kuwait; Libya; Nigeria; Norway; Oman; Qatar; Saudi Arabia; Syrian Arab Republic; Turkmenistan; United Arab Emirates; Venezuela and Yemen.
[6] See for examples: Khan and Knight (1983), Debelle and Faruqee (1996), Chinn and Prasad (2003).

the behaviour of current account in each selected emerging Asian economy and assess their dynamics over time.

The objective of this paper is to examine both the long-run and short-run impacts of initial stock of net foreign assets, degree of openness to international trade, real exchange rate and relative income on current account for eight selected emerging Asian economies since the 1980s. The eight sample economies include China, Hong Kong, India, Korea, Malaysia, Philippines, Singapore and Thailand. Given the non-stationary nature of the data used in this study, this paper adopts a cointegrated VAR approach to analyze current account balances and a set of macroeconomics determinants. Johansen and Juselius (1990) cointegration test is first applied to detect cointegration(s) between current account balances and potential explanatory variables within a VAR framework. In the presence of cointegration(s), the long-run impacts of all the explanatory variables on current account are analyzed based on the estimated cointegrating parameters, while the short-run impacts of all the explanatory variables on current account is investigated according to the estimation of a vector error correction model (VECM).

In general, I show that current account behaviours in emerging Asian economies are heterogeneous. The key findings of the study can be summarized as follows. First, for most selected emerging Asian economies, initial net foreign asset positions and the degree of openness to international trade have significant long-run impacts on current account balances for most of the sample economies. The effects of these two factors have on current account are different across the sample economies. However, they have less important roles to play in causing changes in current account balances in the short-run for most of the sample economies. Second, there is a significant negative long-run relationship exists between the movements of real effective exchange rate and current account balance for most of the sample economies. However, the lack of adjustment of real effective change rate to the long-run disequilibrium term of current account indicates structural rigidities for all the sample economies expect India. Third, current accounts of all sample economies have a self-adjusting mechanism except China. Finally, short-run current account adjustment towards long-run equilibrium path is, on average, gradual, with the disequilibrium term being the main determinant of the short-run current account variations.

The structure of this paper is as follows. Section 2 presents some stylised facts on current account balances of the eight selected emerging Asian economies. Section 3 provides a brief review of the empirical literature. Section 4 discusses some theoretical issues and also presents the empirical framework used in this study. Section 5 provides a description of the data used in this study and analyzes the time series properties of the data. Section 6 discusses the empirical methodology employed by this study. Section 7 outlines the empirical results and section 8 provides a brief discussion. Finally, section 9 concludes.

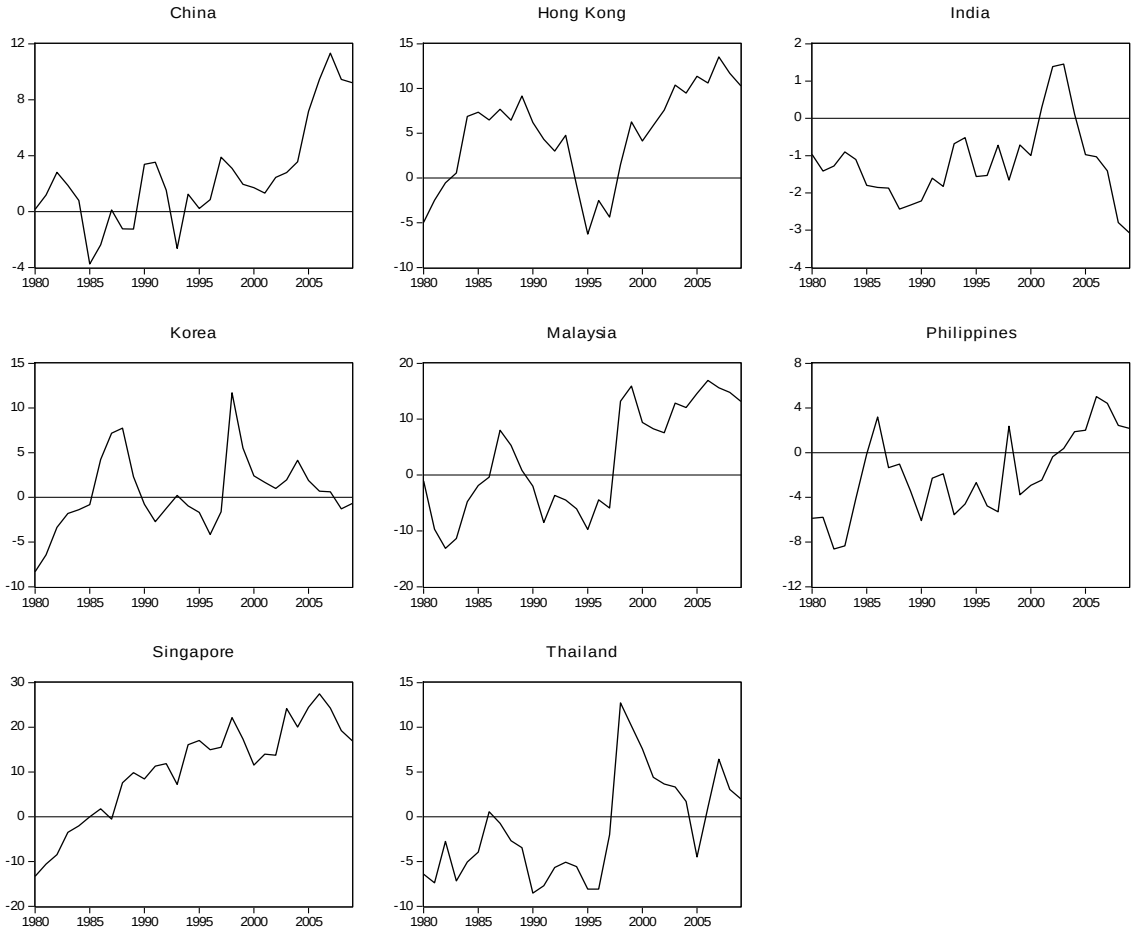
2 Current Account Positions of Eight Emerging Asian Economies

Although emerging Asia as a whole kept running large and persistent current account surplus since the Asian crisis, a generalised picture does not allow us to observe important differences in the behaviour of current account balances within the region. Hence, it becomes necessary to look at the current account behaviour for each individual economy in emerging Asia. In this paper, I intend to focus on 8 largest economies in emerging Asia: China, Hong Kong, India, Korea, Malaysia, Philippines, Singapore and Thailand. These economies are selected for two reasons. First, according to the recent IMF report, these 8 sample economies jointly account for over 85% of the emerging Asian GDP and around 14% of the world's GDP in 2009.[7] It is obvious that the selected economies play a much more significant role in the regional economy. Second, since the empirical study in this paper requires quarterly data, therefore, only these 8 economies are selected. Although Indonesia, Taiwan Province of China and Vietnam are also considered as the largest economies in the region, these three economies are excluded from the sample due to the limited quarterly data.

Figure 2 on the next page presents the current account balance as a percentage of each economy's GDP for the 8 sample economies in emerging Asia over the period 1980-2009. By looking at the figure, it is clear that current account developments in the selected emerging Asian economies are quite heterogeneous during the sample period. China kept running a small amount of current account surplus for most of the time, but the surplus has increased

[7] IMF, 2010 Source: World Economic Outlook (October 2009).

Figure 2: Current Account Balance (% in GDP)



Data source: International Monetary Fund (IMF), World Economic Outlook Database, October 2009.

sharply in the past few years. Hong Kong and Singapore are the economies that tended to run relatively large and sustained current account surplus for most of the sample period. In cases of Korea, Malaysia, Philippines and Thailand, the current account position was seriously affected by the Asian crisis, which had a shift from deficit to large surplus around the time when crisis happened but narrowed down within a few years afterwards, except in the case of Malaysia. While most of the selected economies were running current account surplus, India is the only economy that ran a current account deficit on average over the whole review period.

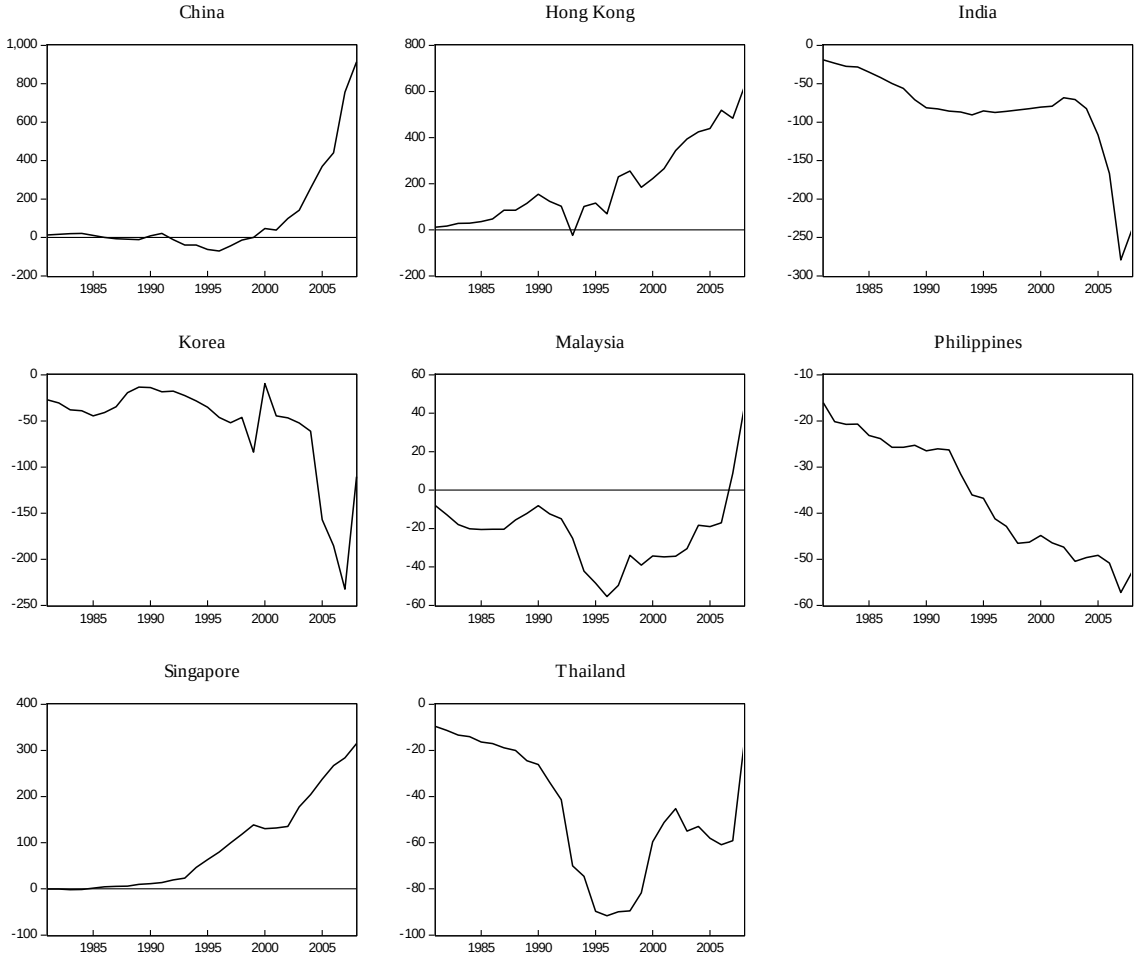
Based on both figure 1 and 2, it becomes more obvious that the large increase in the current account surplus for emerging Asia as whole since the 1997 Asian crisis occurred in two distinct phases. In the immediate post-Asian crisis period, the increase in the current account

surplus in emerging Asia can be seen as the result of sudden shifts in the current account balances of the crisis affected economies from current account deficits to large surpluses. Later, especially after 2004, the increase in the region's surplus was largely caused by a dramatic increase in the China's current account surplus since the surpluses in most of the crisis affected economies had narrowed down and India had an increased deficit.

Furthermore, examining an economy's financial account can be helpful in understanding more about its current account position since it is the mirror image of the current account. For an example, when an economy invests more than it saves, the difference between investments and savings is met with foreign capital inflows shown on an economy's financial account and a current account deficit arises correspondingly. In the traditional accounting of balance of payments, financial account is calculated as the change in net foreign assets (NFA), which indicate the rate at which an economy is accumulating external assets. Figure 3 on the next page shows the NFA positions for each of the selected emerging Asian economies over the period 1981-2008.

According to the figure, all the selected economies were exposed to large NFA movements in and out of the economy after 1992, which was mainly due to the global integration and liberalization of financial markets in the early 1990s. China did not accumulate any large amount of net foreign assets or liabilities before the early 2000s, but had dramatically stimulated its NFA accumulations by accelerating its foreign exchange reserves since 2003. These large changes in the NFA are reflected in its current account surpluses over the period 2003-2008 as shown in Figure 2. Hong Kong and Singapore are the economies that tended to accumulate their NFAs for most of the sample period and have speeded up the accumulation process in recent years. Before the Asian crisis, the accumulated net foreign liabilities in Korea, Malaysia, Philippines and Thailand were corresponding to the current account deficits in that period. However, figure 3 shows large reductions in those countries' net foreign liabilities in the immediate post-Asian crisis period, which were primarily caused by the substantial foreign direct investment outflows and enormous losses in foreign exchange reserves. These reductions are reflected as increases in those countries' current account balances. For India, its economy kept accumulating net foreign liabilities over the whole sample period and has accelerated the accumulation speed dramatically in past few years. As a result, India's current account had been in deficit on average during the same period.

Figure 3: Net Foreign Assets (Billions of US Dollars)



Data Source: updated and extended version of the External Wealth of Nations Mark II database developed by Lane and Milesi-Ferretti (2007).

Note: 2008 data are estimates, which are calculated by using the method developed by Lane and Milesi-Ferretti (2007).

After examining the financial account in each economy under consideration, it is apparent that current account developments in those emerging Asian economies are clearly reflected in their NFA positions. A current account surplus always implies a paralleled increase of the NFA, while a current account deficit is accompanied with a reduction of the NFA. I also find that rapid NFA accumulation has been a feature in all economies exposed to the Asian crisis. However, the more recent pronounced NFA accumulation in emerging Asia as a whole has been largely due to China.

Several conclusions can be drawn in this section. First, current account developments in the

Asian economies have been heterogeneous during the last few decades. It is clear that there is no single common pattern of current account behaviour throughout the sample economies in emerging Asia. Second, current account surpluses in emerging Asia are a recent development rather than an embedded structural feature of the emerging Asian economies since they became apparent only after the Asian crisis. Third, current account developments in those emerging Asian economies are clearly reflected in their NFA positions. Fourth, China has played a remarkable role in building up the current account surpluses and NFA accumulation in emerging Asia in more recent years. These results reinforce the importance of investigating in detail the behaviour of current account in each individual emerging Asian economy.

3 Empirical Literature Review

In the early stage, the empirical literature concentrates more on analysing the current accounts in developed economies rather than in developing economies or emerging Asian economies mainly due to the lack of data. After the 1997 Asian financial crisis, the literature has a tendency to focus more on the behaviour of current account balances in emerging Asian economies, especial after the emergence of global current account imbalances. Despite the heterogeneous current account behaviour in each emerging Asian economies, most of the empirical studies have been carried out in a multi-economy framework. This section reviews some of these studies below, which have examined the current account determinants in developing (including emerging Asia economies) using different estimation approaches and giving different findings.

Khan and Knight (1983) investigate the evolution of the current account balances for 32 non-oil developing countries over the period 1973-1980 by using a pooled time series cross section data and adopting an Ordinary Least Square (OLS) estimation approach. Their results indicate that both internal factors (the increase in fiscal deficits and the appreciation in real effective exchange rates) and external factors (the deterioration in terms of trade, the decline of economic growth and the increase in foreign real interest rates) are important in explaining the deterioration of the current account of the countries under review.

Debelle and Faruqee (1996) try to explain both short-run dynamics and long-run variations of the current account by using a panel data of 21 industrial countries over the period 1971-1993 and also an extended cross section data that includes an additional 34 industrial and developing countries. They adopt a saving-investment perspective to motivate empirical specifications that contain the structural determinants of current accounts. Their work finds that relative income, government debt and demographic factors play a significant role on the long-run variation of the current account in the cross section, while fiscal surplus, terms of trade and capital controls do not. Also, by estimating partial-adjustment and error-correction models using panel data, they find that fiscal policy has both short-run and long-run impacts on the current account in the time series. Furthermore, they find that the real exchange rate, the business cycle and the terms of trade also have short-run effects on the current account.

Calderon, Chong and Loayza (2002) attempt to extend the work of Debelle and Faruqee (1996) by applying more advanced econometric techniques to control for joint endogeneity and by distinguishing between within-economy and cross-economy effects. They used a panel data of 44 developing countries over the period 1966-1995 to examine the empirical links between current account deficits and a broad set of economic variables proposed in the literature. By adopting a reduced-form approach rather than holding a particular structural model, they find that current account deficits in developing countries are moderately persistent. Higher domestic output growth, increase in the terms of trade and the real exchange rate appreciation tend to worsen the current account deficit. On the other hand, increases in the public and private savings, higher growth rates in industrial countries and higher international interest rates have favourable impacts on the current account balance.

Chinn and Prasad (2003) investigate the medium-term determinants of current accounts by adopting a structural approach that highlights the roles of the fundamental macroeconomic determinants of saving and investment. Their basic data set has annual data for 18 industrial and 71 developing countries and covers the period 1971-1995. Both cross-section and panel regression techniques are used in their study to examine the properties of current account variation across countries and over time. They find that initial stocks of net foreign assets and government budget balances have positive effects on current account balances. In addition, they also find that measures of financial deepening are positively correlated while indicators of openness to international trade are negatively correlated with current account balances

among developing countries.

Gruber and Kamin (2007) assess some of the explanations that have been put forward for the global pattern of current account imbalances that has emerged in recent years, particularly the large U.S. current account deficit and the large surpluses of the developing Asian economies. Their work is based on the work of Chinn and Prasad (2003), using a panel data of 61 countries over the period 1982-2003 and including the standard current account determinants (per capita income, relative growth rates, fiscal balance, demographic factors and international trade openness). They find that the Asian surpluses can be well explained by a model that incorporates, in addition to standard determinants, the impact of financial crises on current accounts. However, their model fails to explain the large U.S. current account deficit even when the model is augmented by measures of institutional quality.

Chinn and Ito (2007, 2008) also attempt to explain the upswing since 1997 from current account deficit to surplus in Asian countries by using a framework of the work by Chinn and Prasad (2003). They find that the standard determinants, such as demographics and income variables, used in the work of Chinn and Prasad (2003) alone cannot explain the upswing in Asian countries' current account. Therefore, they augment Chinn and Prasad (2003) specification with indicators of financial development and legal environment that are likely to affect saving and investment behaviour and economic growth. They find that the interaction of legal environment with financial development plays a significant role in explaining capital outflows from Asia. They reject the saving glut hypothesis. On the contrary, their results suggest that it is the lack of investment opportunities rather than excess saving that helps explain current account improvement in Asian countries over the last decade.

In general, most of the above studies have used the intertemporal approach to examine the current account determinants from a saving-investment perspective for different groups of economies over different time horizons. However, evidence from the above studies is still inconclusive on the issue of current account determinants in developing economies or emerging Asian economies since studies provide conflicting results on same sets of variables.

4 Theoretical Issues and Empirical Framework

4.1 The Intertemporal Approach to the Current Account

The economic theory underpinning this paper stems from the intertemporal approach to the current account, which was initially proposed by Sachs (1981) and Buiter (1981) and further extended by Obstfeld and Rogoff (1995). Empirical applications of the intertemporal model have followed two directions. On one hand, several studies have tried to establish evidence in favour of the baseline model using different testing strategies (e.g. see Bergin and Sheffrin, 2000; Nason and Rogers, 2006). On the other hand, a number of papers have examined the long-run relationship between the current account and its fundamental macroeconomic determinants by applying standard econometric techniques (e.g. see Debelle and Faruquee, 1996; Chinn and Prasad, 2003; Gruber and Kamin, 2007). The study in this paper draws upon the second stem of the research.

Originally, the current account was thought of as the net export balance of a country (i.e. the trade elasticity approach). Consequently, relative international prices and their determinants were viewed as central to the dynamics of the current account. Although the trade elasticity approach has the benefit of straightforward empirical predictions, which are often found to be helpful in examining the short-run implications of exchange rate changes on the current account balance, due to its partial-equilibrium nature (i.e. this approach only looks at the traded goods market and ignores the interaction of other various markets in an economy), the elasticity approach is inherently limited in its ability to explain long-run or equilibrium current account positions.

Alternatively, the intertemporal approach to the current account views the current account (CA) as the difference between domestic saving (S) and domestic investment (I):

$$CA = S - I$$

and focused on macroeconomic factors that determine the two variables, *S* and *I*. The intertemporal approach recognizes that saving and investment decisions result from forward looking calculations based on the expected values of various macroeconomic factors. It tries to explain the current account developments through closer examination of intertemporal consumptions, saving and investment decisions. This approach has achieved a synthesis

between the trade and financial flow perspectives by recognizing how macroeconomic factors influence future relative prices and how relative prices affect saving and investment decisions (Obstfeld and Rogoff, 1995). In addition to this, the basic insight of the intertemporal approach to the current account is that the current account can act as a shock absorber that enables a country to smooth consumption and maximize welfare in the presence of temporary shocks in a country's cash flow or net output.

While the basic permanent income model has been very helpful in explaining current account movements at business cycle frequencies, the consumption smoothing perspective has generally had less to say on sustained current account imbalances and trend developments.[8] Nevertheless, the model can be used to analyze longer-term variation in current account balances, as illustrated by the relation between the current account, investment and the stage of economic development in the permanent income model.

In particular, the intertemporal approach suggests that the stage of economic development is an important factor in explaining current account developments in the long-run. To be more specific, a small open economy that is initially capital and income poor, provided it has access to international capital markets, will run current account deficits for a sustained period of time to build its capital stock while maintaining its long-run rate of consumption. During the adjustment, a relatively high marginal product of capital will attract capital inflows and raise external indebtedness. Eventually, as output grows toward its long-run level and the return on capital converges to its value abroad, the current account will improve toward (zero) balance as net exports move sufficiently into surplus to pay the interest obligations on the accumulated external debt.

The intertemporal approach indicates that, for growing economies, long-run growth can complicate the analysis by allowing for possibility of non-zero current account balances in steady state. Assuming that the stock of net foreign assets does not outpace growth in the overall economy indefinitely, the level of current account (measured as a share of GDP) required to stabilize net external indebtedness can be determined. In particular, given that the

[8] In the permanent income model, long-run developments are generally limited to consumption-tilting effects resulting from changes in the rate of time preference, which are difficult to measure. As a result, tests of the present value model have examined de-trended current account series (for example, Ghosh and Ostry, 1995).

current account (CA) equals the change in net foreign assets (NFA), a stable ratio of NFA to GDP (denoted by Y) implies that in steady state:

$$CA/Y = g * NFA/Y$$

where $g = \Delta Y/Y$. During the transition to this 'long-run' position, various other factors could influence this relationship (e.g., see Calderon *et al*., 2000). Furthermore, if there are real exchange rate trends, the proportional factor 'g' would also take account of the long-run rate of appreciation to account for differing valuation effects on NFA and Y. Consequently, structural determinants of the current account could be viewed in terms of the factors that underpin the desired net foreign asset position in the long-run. Equivalently, one could view this stock-flow equilibrium relationship in terms of the underlying determinants of saving and investment behaviour.

Moreover, one thing worth noticing here is that there could also be systematic differences between debtor and creditor countries in the relationship between current accounts and NFA. Kraay and Ventura (2000) suggest that the sign of the current account response to transitory income shocks depends on the share of foreign assets in a country's total assets. Under some plausible assumptions, they show that the current account response to a transitory income shock is equal to the increase in savings generated by the shock times the share of foreign assets in the country's total assets. This "new rule" implies that favourable income shocks lead to current account deficits in debtor countries and current account surpluses in creditor countries. Obstfeld and Rogoff (1998, pp. 76–78) also note that, if the world real interest rate were above its 'permanent' level, the current account surplus would be higher than usual for creditor countries as agents in those countries saved more to smooth into the future their unusually high income. The effect would be reversed for debtor countries.

The intertemporal approach also suggests that real exchange rate has a role to play in explaining the long-run current account developments through the degree of the propensity to save. In particular, an appreciation of the real exchange rate increases the purchasing power in terms of imported goods of current and future income, as well as the value of the accumulated monetary and property assets of domestic agents. This effect tends to raise consumption and reduce the propensity to save, which can cause a decrease in the current account balance.

Finally, in the absence of freely mobile capital, the intertemporal approach suggests that one could approach current account determination by focusing more explicitly on the developments in its counterpart – the capital account. In an open economy, the capital account can be affected by country characteristics that reflect macroeconomic policies. For instance, the degree of openness to international trade could reflect policy choices, including tariff regimes. According to the literature, countries that are more open to international trade tend to attract more foreign capital to finance expenditure relative to income, contributing to current account deficits. Consequently, countries that maintain a relatively open capital account are likely to have larger current account imbalances than otherwise. Therefore, the degree of openness to international trade may have important long-run implications for overall current account positions.

4.2 The Empirical Framework

Based on the above discussion, the general function for current account balances used in this paper is specified as follow

$$ca = f\left(nfa, open, reer, rel\_y\right) \tag{1}$$

where the dependent variable, *ca*, is the current account balance to GDP ratio; *nfa* is the initial net foreign assets position to GDP ratio; *open* is the indicator of openness to international trade; *reer* is the real effective exchange rate; *rel_y* is the level of domestic real income relative to foreign real income.

Although no single theoretical model can capture the entire range of empirical relationships between current account and the explanatory variables identified in equation (1) that are analyzed in this study, it is still useful to examine the predictions of different theoretical models about some of these relationships.

1) Initial Stock of NFA

The initial stock of NFA is measured as the one period lagged NFA stock to GDP ratio to avoid endogeneity problems with the current account. According to the intertemporal

approach, initial stock of NFA serves as an important initial condition since the current account is the sum of the trade balance and the return on an economy's stock of NFA.

In general, initial stock of NFA can influence current account balance in two ways. First, an economy with a higher initial stock of NFA obviously can benefit from a higher level of investment income from abroad. From the saving-investment perspective, an increase in the foreign income flow has a positive effect on current account balance. It therefore creates a positive relationship between initial stock of NFA and current account balance. Second, since the sum of current account and capital account must equal zero *ex post* in a flexible exchange rate regime, an economy with an initially higher level of NFA can afford a higher trade deficit for an extended period and still remain solvent. This potentially leads to a negative relationship between initial stock of NFA and current account balance.

Overall, standard open economy macroeconomic models predict that the first effect should be stronger. Empirically, the first effect would be expected to dominate (see for examples, Chinn and Prasad, 2003 and Lee *et al*., 2008).

2) Trade Openness

The trade openness is measured as the sum of exports and imports to GDP ratio. It not only measures the degree of an economy's openness to international trade, but also reflects some of the macroeconomic policies that could be relevant for the long-run current account developments. For examples, trade openness could be indicative of attributes such as liberalized international trade, receptiveness of technology transfers, and ability to service external debt through export earnings.

Moreover, this variable also measures the degree of various trade restrictions, which are likely to impede a flow of goods and services from abroad. An economy with more trade restrictions is likely to send an adverse signal to foreign investors. On the other hand, an economy with less trade restrictions and more exposure to international trade tends to be relatively more attractive to foreign capital (Chinn and Prasad, 2003). Consequently, trade openness is likely to be associated negatively with the current account balance.

In general, the common empirical literature usually expects a negative relationship between trade openness and current account balance.

3) Real Effective Exchange Rate (REER)

The REER can affect the current account balance in two ways. On one hand, from a saving-investment perspective, an increase in the REER can decrease an economy's overall saving ratio because it increases the purchasing power of the domestic currency on foreign goods and services, thereby encouraging domestic residents to purchase more imported goods and to travel and consume abroad. The increase in spending on foreign goods and services will cause real consumption to rise relative to output, thus lowering the saving ratio. Since current account is increasing in savings, a decrease in the saving ratio will lead to a decrease in an economy's current account balance.

On the other hand, the consumption smoothing hypothesis suggests that the current account acts as a buffer to smooth consumption in the face of shocks to national cash flow (i.e. output less investment). In response to an increase in the REER, an open economy would prefer to run a current account surplus and invest abroad rather than allow consumption to increase. As a result, a home currency appreciation can result in an improvement of the current account (Herrmann and Jochem, 2005).

After all, the link between the REER and the current account balance can only be determined empirically.

4) Domestic Relative Income

The relative income is measured as the ratio of domestic real output to U.S. real output. This variable captures the stage of development effects. The stages of development hypothesis for balance of payments (Debelle and Faruqee, 1996) suggest that, at an early stage of the development process where the relative income level is low, an economy runs current account deficits as it usually imports capital due to its external financing requirement. However, at a later stage of the development process with high relative income, the economy normally runs current account surpluses in order to repay the previously accumulated external liabilities and also exports capital to less developed economies.

In general, the relationship between relative income and current account balances is expected to be positive.

5 Data and Preliminary Analysis

Quarterly time series data are used in this study for all the sample economies, which include China, Hong Kong, India, Korea, Malaysia, Philippines, Singapore and Thailand. However, since quarterly data for initial stock of NFA are unavailable for all sample economies, quarterly data for this variable are the interpolated results of the annual time series by using the cubic spline interpolation method for all selected economies. The main data source is the IMF's International Financial Statistics (IFS) databank. Variables exhibit strong seasonality for which I account by seasonal adjustment.[9] More detailed data sources and variable definitions are provided in Data Appendix.

Sample size is different across sample economies due to each economy's data availability. For Singapore, the sample period is 1980Q1-2009Q1. For Hong Kong, India and Philippines, the sample period is 1981Q1-2009Q1. For Korea, the sample period is 1981Q1-2008Q1. For China and Malaysia, the sample size is 1985Q1-2009Q1. Finally, for Thailand, the sample size is 1988Q1-2009Q1. More detailed data sources and variable definitions are provided in the data appendix.

The time properties of the data are examined by applying the Augmented Dickey–Fuller (1979) (hereafter ADF) test to both levels and first differences of the time series for all the sample economies. The ADF test constructs a parametric correction for higher-order correlation by assuming that the time series follows an autoregressive (AR) process up to a k^{th} order.

$$\Delta y_t = c + \beta t + \alpha y_{t-1} + \sum_{j=1}^{k} \gamma_j \Delta y_{t-j} + \varepsilon_t \qquad (2)$$

[9] Variables are adjusted by using the Census XII multiplicative seasonal adjustment method used by the US Bureau of Census.

$$\Delta y_t = c + \alpha y_{t-1} + \sum_{j=1}^{k} \gamma_j \Delta y_{t-j} + \varepsilon_t \quad (3)$$

$$\Delta y_t = \alpha y_{t-1} + \sum_{j=1}^{k} \gamma_j \Delta y_{t-j} + \varepsilon_t \quad (4)$$

Equation (2) is used to test for the null of a unit root against a trend-stationary alternative in y_t, where y refers to the examined time series. Equation (3) tests the null of a unit root against a mean-stationary alternative, and equation (4) tests the null of a unit root against zero-mean stationary alternative. The purpose of including the lagged first differences, Δy_{t-j}, into the right-hand side of the three test equations is to accommodate serial correlation in the residual terms, ε_t. The lag length of Δy_{t-j} can be selected by conventional information-based criteria. In this study, the Akaike Information Criterion (AIC) is used to choose the lag length.

Table 1 on the next page reports the results of ADF test for all the time series used in this study. Panel A and B reports the results of the ADF test on the level series. The results indicate that, at 5% significance level or lower, the null hypothesis of a unit root cannot be rejected for all the time series at levels. Panel C reports the results of the ADF test on the first differences of all the variables. The null hypothesis of a unit root is rejected when the ADF test is applied to the first difference for all the variables at 5% significance level or even 1% significance level, except that the null hypothesis is rejected at 10% significance level in the case of India's relative income. Therefore, the overall conclusion from the ADF test is that, for all the sample economies, all the variables are unit root non-stationary processes and integrated of order one, I(1).

6 Methodology

Based on the preliminary analysis of the data presented in the last section, all the variables in this study are non-stationary and follow a I(1) process. As a general rule, non-stationary time series should not be used in regression models in order to avoid the problem of spurious regression. However, Engle and Granger (1987) pointed out that a linear combination of two or more non-stationary series may be stationary. If such a stationary linear combination does

Table 1: Augmented Dickey-Fuller (ADF) Test Results

Panel A: ADF Tests on Levels - Intercept and Trend

	Current Account to GDP ratio (*ca*)	Initial NFA to GDP ratio (*nfa*)	Trade Openness (*open*)	Real Effective Exchange Rate (*reer*)	Relative Income (*rel_y*)
China	-2.06 [0.562]	-0.54 [0.980]	-2.59 [0.287]	-2.79 [0.205]	-2.82 [0.196]
Hong Kong	-1.96 [0.617]	-1.69 [0.748]	-2.79 [0.205]	-1.77 [0.714]	-1.76 [0.718]
India	-3.14 [0.110]	-2.53 [0.316]	-1.85 [0.671]	-0.89 [0.952]	-0.17 [0.993]
Korea	-2.99 [0.140]	-1.23 [0.898]	-1.78 [0.707]	-2.43 [0.359]	-1.89 [0.652]
Malaysia	-2.61 [0.279]	-1.81 [0.690]	-0.42 [0.986]	-2.24 [0.460]	-1.66 [0.762]
Philippines	-1.72 [0.734]	-2.05 [0.567]	-0.36 [0.999]	-2.18 [0.497]	-1.12 [0.919]
Singapore	-2.15 [0.510]	-2.66 [0.254]	-2.46 [0.344]	-2.10 [0.537]	-1.79 [0.703]
Thailand	-2.57 [0.295]	-0.96 [0.943]	-1.91 [0.642]	-1.05 [0.930]	-2.48 [0.336]

Panel B: ADF Tests on Levels - Intercept Only

	Current Account to GDP ratio (*ca*)	Initial NFA to GDP ratio (*nfa*)	Trade Openness (*open*)	Real Effective Exchange Rate (*reer*)	Relative Income (*rel_y*)
China	-0.86 [0.798]	-1.38 [0.998]	-1.80 [0.380]	-2.11 [0.242]	-2.39 [0.145]
Hong Kong	-1.52 [0.518]	-0.74 [0.828]	-1.62 [0.465]	-1.60 [0.478]	-1.66 [0.449]
India	-1.84 [0.359]	-2.54 [0.109]	-0.71 [0.992]	-1.72 [0.416]	-2.24 [0.999]
Korea	-2.55 [0.106]	-2.16 [0.220]	-0.81 [0.810]	-2.40 [0.141]	-2.22 [0.199]
Malaysia	-1.69 [0.429]	-1.07 [0.722]	-2.38 [0.150]	-1.34 [0.604]	-1.86 [0.346]
Philippines	-1.12 [0.707]	-0.87 [0.792]	-1.17 [0.683]	-2.50 [0.117]	-1.61 [0.473]
Singapore	-2.30 [0.171]	-0.45 [0.984]	-2.45 [0.130]	-2.09 [0.248]	-1.03 [0.738]
Thailand	-1.78 [0.383]	-0.82 [0.807]	-1.02 [0.740]	-1.23 [0.655]	-2.55 [0.107]

Panel C: ADF Tests on 1st Differences - Intercept Only

	Current Account to GDP ratio (*ca*)	Initial NFA to GDP ratio (*nfa*)	Trade Openness (*open*)	Real Effective Exchange Rate (*reer*)	Relative Income (*rel_y*)
China	-9.05 [0.000]***	-2.91 [0.045]**	-3.11 [0.029]**	-8.43 [0.000]***	-5.06 [0.000]***
Hong Kong	-6.19 [0.000]***	-3.82 [0.004]***	-4.07 [0.002]***	-7.38 [0.000]***	-3.06 [0.033]**
India	-7.04 [0.000]***	-7.53 [0.000]***	-6.68 [0.000]***	-3.70 [0.005]***	-2.87 [0.052]*
Korea	-10.88 [0.000]***	-4.66 [0.000]***	-7.75 [0.000]***	-4.78 [0.000]***	-5.61 [0.000]***
Malaysia	-11.24 [0.000]***	-3.45 [0.012]**	-3.21 [0.023]**	-3.66 [0.007]***	-3.54 [0.009]***
Philippines	-6.70 [0.000]***	-3.13 [0.027]**	-5.88 [0.000]***	-5.36 [0.000]***	-3.04 [0.034]**
Singapore	-4.37 [0.001]***	-5.28 [0.000]***	-4.14 [0.001]***	-6.46 [0.000]***	-5.47 [0.000]***
Thailand	-4.13 [0.002]***	-3.47 [0.012]**	-5.75 [0.000]***	-3.98 [0.003]***	-5.87 [0.000]***

Notes: 1. Null hypothesis in both ADF tests is specified as 'the tested variable has a unit root'.
2. Critical values for the ADF test with a trend are: -4.011, -3.439 and -3.139 at the 1%, 5% and 10% significance levels respectively. Critical values for the ADF test without a trend are: -3.481, -2.884 and -2.574 at the 1%, 5% and 10% significance levels respectively.
3. ** and *** denote the rejection of the null hypothesis at 5% and 1% significance level respectively; numbers in square bracket denote test probability values.

exist, the non-stationary time series are said to be cointegrated and the stationary linear combination can be interpreted as a long-run equilibrium relationship among the variables. Give the above consideration, I first use the Johansen and Juselius (1990, hereafter JJ) cointegration test, which is a vector autoregressive (hereafter VAR) based approach, to examine the underlying cointegrating relationship(s) among the variables specified in equation (1). The JJ's approach involves estimation of a *K*-dimensional VAR model of *p* order (VAR(*p*)), which can be described as follow

$$X_t = \mu + \Gamma_1 X_{t-1} + \Gamma_2 X_{t-2} + ... + \Gamma_p X_{t-p} + \varepsilon_t \quad (5)$$

In this study, X_t = (ca_t, nfa_t, $open_t$, $reer_t$, rel_y_t) and is a (5×1) column vector; μ is a constant term; Γ_i represents a (5×5) parameter matrix where $i = (1, 2..., p)$; and finally ε_t represents a (5×1) matrix of Gaussian errors. Equation (2.5) is estimated by using the maximum likelihood method.

Compared with a single equation residual based approach, the JJ's test is superior in two main aspects. First, all the variables in the VAR system as described in equation (5) are assumed to be endogenous in the JJ's test, even if some of them do not act as dependent variables. As a result, it avoids the problem of normalizing the cointegrating vector on one of the variables or of imposing a unique cointegrating vector as in a single equation residual based test (for example, Engle-Granger (1987) 2-step cointegration test). Second, the JJ's approach can address the multi-cointegration problem when there are more than two variables involved in the test, whereas a single equation residual based test is only capable to find one cointegrating relationship despite the number of variables involved in the test. This second advantage of the JJ's test is especially important to this study given that there are five variables involved in the analysis of current account behaviour. Last but not least, Cheung and Lai (1993) point out that the power of the JJ test is better than that of the EG test. Due to all these reasons, this study applies the JJ test to test the cointegrating relationship(s) between current account balance and the explanatory variables specified in equation (1).

Johansen and Juselius (1990) and Johansen (1995) suggest that if X_t consists of *k* terms integrated of order one, equation (2.5) can be re-arranged as a vector error correction model (VECM) as below:

$$\Delta X_t = \mu + \Psi_1 \Delta X_{t-1} + \Psi_2 \Delta X_{t-2} + ... + \Psi_{p-1} \Delta X_{t-p+1} + \Pi X_{t-p} + \varepsilon_t \quad (6)$$

In equation (6), μ is a constant term; ΔX_t represents the first differenced X_t (i.e. $\Delta X_t = X_t - X_{t-1}$), $\Psi_i = -\left(I - \Gamma_1 - \Gamma_2 - ... - \Gamma_i\right)$, $\Pi = -\left(I - \Gamma_1 - \Gamma_2 - ... - \Gamma_p\right)$, where I is the identity matrix and $i = (1, 2..., p-1)$. If Π includes r linearly independent columns where $r<k$ and k is the number of variables in X_t, equation (6) convergences to a long-run equilibrium described by $\Pi = \alpha\beta'$, where α and β are both $(5 \times r)$ matrices. Matrix β includes the coefficients defining the long-run relationship, while matrix α consists of loading factors, which can be interpreted as the coefficients of the speed of adjustment toward the long-run equilibrium. Equation (6) can be re-written as:

$$\Delta X_t = \mu + \Psi_1 \Delta X_{t-1} + \Psi_2 \Delta X_{t-2} + ... + \Psi_{p-1} \Delta X_{t-p+1} + \alpha\left(\beta' X_{t-p}\right) + \varepsilon_t \quad (7)$$

In equation (7), βX_{t-p} can yield a maximum of (k-1) cointegration relationships provided all X_t are I(1). The number of cointegrating vectors r is given by the rank of Π. The test itself produces two separate test statistics, Trace statistics (λ_{trace}) and Maximum Eigenvalue statistics $(\lambda_{\max})$, which are calculated using the maximum likelihood estimates of the VAR(p) model. Both of the test statistics can be used to determine the number of cointegrating vectors, r, in the system.

In the JJ's test procedure, it is important to select the deterministic component in the cointegrated VAR models before estimating and drawing inferences on the VECM as described in equation (6). There are five possible combinations of deterministic components that are contained in the JJ test procedure (see Johansen, 1995). The most restrictive model (Model 1) contains no deterministic components and the least restrictive model (Model 5) contains quadratic trends in levels. The five models are nested so that Model 1 is contained in Model 2 and so on. As suggested by Hansen and Juselius (1995), this study uses a method called the 'Pantula principle' to determine the deterministic components in the VAR models. The 'Pantula Principle' suggests the following procedures: start from the most restrictive model (Model 1) and then compare the rank test statistic, either Trace statistics or Maximum Eigenvalue statistics, with the critical values of the test. If the model is rejected, continue to Model 2, which restricts the constant to the cointegration equation. If this model is also rejected, go to Model 3 where there is an unrestricted constant. In the case of rejection, proceed to Model 4, which includes linear trends in both the variables and the cointegration

equation. If this is also rejected, repeat the procedure for Model 5. If all five models are rejected, repeat the procedure for the next rank. Continue until the null hypothesis cannot be rejected for the first time.

If current account and all the explanatory variables specified in equation (1) are found to be cointegrated, the long-run impacts of all the explanatory variables on current account will be analysed based on the estimated cointegrating vector(s). However, a potential problem arises here in this study is that, since the dimension of the vector of variables, X_t, as specified in equation (5) is equal to five, the cointegrating vector, *r,* may not be unique. In the presence of multiple cointegrating vectors, the resulting estimates are not directly interpretable unless some identifying restrictions are imposed. If this is the case, the identification problem will be addressed later in this paper.

Given the presence of cointegration(s), the VECM as described by equation (6) is used to examine the short-run impacts of all the explanatory variables on current account for each sample economy. The VECM is a powerful model and reveals information beyond the long-run cointegrating relationship(s). The purpose of VECM is to focus on the short-run dynamics of the endogenous variables in the system, while making them consistent with their long-run cointegrating relationship(s). If a number of variables are found to be cointegrated with at least one cointegrating vector, then there always exists a corresponding error correction representation which implies that changes in the dependent variable can be formulated as a function of the level disequilibrium in the cointegration relationship and fluctuation in other explanatory variables.

This paper focuses on two main things when estimating the VECM. One thing is the speed of adjustment of current account to deviation from its long-run equilibrium, which can be evaluated through the estimated coefficient of the error correction term that derived from the cointegrating vector. The other thing is the short-run impact of all the explanatory variables specified in equation (1) on current account. This can be done by analysing the FILM estimates of the current account equation from the VECM.

In addition, a uni-directional short-run Granger causality test is applied in the short-run analysis to shed some light on the short-run causality between current account and other

explanatory variables defined in this study. This test involves a *F*-test on the joint significance of the sum of lags of each explanatory variables. For simplicity, assuming there is just one cointegrating vector, the Granger causality test equation in this study can be specified as follow

$$\Delta ca_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i} \Delta ca_{t-i} + \sum_{i=1}^{p} \beta_{2i} \Delta nfa_{t-i} + \sum_{i=1}^{p} \beta_{3i} \Delta open_{t-i} + \sum_{i=1}^{p} \beta_{4i} \Delta reer_{t-i} + \sum_{i=1}^{p} \beta_{5i} \Delta rel\_y_{t-i} + \beta_6 ect_{t-1} + \varepsilon_t \quad (8)$$

where all the variables are in their first differences, ect_{t-1} is the error correction term derived from the cointegrating vector, β_0 is a constant, ε_t is a random error, and p represents the number of lags included in the test. To see whether the initial stock of NFA (*nfa*), has a short-run causal relationship with the current account (*ca*), the null hypothesis of this particular test is given by

$$H_0 : \sum_{i=1}^{p} \beta_{2i} = 0$$

where the test statistics follows a *F*-distribution. If the null is rejected, it implies that the initial stock of NFA Granger causes the current account in the short-run, *vice versa*. Following the same rationale, I can test for the other explanatory variables.

7 Empirical Results

7.1 Lag Order Selection for VAR

It is well known that the VAR analysis may depend critically on the lag order selection of the VAR model. Sometimes, different lag orders can seriously affect the substantive interpretation of VAR estimates when those differences are large enough (see e.g. Hamilton and Herrera 2004, Kilian 2001). Therefore, selecting the right lag order for each VAR is a very important preliminary step in this empirical study.

The most common strategy in empirical studies is to select the lag order by some pre-specified criterion and to condition on this estimate in constructing the VAR estimates. There are four most commonly used lag order selection criteria in the literature, which are the Akaike Information Criterion (AIC), the Schwarz Information Criterion (SIC), the Hannan-

Quinn Criterion (HQC) and the general-to-specific sequential Likelihood Ratio test (LR). However, these criteria may draw different conclusions on the lag order. Ivanov and Kilian (2005) use Monte Carlo simulations to compare these four criteria. Their study concludes that for monthly VAR models, the AIC tends to produce the most accurate structural and semi-structural estimates for realistic sample sizes, while the HQC appears to be the most accurate criterion for quarterly VAR models, if sample sizes are larger than 120. However, if sample sizes are smaller than 120, then the SIC becomes the most accurate criterion. For persistence profiles based on quarterly VECMs with known cointegrating vector, their results suggest that the SIC is the most accurate criterion for all realistic sample sizes.

Given that only quarterly VAR/VECM models are estimated in this analysis and the largest sample size is 117, the SIC is used here to select the lag length for each estimated VAR. Table 2 below reports the results for the lag length selection based on the SIC. The results suggest that the optimal lag length should be 1 for Malaysia, Singapore and Thailand and 2 for China, Hong Kong, Korea and Philippines. In the case of India, the suggested optimal lag length is 4.

Table 2: Lag Order Selection for Each Estimated VAR

Lag	China	Hong Kong	India	Korea	Malaysia	Philippines	Singapore	Thailand
0	-13.96	-1.67	-10.86	-8.02	-4.56	-15.41	-1.87	-6.78
1	-23.30	-13.61	-21.94	-19.93	-15.25^{+}	-25.14	-15.49^{+}	-16.31^{+}
2	-23.65^{+}	-14.42^{+}	-21.63	-20.19^{+}	-15.08	-25.27^{+}	-15.34	-16.23
3	-22.98	-14.18	-21.61	-20.04	-15.15	-24.52	-14.52	-15.45
4	-23.29	-14.56	-21.93^{+}	-19.38	-14.50	-24.06	-13.65	-14.99
5	-22.72	-13.00	-21.80	-18.84	-14.02	-23.38	-13.14	-14.69
6	-21.88	-12.36	-20.98	-18.16	-13.18	-22.89	-12.48	-13.93
7	-21.26	-11.66	-20.36	-17.67	-12.29	-22.06	-11.88	-13.15
8	-20.45	-10.91	-19.87	-16.75	-11.69	-21.40	-11.09	-12.59

Note: + indicates lag order selected by the Schwarz Information Criterion.

In addition, to ensure that the selected lag lengths are appropriate, two multivariate diagnostic tests are applied to the unconditional VAR models to examine whether the estimated residuals deviate from being Gaussian. To be more specific, the presence of serial correlation in the residuals is tested by using the multivariate Lagrange Multiplier (hereafter LM) test by

adopting same lag length as suggested by the SIC for each estimated VAR. Meanwhile, Jarque-Bera (henceforth JB) normality joint test is applied to check the normality of the error terms from the unconditional VAR models. Table 3 below reports the results of these two diagnostic tests.

Table 3: Lag Order Selection for Each Estimated VAR

	LM Test		Normality Test
	Lag Length in the Test	Test Statistics	Test Statistics
China	2	25.26 [0.447]	1034.60 [0.000]***
Hong Kong	2	37.13 [0.156]	21.31 [0.016]**
India	4	28.10 [0.302]	26.16 [0.004]***
Korea	2	33.57 [0.117]	17.69 [0.041]**
Malaysia	1	31.36 [0.177]	113.22 [0.000]***
Philippines	2	30.23 [0.216]	196.62 [0.000]***
Singapore	1	25.96 [0.409]	70.51 [0.000]***
Thailand	1	35.23 [0.084]*	81.86 [0.000]***

Notes: 1. Null hypothesis in the LM test is specified as 'there is a serial correlation in the residual term up to the n^{th} order' where n refers to the number of lags included in the test.
2. Null hypothesis in the JB's normality test is specified as 'the residual term is normally distributed'.
3. *, ** and *** denote the rejection of the null hypothesis at 10%, 5% and 1% significance level respectively; numbers in square bracket denote test probability values.

The LM test results suggest that there is no serial correlation in all cases at 5% significance level. In other words, there are no deviations from the basic assumptions of residual independence. On the other hand, the JB joint test results indicate that all the estimated VARs seem to exhibit residual non-normality at 5% significance level or lower.[10] However, since the asymptotic properties of the JJ test depend only on the independent and identically distributed (i.i.d.) assumption of the residuals, non-normality of the error terms is not crucial for inference. Furthermore, in a simulation study, Gonzalo (1994) also shows that the JJ's maximum likelihood approach is robust to non-normality and even heteroscedasticity.

[10] As noted during the test, the null hypothesis that the residuals have a normal distribution is rejected mainly due to excess kurtosis. Paruolo (1997) has demonstrated that in instances where normality is rejected for this reason, rather than skewness, the JJ's results are not affected.

7.2 Cointegration Rank

Table 4: Johansen – Juselius Cointegration Test Results

Panel A: Trace Statistics: λ_{trace}

	Lag Length	H0 : r = 0 H1 : r = 1	H0 : r ≤ 1 H1 : r = 2	H0 : r ≤ 2 H1 : r = 3	H0 : r ≤ 3 H1 : r = 4	H0 : r ≤ 4 H1 : r = 5
China	2	78.25 [0.039]**	41.37 [0.403]	21.40 [0.636]	9.96 [0.644]	1.19 [0.925]
Hong Kong	2	75.52 [0.016]**	42.25 [0.152]	22.81 [0.256]	6.37 [0.652]	1.23 [0.268]
India	4	115.93 [0.000]***	41.58 [0.171]	20.93 [0.362]	8.42 [0.421]	1.59 [0.208]
Korea	2	76.04 [0.015]**	42.10 [0.156]	20.56 [0.386]	6.49 [0.637]	0.05 [0.827]
Malaysia	1	98.80 [0.008]***	58.81 [0.124]	29.83 [0.512]	13.33 [0.712]	4.42 [0.681]
Philippines	2	79.37 [0.032]**	42.62 [0.346]	19.31 [0.769]	8.30 [0.799]	2.48 [0.682]
Singapore	1	75.82 [0.015]**	42.86 [0.136]	22.77 [0.258]	10.34 [0.256]	0.59 [0.439]
Thailand	1	81.88 [0.020]**	46.81 [0.189]	20.85 [0.672]	9.78 [0.661]	3.44 [0.503]

Panel B: Max-Eigen Value: λ_{max}

	Lag Length	H0 : r = 0 H1 : r = 1	H0 : r ≤ 1 H1 : r = 2	H0 : r ≤ 2 H1 : r = 3	H0 : r ≤ 3 H1 : r = 4	H0 : r ≤ 4 H1 : r = 5
China	2	36.88 [0.028]**	19.97 [0.415]	11.43 [0.710]	8.77 [0.459]	1.19 [0.925]
Hong Kong	2	33.28 [0.059]**	19.44 [0.382]	16.44 [0.200]	5.14 [0.724]	1.23 [0.268]
India	4	74.34 [0.000]***	20.65 [0.298]	12.51 [0.498]	6.83 [0.510]	1.59 [0.208]
Korea	2	33.94 [0.049]**	21.54 [0.245]	14.07 [0.360]	6.44 [0.557]	0.05 [0.827]
Malaysia	1	39.99 [0.032]**	28.98 [0.125]	16.50 [0.500]	8.91 [0.734]	4.42 [0.681]
Philippines	2	36.75 [0.029]**	23.31 [0.204]	11.01 [0.749]	5.82 [0.808]	2.48 [0.682]
Singapore	1	32.96 [0.064]*	20.09 [0.335]	12.43 [0.505]	9.74 [0.229]	0.59 [0.439]
Thailand	1	35.07 [0.047]**	25.96 [0.104]	11.06 [0.744]	6.35 [0.748]	3.44 [0.503]

Note: ***,*** ** and *** denote the rejection of the null hypothesis at 10%, 5% and 1% significance level respectively numbers in square bracket denote the MacKinnon-Haug-Michelis (1999) probability values.

Table 4 above reports the JJ cointegration tests results for each sample economy. According to the reported test results, λ_{trace} suggests that there is only one cointegrating relationship

among all the variables at 5% significance level for all the economies. Meanwhile, λ_{max} also indicates a single cointegrating vector among all the variables at 5% significance level for most sample economies, except Hong Kong and Singapore where the null is rejected marginally below 5% but comfortably at 10 % significance level. Overall, both test statistics confirm that there is a unique long-run relationship existing between the current account balance and the explanatory variables specified in equation (1) at 10% significance level for all the sample economies. Since there is only one cointegrating vector for all sample economies, identification problem is out of the consideration in this study.

7.3 Long-Run Determinants of Current Account

Given that the cointegration rank is equal to 1 for all the sample economies, the next step is to normalise the unique cointegrating vector. Wickens (1996) points out that the sign and the significance of loading factors, α, are important for normalisation. He indicates that the loading factor associated with the normalised variable must be negative and significant for the error correcting behaviour. Therefore, normalisation of the unique cointegrating vector in this study is accomplished based on the strategy suggested by Wickens (1996).

Table 5 on the next two pages reports the normalised cointegrating vectors and the associated loading factors. Panel A reports the results when normalisation is made on the current account balances, *ca*, for all the sample economies. It is clear that, based on the sign and significance of the loading factors, normalising the unique cointegrating vector on *ca* is appropriate for all sample economies expect for China where normalisation on *ca* is implausible due to the wrong sign (i.e. positive) and insignificance of the loading factor associated with *ca*. As a result, the unique cointegrating vector is normalised on the initial stock of net foreign assets, *nfa*, for China since normalisations on the other variables including the REER, trade openness and relative income can result either wrongly signed and insignificant loading factors or implausible values for the normalised cointegrating vectors.

Panel B reports the revised normalisation results for China. Results in Panel B show that, after normalising on *nfa*, the associated loading factor is correctly signed and statistically

Table 5: Estimated Johansen – Juselius Cointegrating Vectors

Panel A

	Normalized cointegrating coefficients, β	Loading Factors/Adjustment coefficients, α				
		Δca	Δnfa	$\Delta open$	$\Delta reer$	Δrel_y
China	$ca = 0.294nfa - 0.615open - 0.395reer - 0.079rel\_y + 2.07$	0.011	0.164	-0.452	0.007	-0.033
	(0.049) (0.136) (0.067) (0.651)	(0.032)	(0.054)	(0.196)	(0.171)	(0.011)
	[0.000]*** [0.002]*** [0.000]*** [0.925]	[0.825]	[0.004]***	[0.021]**	[0.971]	[0.006]***
Hong Kong	$ca = 0.015nfa + 0.150open - 0.099reer - 0.144rel\_y$	-0.492	1.724	0.175	-0.183	-0.118
	(0.003) (0.042) (0.033) (0.083)	(0.111)	(0.724)	(0.270)	(0.102)	(0.066)
	[0.008]*** [0.671] [0.054]* [0.213]	[0.000]***	[0.018]**	[0.607]	[0.166]	[0.134]
India	$ca = 0.076nfa + 1.058open - 0.056reer - 0.291rel\_y$	-0.205	0.795	0.198	-0.333	-0.402
	(0.017) (0.171) (0.024) (0.064)	(0.064)	(0.156)	(0.061)	(0.092)	(0.113)
	[0.000]*** [0.000]*** [0.027]** [0.000]***	[0.009]***	[0.000]***	[0.001]***	[0.000]***	[0.000]***
Korea	$ca = 0.041nfa - 0.026open - 0.251reer - 0.137rel\_y - 1.26$	-0.144	0.010	0.153	-0.074	-0.173
	(0.026) (0.122) (0.061) (0.055)	(0.055)	(0.075)	(0.077)	(0.119)	(0.043)
	[0.238] [0.857] [0.004]*** [0.067]*	[0.001]***	[0.900]	[0.124]	[0.625]	[0.001]***
Malaysia	$ca = -0.048nfa - 0.250open - 0.410reer - 0.547rel\_y$	-0.309	-0.289	-0.723	0.052	-0.316
	(0.012) (0.079) (0.155) (0.141)	(0.079)	(0.161)	(0.216)	(0.069)	(0.073)
	[0.001]*** [0.090]* [0.168] [0.091]*	[0.001]***	[0.132]	[0.015]**	[0.562]	[0.002]***
Philippines	$ca = -0.195nfa - 0.050open - 0.031reer + 0.023rel\_y + 0.09$	-0.195	-0.160	-3.298	1.028	0.880
	(0.040) (0.011) (0.010) (0.013)	(0.097)	(0.068)	(0.955)	(0.752)	(0.288)
	[0.004]*** [0.005]*** [0.097]* [0.206]	[0.063]*	[0.091]*	[0.006]***	[0.268]	[0.010]**
Singapore	$ca = -0.057nfa + 0.130open - 0.292reer + 0.793rel\_y$	-0.194	-0.743	0.569	-0.031	0.016
	(0.011) (0.042) (0.175) (0.106)	(0.073)	(0.199)	(0.158)	(0.020)	(0.025)
	[0.001]*** [0.057]* [0.267] [0.001]***	[0.002]***	[0.002]***	[0.011]***	[0.193]	[0.581]
Thailand	$ca = -0.045nfa + 0.436open + 0.517reer - 0.505rel\_y$	-0.348	0.142	0.271	0.081	-0.082
	(0.017) (0.098) (0.190) (0.114)	(0.076)	(0.254)	(0.102)	(0.084)	(0.039)
	[0.204] [0.083]* [0.148] [0.032]**	[0.000]***	[0.770]	[0.018]**	[0.390]	[0.109]

(Table 5 continued)

Panel B: China's Case

Revised normalized cointegrating coefficients, β				Loading Factors/Adjustment coefficients, α				
				Δnfa	Δca	$\Delta open$	$\Delta reer$	Δrel_y
$nfa = 3.396ca + 2.088open - 1.343reer + 0.269rel\_y + 7.04$				-0.048	-0.003	0.133	-0.002	0.009
(1.332)	(0.326)	(0.147)	(2.306)	(0.016)	(0.009)	(0.058)	(0.051)	(0.003)
[0.072]*	[0.002]***	[0.000]***	[0.925]	[0.004]***	[0.769]	[0.021]**	[0.971]	[0.006]***

Note: 1. Standard errors are in parentheses. P-values are in square brackets.
2. ***,** ** and *** denote the rejection of the null hypothesis at 10%, 5% and 1% significance level respectively.

significant at 1% significance level. The cointegrating vectors are all correctly signed and significant at 10% significance level except that the coefficient associated with relative income, *rel_y*, is correctly signed but statistically insignificant. Therefore, the magnitude of the normalised cointegrating vectors, β, also confirms that normalising on *nfa* is appropriate for China. Since normalisation on *ca* is implausible for China, China is treated as a special case and will be discussed separately after the analysis of the other seven sample economies' long-run results.

The normalised cointegrating vectors reported in table 5 panel A suggest that the initial stock of NFA, trade openness, REER and domestic relative income have different long-run impacts on the current account balances across the seven sample economies. First of all, the coefficient of initial level of NFA stocks is statistically significant in the ca_t cointegrating equation at 1% significance level for all sample economies except for Korea and Thailand. However, the sign of this coefficient is different across economies. In the cases of Hong Kong and India, the initial stock of NFA has a positive impact on the long-run current account developments. This implies that, for these two economies, when initial stock of NFA is high, current account balance increases in the long-run due to large net investment earnings from abroad. This is consistent with both the prediction of the intertemporal approach and the result found by most of the studies in the existing empirical literature using cross section or panel estimation approach.

On the other hand, the initial stock of NFA has a negative effect on the current account balance in the long-run for Malaysia, Philippines and Singapore, which is contradictory with

the common finding in the empirical literature. However, from an intertemporal perspective, this negative relationship can be interpreted in a way that economies with a relatively high initial level of NFA can afford to run current account deficits for an extended period and still remain solvent. In the cases of Malaysia, Philippines and Singapore, this negative effect dominates the positive effect resulted from large net investment earnings from abroad when initial stock of NFA is high. For Korea and Thailand, the initial stock of NFA does not have a significant role in explaining the long-run current account developments.

Second, the coefficient of trade openness is statistically significant at 10% significance level for all selected economies except for Hong Kong and Korea. In the cases of Malaysia and Philippines, the estimated coefficient shows a negative relationship between the trade openness and the current account balance in the long-run, which coincides with both the prediction of the intertemporal approach and the finding of Chinn and Prasad (2003). This result suggests that trade liberalisation policies can reduce the current account balances in the long-run. As the intertemporal approach pointed out, a higher degree of trade openness indicates a more liberalized trade system that makes an economy more attractive to foreign direct investments. Consequently, an economy's capital account will increase but its current account will decrease.

Nevertheless, the coefficient of trade openness enters positively into the cointegrating equation for India, Singapore and Thailand, which contradicts with the findings in the common empirical literature and violates the prediction of the intertemporal approach. However, Lane (2000) postulates that a higher degree of trade openness is often associated with greater output volatility, which calls for the need to accumulate substantial net foreign assets for the purpose of income smoothing and risk diversification by incurring current account surplus. Also, a more liberalized trade system with less trade restrictions may lead to lower domestic prices and depreciated real exchange rates (Edwards and Ostry (1990) and Goldfajn and Valdes (1999)), which help to improve the current account balances.

Third, the estimated coefficient of REER is statistically significant at 10% significance level for all the sample economies except for Malaysia and Singapore, which implies that the REER does not have an impact on the long-run current account developments in these two economies. Furthermore, the estimated coefficient of REER enters negatively into the

cointegrating equation for most of the sample economies. This result is supported by the common literature, which suggests that an increase in the REER can reduce the propensity to save and therefore cause a decrease in an economy's current account balance.

However, one thing worth noticing there is that the estimated coefficient of REER appears to be positive in the case of Thailand, which is inconsistent with the common finding in the empirical literature. However, this could be explained by the smooth consumption hypothesis. Obstfeld and Rogoff (1995) argue that the current account can act as a buffer to smooth consumption when there are shocks to domestic savings. For example, in response to a real effective exchange rate appreciation, an open economy would prefer to run a current account surplus and invest abroad rather than allow consumption to increase. A real appreciation in the domestic currency would therefore result in an improvement of the current account (Herrmann and Jochem, 2005). However, this positive coefficient is statistically insignificant in the case of Thailand.

Finally, the coefficient of domestic relative income appears to be statistically significant at 10% significance level for all the sample economies except for Hong Kong and Philippines. On one hand, in the case of Singapore, the estimation result suggests a positive long-run relationship existing between the domestic relative income and current account balances. This result the intertemporal approach suggests that the stage of economic development is an important factor confirms the role of stage of economic development in explaining the long-run current account developments as suggested by the intertemporal approach. It also coincides with the empirical findings of Chinn and Prasad (2003).

On the other hand, the domestic relative income has a negative long-run impact on the current account in the cases of India, Korea, Malaysia and Thailand. This result rejects the 'stages of development' hypothesis, which expects that less developed economies run current account deficits due to their high demands in foreign capitals. In particular, the estimation results indicate that if the domestic income in these four economies is 1% below the U.S. income level, their current account balances would improve by approximately 0.137 (Korea) to 0.547 (Malaysia) of a percentage point. However, this finding is consistent with the findings of Aristovnik (2007) for countries in the Middle East and North Africa (MENA) region.

Next, let us now turn back to the China's case. According to the results reported in table 5 panel A, the loading factor associated with *ca* is wrongly signed and statistically insignificant for China when normalisation is made on *ca*. This result implies that the current account balances in China is weakly exogenous in the VAR system. This surprising finding suggest that, at least in the long-run, current account is not driven by any other variables in the system, but instead is likely to influence them by itself. Since the unique cointegrating vector is normalised on *nfa* in the case of China, the underlying implication for policy analysis is that current account can be used as a policy instrument in China to control its stock of net foreign assets.

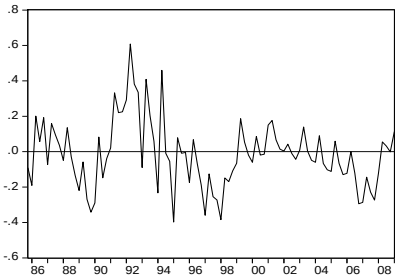
Further, table 5 panel B reports the results when normalisation is made on *nfa* for China. The results indicate that all the cointegrating coefficients are statistically significant at 10% significance level or lower expect the coefficient of domestic relative income. Moreover, all the cointegrating coefficients are with the expected signs as predicted by the common literature.

To be more specific, first, an increase in the China's current account balance has a positive effect on the NFA since the NFA position reflects the cumulative addition of all prior current account balances. Second, trade openness is also positively associated with the NFA position, which can be interpreted in a way that, an economy with less trade restrictions and more exposure to international trade tends to be relatively more attractive to foreign capital and therefore increases the NFA. Third, a negative relationship is found between the REER and NFA. Indeed, an increase in the REER in this study implies an appreciation in the home currency that can worsen the current account and thus decrease the accumulation of NFA. Finally, the positive relationship between domestic relative income and the NFA can be explained in several ways. According to the traditional stages of development hypothesis for balance of payments, when an economy moves from a low to an intermediate stage of development, the economy typically imports capital from abroad. As a result, the NFA increases. On the other hand, as suggested by Lane and Milesi-Ferretti (2001), if an economy grows richer is due to a decrease in the domestic marginal product of capital, domestic investment would fall and home investors would look for oversea investment opportunities.

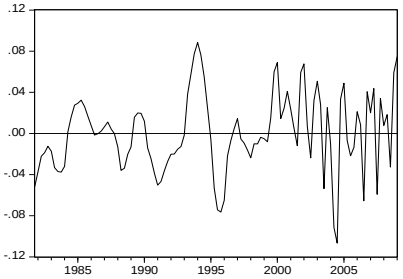
Figure 4 on the next page presents the estimated cointegrating vectors obtained by the JJ's

Figure 4: Estimated Johansen-Juselius Cointegrating Vectors

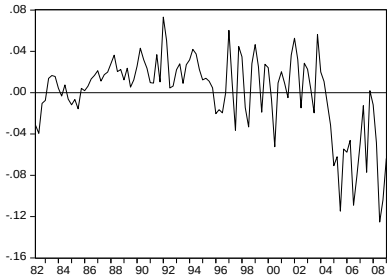
China



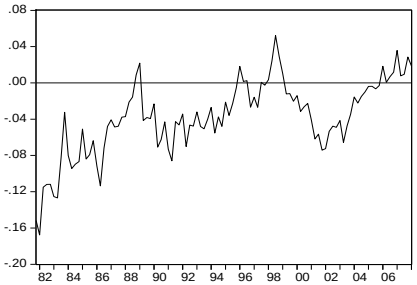
Hong Kong



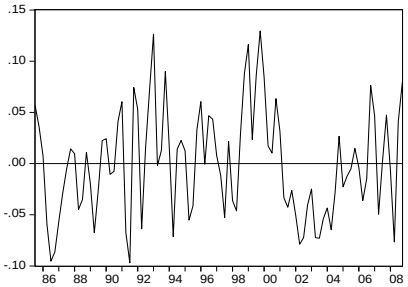
India



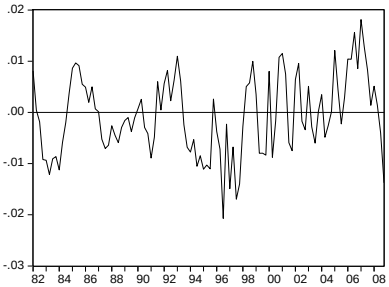
Korea



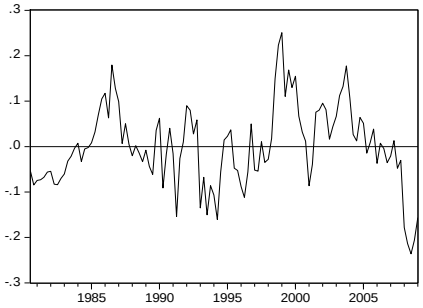
Malaysia



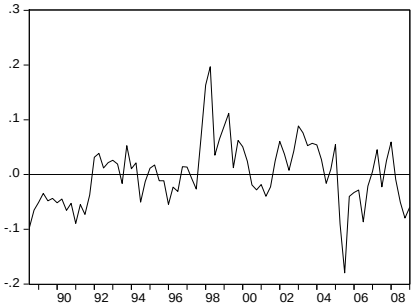
Philippines



Singapore



Thailand



approach. For all the sample economies the estimated cointegrating vector is normalised on *ca* except that the estimated cointegrating vector is normalised on *nfa* in the case of China. It clearly reveals that, toward the end of the sample period, most of the other sample economies have had their current account positions close to the long-run equilibrium positions (i.e. the zero line in figure 4), while China has had its initial NFA position close to its long-run equilibrium position. However, the figure suggests that India and Singapore had relatively large current account deviations from their current account equilibrium values (i.e. depart from the zero line in figure 4). To find out whether these large deviations in the long-run can be explained by a slow adjustment toward an otherwise healthier long-run position in these

two economies, I now turn my attention to the short-run dynamics of current account immediately in the next section.

7.4 Short-Run Dynamics of Current Account

In this section, the linear VECM described by equation (6) is used to investigate the short-run dynamics of each sample economy's current account. The VECM is estimated by the Full Information Maximum Likelihood (FIML) method. A focus has been clearly made on the Δca_t equation of each VECM in the analysis in order to find out the effects of the explanatory variables have on the current account in the short-run and also whether the current account can successfully self-adjust each time it diverges from its long-run equilibrium value. Table 6 on the next page presents the estimated results of the parsimonious form of the Δca_t equations for all sample economies except for China. Again, China is treated as a special case and will be discussed separately towards the end of this section.

As reflected in the results reported in the table 6 panel A, the short-run effects of *nfa, open, reer* and *rel_y* on current account are very different across the seven sample economies. First of all, the initial stock of NFA shows no significant short-run effect on the current account for most of the seven sample economies. However, in the cases of Hong Kong and Thailand, the initial stock of NFA has a significant negative contemporaneous effect on these two economies' current account balances. Second, the short-run effect of the trade openness appears to be significant in only three economies. To be more specific, it has a positive short-run effect on the Malaysia's current account and a negative on the India and Thailand's current account balances. Third, REER has an expected negative contemporaneous effect on the short-run current account adjustment for India, Korea and Thailand. Finally, the short-run effect of the domestic relative income appears to be significant only in the case of Thailand where the effect is negative. These findings suggest two things. One thing is that the initial position of NFA and the degree of trade openness have less important roles to play in the short-run dynamics of current account than they would do in the long-run. The other thing is that, for most of the sample economies, given the significance of the lagged terms of Δca and the insignificance of the lagged terms of Δnfa, $\Delta open$, $\Delta reer$ and Δrel_y, this implies that the major determinant of the short-run current account adjustment is the latter's tendency to return to its long-run equilibrium position.

Table 6: Estimated Δca_t Equation of the VECM System

Panel A: Estimation of Δca_t Equation

	Hong Kong	India	Korea	Malaysia	Philippines	Singapore	Thailand
α							0.009 [0.018]**
Δca_{t-1}		-0.475 [0.000]***	-0.225 [0.049]**		-0.288 [0.012]**	-0.248 [0.015]**	-0.266 [0.097]*
Δca_{t-2}		-0.366 [0.004]***					
Δca_{t-3}		-0.387 [0.005]***					
Δnfa_{t-1}							-0.062 [0.022]**
Δnfa_{t-2}	-0.019 [0.059]*						
$\Delta open_{t-1}$		-0.393 [0.001]***		0.105 [0.013]**			-0.445 [0.000]***
$\Delta open_{t-2}$		-0.434 [0.008]***					
$\Delta open_{t-3}$		-0.566 [0.003]***					
$\Delta reer_{t-1}$			-0.118 [0.054]*				-0.775 [0.000]***
$\Delta reer_{t-2}$							
$\Delta reer_{t-3}$		-0.163 [0.016]**					
$\Delta reer_{t-4}$		-0.150 [0.036]**					
Δrel_y_{t-1}							-0.559 [0.005]***
Δrel_y_{t-2}							
ect_{t-1}	-0.492 [0.000]***	-0.205 [0.009]***	-0.144 [0.001]***	-0.309 [0.001]***	-0.195 [0.063]*	-0.194 [0.002]***	-0.348 [0.000]***

Note: 1. All the insignificant variables are removed from the system to leave the conditional VECM in its parsimonious form.

Panel B: Diagnostic Tests of Δca_t Equation (p-values)

	Hong Kong	India	Korea	Malaysia	Philippines	Singapore	Thailand
LM test for autocorrelation	0.13	0.23	0.11	0.53	0.19	0.15	0.18
JB's Normality Test	0.08*	0.10	0.19	0.49	0.60	0.19	0.52
LM F-test for ARCH	0.31	0.15	0.13	0.70	0.13	0.64	0.29
White's test for heteroscedasticity	0.15	0.17	0.26	0.17	0.76	0.60	0.11

2. P-values are in square brackets. ***,** ** and *** denote the rejection of the null hypothesis at 10%, 5% and 1% significance level respectively.
3. The ect_{t-1} is derived from the long-run cointegrating vector normalised on ca_t.
4. The null hypothesis in ARCH test is 'the residual does not have autoregressive conditional heteroscedasticity'; the null hypothesis in the White's test is 'the residual does not have heteroscedasticity'.

The estimated error correction term, ect_{t-1}, reported in table 6 panel A can shed more light on the short-run dynamics of the current account. When a gap between the current account and its equilibrium level arises, the current account will tend to converge to its equilibrium level. Depending on the cause of the gap, the adjustment requires that the current account either moves progressively toward a new equilibrium level, or returns from its temporary deviation to the original equilibrium value. The results show that the error correction term is statistically significant at 10% for all for seven sample economies. This implies that, for these economies, their current accounts can successfully converge to their own long-run equilibrium positions each time when there is a shock in the external sector. The estimated coefficient values of the ect_{t-1} suggest that the speeds of the current account adjustment are quite different across the seven sample economies. The size of the error correction has a range from -0.144 (Korea) to -0.492 (Hong Kong), suggesting slow to moderate speed of adjustment. To be more specific, for Korea, about 14.4% of the current account deviation would be eliminated every quarter, implying that in the absence of further shocks the whole current account gap would be closed within two years. On the other hand, given a higher speed of adjustment rate in Hong Kong, in the absence of further shocks the entire current account gap would be closed roughly about half a year.

Further analysis on the short-run dynamics of the current accounts is carried out by testing the hypothesis of weak exogeneity for *nfa*, *open*, *reer* and *rel_y*. The test is performed by imposing zero restriction on the ect_{t-1} term in each of the five equations constituting the VECM system given by equation (4). Since the ect_{t-1} term is derived from the long-run cointegration relationship that normalised on *ca*, the significance of the ect_{t-1} term will indicate the long-run causal relationship between the long-run fluctuations of the current account and the short-run dynamics of all the other variables in the VECM system. The test results are presented in the earlier table 5 panel A.

Concentrating on the right-hand-side section of table 5 panel A (i.e. loading factors or adjustment coefficients) and ignoring the China's case which will be discussed separately later on, the estimated loading factors suggest that the initial stock of NFA is weakly exogenous only in Korea, Malaysia and Thailand; trade openness is weakly exogenous only in Hong Kong and Korea; REER is weakly exogenous in all seven sample economies except

India, and domestic relative income is weakly exogenous only in Hong Kong, Singapore and Thailand.

The above results have two important implications. First, in the majority of the seven sample economies, excessive volatility of the current account resulting from the short-run fluctuations of the current account is smoothed out by modifying the stock of NFA, degree of trade openness and domestic income throughout the long-run. Second, the weakly exogenous REER term in most of the sample economies indicates structural rigidities for these emerging Asian economies, as the REER term is a measure of an economy's international competitiveness. On the other hand, the non-weakly exogenous REER in India suggests that India has a higher degree of adaptability to changing external sector conditions and a competitive advantage relative to the rest of the selected economies in emerging Asia. The diagnostic tests results reported in table 6 panel B on earlier page indicate that, for all the seven sample economies, there are no signs of autocorrelation, heteroscedasticity, and residuals are normally distributed at 5% significance level.

Now, let us look at the China's case. Although current account does not react to long-run disequilibria in *nfa, openness, reer* and *rel_y*, it may still react to changes in these variables in the short-run. Table 7 panel A below reports the estimated results of the parsimonious form of the Δca_t equation for China. As noticed earlier, the ect_{t-1} term does not significantly enter into the Δca_t equations at 10% significance level in the case of China. This implies that, in the case of China, deviations from the long-run equilibrium value of the current account cannot be corrected through a self-adjusting mechanism in the short-run. Moreover, the estimated results suggest that the China's current account is only influenced by the REER in

Table 7: China's Case: Estimated Δca_t and Δnfa_t Equations of the VECM System

Panel A

$$\Delta ca_t = \underset{[0.014]^{**}}{-0.049}\,\Delta reer_{t-1}$$

Diagnostic Tests	p-value
LM F-test for autocorrelation:	0.83
Jarque-Bera Chi-square test for normality:	0.09*
LM F-test for ARCH:	0.91
White's Chi-square test for heteroscedasticity:	0.95

(Table 7 continued)

Panel B

$$\Delta nfa_t = \underset{[0.007]***}{-0.048}\, ect_{t-1} + \underset{[0.027]**}{0.384}\,\Delta ca_{t-1} + \underset{[0.000]***}{0.762}\,\Delta nfa_{t-1} - \underset{[0.028]**}{0.079}\,\Delta open_{t-1} - \underset{[0.000]***}{0.112}\,\Delta reer_{t-2}$$

Diagnostic Tests	p-value
LM F-test for autocorrelation:	0.23
Jarque-Bera Chi-square test for normality:	0.14
LM F-test for ARCH:	0.55
White's Chi-square test for heteroscedasticity:	0.16

Note: 1. All the insignificant variables are removed from the system to leave the conditional VECM in its parsimonious form.
2. P-values are in square brackets. ***,** ** and *** denote the rejection of the null hypothesis at 10%, 5% and 1% significance level respectively.
3. The ect_{t-1} is derived from the long-run cointegrating vector normalised on nfa_t.

the short-run. To be more specific, an increase in the REER is likely to decrease the current account balance in the short-run. This effect is like to be due to the temporary loss in the international competitiveness.

Moreover, table 7 panel B above reports the estimated results of the parsimonious form of the Δnfa_t equation for China. The results suggest that the current account is a significant factor in the short-run fluctuations of NFA. This finding implies that, in the dynamic system, China alters its initial stock of NFA in response to the current account fluctuations in the short-run in order to correct for deviations from the long-run path, but not the other way around. At 5% significance level, the diagnostic tests results reported in table 7 indicate no signs of autocorrelation, heteroscedasticity and non-normality for the estimated residual term in the corresponding equations.

Finally, table 8 on the next page presents the results of the uni-directional short-run Granger causality tests for all the eight sample economies. The results suggest that initial stock of NFA Granger causes current account only in the cases of Hong Kong and Thailand; trade openness has a short-run causal relationship with current account in the cases of India, Malaysia and Thailand; REER has a short-run causal relationship with current account in the cases of China, India and Thailand; and relative income Granger causes current account only in the cases of India and Thailand. Overall, most of the explanatory variables do not have a

Table 8: Uni-directional Short-run Granger Causality Test

Test equation:

$$\Delta ca_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i} \Delta ca_{t-i} + \sum_{i=1}^{p} \beta_{2i} \Delta nfa_{t-i} + \sum_{i=1}^{p} \beta_{3i} \Delta open_{t-i} + \sum_{i=1}^{p} \beta_{4i} \Delta reer_{t-i} + \sum_{i=1}^{p} \beta_{5i} \Delta rel\_y_{t-i} + \beta_6 ect_{t-1} + \varepsilon_t$$

	China	Hong Kong	India	Korea	Malaysia	Philippines	Singapore	Thailand
Δnfa_{t-i}	[0.870]	[0.095]*	[0.352]	[0.537]	[0.585]	[0.712]	[0.896]	[0.022]**
$\Delta open_{t-i}$	[0.989]	[0.761]	[0.001]***	[0.587]	[0.013]**	[0.986]	[0. 906]	[0.000]***
$\Delta reer_{t-i}$	[0.061]*	[0.738]	[0.000]***	[0.150]	[0.922]	[0.650]	[0.332]	[0.000]***
Δrel_y_{t-i}	[0.163]	[0.441]	[0.005]***	[0.416]	[0.508]	[0.538]	[0.328]	[0.005]***

Note: *, ** and *** denote the rejection of the null hypothesis at 10%, 5% and 1% significance level respectively; numbers in square bracket denote chi-square probability values.

significant short-run causal relationship with current account for most of the selected economies. However, these Granger causality tests results need to be interpreted with cautions due to two main limitations of the test. First, this test is only able to identify 'temporal' causality rather than theoretical causality. Second, the test focuses on the relationship between lagged values of each of the explanatory variables and current values of current account. However many economic relationships involve simultaneous interaction of variables and this simultaneous causal dimension is not picked up at all.

8 Discussion

In general, the empirical evidence found in this paper suggests that the initial stock of net foreign assets, degree of openness to international trade, real exchange rate and relative income have different impacts on the current account balances of the eight selected emerging Asian economies, which implies that these emerging Asian economies are heterogeneous. Moreover, this heterogeneity is an indication of structural differences among the emerging Asian economies toward business cycle heterogeneity, which could be explained by the fundamental structural differences embedded in each of the sample economies.

For example, although China and India are both categorized as low income economies, their

economy structures are fundamentally different from each other where the former is following a socialist economy and the latter is following a mixed economy. Moreover, in contrast to India's neglect of the basic infrastructure, China is investing its surplus in railroad, power, road and water management in a concerted way. There is no question that China still lacks adequate infrastructure, but it has understood clearly the importance of modernizing its basic infrastructure to generate employment, adequate utilization of its vast population and attract more foreign direct investments.

On the other hand, Indian policy makers give the impression that India's strategy to accelerate growth is to leapfrog past technologies through its information technology (IT) acumen. India's services sector has seen a steady increase in growth rates, share of GDP and contribution to GDP growth. However, it is widely recognized that IT cannot move a slow moving economy, burdened with a massive shortfall of infrastructural development, crippling poverty and very high unemployment. Also, Indian policy makers focus more on the domestic demand side rather than the supply side. Consequently, the Indian imports were, on average, higher than its exports over the past few decades, which caused long-lasting current account deficits.

Furthermore, although Hong Kong and Singapore are both high income economies and they do share some similarities (i.e. for examples, both had once been British colonies that served as trading ports; each country developed a flourishing manufacturing sector after World War II and a financial services sector during the 1980s), there are vital differences embedded in the two economies. In general, these structural differences are believed to be the direct result of the contrasting levels of government intervention in these two economies. For instance, while the Hong Kong government has emphasised a policy of laissez faire, the Singaporean government has, since the early 1960s, pursued the accumulation of physical capital via forced national saving and the solicitation of a veritable deluge of foreign investment. However, the forced national savings were wasted over the years by Singapore's policy of 'industrial targeting'. Singapore is a victim of its own targeting policies, which are increasingly driving the economy ahead of its learning maturity into the production of goods in which it has lower and lower productivity. Singapore has had one of the most rapid rates of intra-manufacturing structural change in the world economy. As a consequence, Singapore had one of the lowest returns to physical capital in the world. The days in which Singapore

can continue to sustain accumulation driven growth can be thus clearly numbered.

On the other hand, although Hong Kong's economic system does not strictly adhere to the laissez faire doctrine, it is, by most standards, free of governmental controls (i.e. the government has long supported the predominance of the private sector and there are virtually no restrictions on capital, labor and enterprise). As a result, Hong Kong's more laissez faire policy has made its economy once again the freest in the world. At the same time, Hong Kong has achieved enviable economic growth without compulsory saving, industrial targeting, or other policies that not only impinge on economic freedom but also do nothing in the long run to foster growth.

Finally, structural differences are also lying under the Korea, Malaysia, Philippines and Thailand's economies. For examples, having almost no natural resources and always suffering from overpopulation in its small territory, which deterred continued population growth and the formation of a large internal consumer market, Korea adapted an export-oriented economic strategy to fuel its economy. Meanwhile, the economy of Malaysia is a growing and relatively open state-oriented and newly industrialized market economy. The state plays a significant but declining role in guiding economic activity through macroeconomic plans. Manufacturing has a large influence in the country's economy. Also, Malaysia is the world's largest Islamic banking and financial centre. For Philippines, food processing, textiles and garments and electronics assembly are its important industrial sectors. As a newly industrialized nation, Philippines is still an economy with a large agricultural sector. In the case of Thailand, its economy is heavily export-dependent, with exports accounting for more than two thirds of its GDP and tourism is an important component of its GDP (i.e. 8% in year 2010).

Overall, I find that economic structures are quite heterogeneous across the selected emerging Asian economies even though some of them fall into the same income level category, which is measured by GDP per capita. This heterogeneity may, to some extent, explain why a same set of explanatory variables can have different impacts on each sample economy's current account.

9 Conclusion

This paper provides an empirical analysis of the long-run determinants of current account and also the short-run dynamics of current account adjustment for eight largest emerging Asian economies. Quarterly data from 1980 to 2009 is used in the study. Given the non-stationary nature of the data used in this study, this paper adopts a cointegrated VAR approach to analyze current account balances and a set of macroeconomics determinants. In the presence of a unique cointegration, the long-run determinants of current account are analyzed based on the estimated cointegrating parameters, while the short-run dynamics of current account is investigated according to the estimation of a linear VECM.

The main findings of this study can be summarized as follows. First, current account behaviours in emerging Asian economies are heterogeneous. This heterogeneity is an indication of structural differences among the emerging Asian economies toward business cycle heterogeneity. Second, there is a strongly significant long-run relationship among the current account, initial stock of NFA, trade openness, REER and domestic relative income for all the sample economies. Compared with the REER and domestic relative income, the initial stock of NFA and the degree of trade openness are more important factors in explaining the long-run behaviour of current account in most of the sample economies. Third, current accounts of all sample economies have a self-adjusting mechanism, the only exception being China. On average, the short-run current account adjustment toward long-run equilibrium path is gradual, with the disequilibrium term (ect_{t-1}) being the main determinant of the short-run current account variations.

In addition, compared with other selected economies, I find that China has been a very special case in this study. To be more specific, China's current account is not driven by its initial position of NFA, degree of trade openness, REER and relative income in the long-run. However, it still reacts to changes in the REER in the short-run. Moreover, in the case of China, current account is found to be a significant factor in both the long-run and short-run fluctuations of the initial stock of NFA. This finding implies that current account can be used as a policy instrument in China to control its initial stock of NFA, but not the other way around.

Last but not least, this paper analyses the short-run dynamics of current account adjustment based on a linear VECM. However, it should be noted that current account adjustment process could be non-linear. This opinion has been recently expressed by Clarida *et al.* (2006), Arghyrou and Chortareas (2008) and de Mello and Mogliani (2010).[11] They suggest that linear VECM tend to poorly approximate the non-linear current account adjustment. Moreover, non-linear methods may shed more light on the adjustment mechanism of current account imbalances and could demonstrate how robust the linear framework is. Therefore, an interesting avenue for future research is to both test for and estimate the non-linear current account adjustment for consider the sample economies selected in this paper using more appropriate software.[12]

[11] Clarida *et al.* (2006) use a threshold autoregressive model to assess the current account dynamics for the G7 countries; Arghyrou and Chortareas (2008) test for nonlinear effects in the current account dynamics of the EMU (European Monetary Union) countries using a smooth-threshold error correction model; and de Mello and Mogliani (2010) estimate the determinants of the Brazil's current account in a smooth-transition vector-autoregressive setting.

[12] The author has tried to test and estimate two non-linear current account adjustment models (i.e. including both the logistic smooth threshold model and the quadratic logistic smooth threshold model) using Eviews 6.0 in this study. Unfortunately, due to some unsolved technical bugs of the software, Eviews 6.0 cannot provide consistent and reliable results for the estimations of these two non-linear models. Therefore, an appropriate software is essential to the analysis of the non-linear current account adjustment models in future research.

References

Aristovnik, Aleksander, 2007, "Short- and Medium-Term Determinants of Current Account Balances in Middle East and North Africa Countries," *William Davidson Institute Working Paper* No. 862.

Bernanke, Ben S., 2005, "The Global Saving Glut and the U.S. Current Account," Remarks at the Sandridge Lecture, Virginia Association of Economics, Richmond, VA, March 10.

Calderon, Cesar, Alberto Chong, and Norman Loayza, 2002, "Determinants of Current Account Deficits in Developing Countries," *Contributions to Macroeconomics,* Vol. 2(1), pp. 1021–1021, Berkeley Electronic Press.

Chinn, Menzie D. and Eswar S. Prasad, 2003, "Medium-Term Determinants of Current Accounts in Industrial and Developing Countries: An Empirical Exploration," *Journal of International Economics,* Vol. 59(1) (January), pp. 47–76, Elsevier.

Chinn, Menzie D. and Hiro Ito, 2007, "Current Account Balances, Financial Development and Institutions: Assaying the World 'Saving Glut," *Journal of International Money and Finance,* 26(4), pp. 546–569.

Chinn, Menzie D. and Hiro Ito, 2008, "Global Current Account Imbalances: American Fiscal Policy versus East Asian Savings," *Review of International Economics,* 16(3), pp. 479–498.

Debelle, G. and H. Faruquee. 1996. "What Determines the Current Account? A Cross-Sectional Panel Approach". *IMF Working Paper* No. 96/58.

Edwards, Sebastian, 2007, "On Current Account Surpluses and the Correction of Global Imbalances," *NBER Working Paper* No. 12904.

Edwards, Sebastian and Jonathan D. Ostry, 1990, "Anticipated Protectionist Policies, Real Exchange Rates, and the Current Account: The Case of Rigid Wages," *Journal of International Money and Finance,* Vol. 9, pp. 206–19.

Engle R. and C. Granger (1987) "Co-integration and Error Correction: Representation, Estimation, and Testing," *Econometrica*, 55, pp. 251-76.

Faini, Riccardo, 1994, "Export supply, capacity and relative prices," *Journal of Development Economics*, vol. 45(1), pages 81-100, October, Elsevier.

Goldfajn, I., and Valdes, R., 1999, "The Aftermath of Appreciations," *Quarterly Journal of Economics,* Vol. 114 (February), pp. 229–62.

Gruber, J.W. and S.B. Kamin, 2007, "Explaining the Global Pattern of Current Account Imbalances," *Journal of International Money and Finance,* 26(4), pp. 500–522.

Hamilton, James D. and Herrera, A. M., 2004, "Oil Shocks and Aggregate Macroeconomic Behavior: The Role of Monetary Policy," *Journal of Money, Credit, and Banking*, 36, pp. 265-286.

Herrmann, S. and A. Jochem. 2005. "Determinants of Current Account Developments in the Central and East European EU Member States-Consequences for the Enhancement of the Euro Area," Deutsche Bundesbank.

International Monetary Fund, October 2009, World Economic Outlook (WEO).

Ivanov , Ventzislav and Kilian, Lutz, 2005, "A Practitioner's Guide to Lag Order Selection For VAR Impulse Response Analysis," *Studies in Nonlinear Dynamics & Econometrics*, Vol. 9, No. 1.

Johansen, S. and Juselius, K., "Maximum Likelihood Estimation and Inference on Cointegration with Applications to the Demand for Money," *Oxford Bulletin of Economics and Statistics* 52 (1990):169–209.

Khan, M. S. and M. D. Knight, 1983, "Determinants of Current Account Balances of Non-Oil Developing Countries in the 1970s: An Empirical Analysis". *IMF Staff Papers* Vol. 30, pp. 819-842.

Kilian, L., 2001, "Impulse Response Analysis in Vector Autoregressions with Unknown Lag Order," *Journal of Forecasting*, **20**, 161-179.

Krugman, Paul, 1987, "Trigger Strategies and Price Dynamics in Equity and Foreign Exchange Markets," NBER Working paper, No.2459.

Lane, Philip R. (2000), "International Investment Positions: A Cross-Sectional Analysis", *Journal of International Money and Finance*, Volume 19 No.4, page 513-534.

Lane, Philip R. and Milesi-Ferretti, G. M, 2007, "The External Wealth of Nations Mark II: Revised and Extended Estimates of Foreign Assets and Liabilities, 1970–2004", *Journal of International Economics*, Vol. 73, 223-250, November.

Lee, J., Milesi-Ferretti, G. M, J. Ostry, A. Prati, and L. A. Ricci, 2008, *Exchange Rate Assessments*: *CGER Methodologies*, *IMF Occasional Paper* No. 261.

Obstfeld, M. and Rogoff, K., 1995, "The intertemporal approach to the current account," In: Grossman, G. and Rogoff:, K., Editors, 1995. *Handbook of International Economics*, Vol. 3, Elsevier.

Wickens, R. W., 1996, “Interpreting Cointegrating Vectors and Common Stochastic Trends”, *Journal of Econometrics*, Vol. 75, 255-271.

World Bank Group, 2009, World Development Indicators (WDI).

Data Appendix

Data Description and Sources

Variable	Descriptor	Units	Database
ca	Current account balance (*ca*>0 surplus*; ca*<0 deficit*)*	Ratio to GDP	IFS[1]
nfa	One period lagged net foreign asset position	Ratio to GDP	Annual data is obtained from "Updated and extended version of the External Wealth of Nations Mark II database developed by Lane and Milesi-Ferretti (2007)"[2]
open	Trade openness; Sum of exports and imports	Ratio to GDP	IFS
reer	Natural logarithm of real effective exchange rate (trade-weighted)[3]	Index number (2000Q1=100)	IFS, BIS[4]
rel_y	Domestic relative income level; rel_y = y/y^*, where:		
	y Natural logarithm of domestic real GDP[5]	Real GDP volume index (2000Q1=100)	IFS, OECD[6]
	y^* Natural logarithm of US real GDP[7]	Real GDP volume index (2000Q1=100)	IFS, OECD[8]

[1] International Monetary Fund's (IMF): International Financial Statistics 2009 online database.

[2] 2008 data are calculated using the same method as in Lane-Milesi-Ferretti (2007). Quarterly data are interpolated results by using cubic spline interpolation method.

[3] For China, Hong Kong, India, Malaysia, Philippines, Singapore and Thailand are Consumer-Price-Index (CPI) based REER, while for Korea is Unit-Labour-Cost (ULC) based REER.

[4] Bank for International Settlements: 2009 online statistics for effective exchange rate indices.

[5] In the case of China, Index of Industrial Production (IIP) is used instead of real GDP volume index.

[6] Organisation for Economic Co-operation and Development: 2009 online database for China's IIP data.

[7] In order to be consistent with the measure of both domestic and foreign output, Index of Industrial Production (IIP) of US is used instead of real GDP volume index in the case of China.

[8] Organisation for Economic Co-operation and Development: 2009 online database for US's IIP data.