

THE TWIN DEFICITS HYPOTHESIS: A REVISITED CASE OF SIX ASIAN EMERGING  
MARKET ECONOMIES

Vinh Dao

Bachelor's Thesis

Instructor: Christopher Decker

Date of submission: 06.04.2021

**Declaration**

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**Title of thesis:** The Twin Deficits Hypothesis: A Revisited Case of Six Asian Emerging Market Economies

**Date:** 6 April 2021

**Degree:** Bachelor of Science in Economics and Business Administration

**Supervisor:** Dr. Christopher Decker

### **Objectives**

The main objectives of this study was to inspect the validity of the twin deficits hypothesis in the context of six Asian emerging market economies. In addition to this, the study aims to identify any long-run and short-run relationship between the government fiscal deficit and the current account deficit in the selected countries. If such a relationship exists, the study goes on to assess possible directions of causality between the two deficits. Any form of causality would carry significant macroeconomic implications because it allows policymakers to fathom out the transmission mechanism of this economic phenomenon and devise a coherent package of fiscal and monetary policy for dealing with it.

### **Summary**

This study employed the real effective exchange rate and the real interest rate as the mediating factors of the dynamic nexus between the government fiscal deficit and the current account deficit in China, India, Indonesia, Malaysia, the Philippines, and Thailand over the period 1982-2019. The ARDL bounds testing approach was adopted in detecting the long-run and short-run relationships among these variables. The study applied the modified Wald test to assess the direction of causality of these relationships. A number of diagnostic tests were performed to check the model's robustness and stability.

### **Conclusions**

The government fiscal deficit was found to Granger-cause the current account deficit in the long run for India and in the short run for Thailand while reverse causality was evident for China, Malaysia, and the Philippines. The test results for Indonesia suggested a bidirectional causal relationship between the two deficits. The real effective exchange rate constituted an important mediator of the dynamic nexus between the government fiscal deficit and the current account deficit whereas the mediating effect of the real interest rate was insignificant.

**Key words:** *twin deficits, government fiscal deficit, current account deficit, international capital inflows, savings and investment, Asian emerging markets*

**Language:** English

**Grade:**

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# 1. INTRODUCTION

The twin deficits hypothesis constitutes one of the major contemporary debates in macroeconomics. To put it simply, the hypothesis states that there exists a systematic relationship between two of the sectoral balances, specifically the government fiscal balance and the current account balance. When a country runs a current account deficit, it is said to be living beyond its means and accumulating liabilities to the rest of the world that are financed by flows of the financial account. The current account deficit therefore represents a measure of the country's overseas borrowing. An increasing current account deficit indicates that consumption and investment in the domestic economy is becoming increasingly dependent on foreign creditors. Chronic current account deficits can lead to excessive domestic demand and drive up interest rates and inflation which undermines the competitiveness of the nation and hampers its exports.

When the government fiscal deficit and the current account deficit exhibit similar patterns, they are said to be twinned. This economic phenomenon is usually referred to as the twin deficits. Advocates of the twin deficits hypothesis argue that there is a strong and direct relationship between a country's current account balance and its government fiscal balance and hence they can move together dollar for dollar. Following this logic, they claim that if a nation has an increasing fiscal deficit, it is becoming increasingly fixated on external funds or foreign purchases of its debt to supplement purchases of domestic residents. Thus, both a rising fiscal deficit and rising current account deficit make the domestic economy vulnerable to unexpected and sudden changes. Furthermore, accelerating interest rates and inflation due to competition for limited loanable funds and excessive demand crowd out productive investments, which thwarts improvements in the trade balance and tends to make the nation less competitive in international markets. In the long run, the country's inability to generate sufficient reserves to pay back foreign liabilities would leave the nation hardly any choice but to default on its foreign debt obligations and experience perilous ramifications such as the depreciation of the domestic currency or the inability to raise capital in global financial markets. As a result, it is oftentimes suggested that the government should steer clear of the twin deficits problem in the first place. However, the validity of all the

aforementioned claims remains unclear as empirical studies yield different results and conclusions of the existence of the relationship between the two deficits.

The term *twin deficits* was originally invented to describe the co-movement and the dynamics between the government fiscal deficit and current account deficit in the United States during the early 1980s. However, such a vigorous and relationship with possibility of causality is not exclusive to the United States. Indeed, in the context of spiraling external and public-sector imbalances, increasing government fiscal deficits alongside with current account deficits have been of paramount importance to policy makers in developing countries, especially in the case of Asian emerging market economies which are more prone to the aggravation of government fiscal and current account deficits due to sudden large surges of capital inflows. Compared to advanced economies, little has been known about the dynamic relationship between the government fiscal deficit and the current account deficit in developing countries, especially in the Asian emerging markets. Since the 1980s, the liberalization of goods, services, and financial markets has facilitated the outsourcing of countries to acquire external resources. Following this, Asian developing economies with low saving rates and high consumption rates are faced with chronic current account deficits along with rising fiscal deficits during the development process.

Understanding the relationship between the two deficits in the context of emerging Asia is imperative as it allows policymakers to know the extent to which fiscal adjustments can conduce to tackling external imbalances. In the spirit of previous literatures, the research makes its contribution in the following aspects. Firstly, it is one of the few attempts to study the twin deficits phenomenon in Asian emerging market economies, specifically China, India, Indonesia, Malaysia, the Philippines, and Thailand that take into account the four possible causal linkages between the two deficits and two other mediating factors including the real effective exchange rate and real interest rate. Secondly, the research endeavors to address several time-series data's problems regarding stationarity, autocorrelation, normality, and conditional heteroskedasticity which could result in spurious regressions, misleading analyses, and invalid findings. Thirdly, the research goes further to provide cross-country comparisons regarding the

presence of any relationship between the government fiscal deficit and the negative external account balance in the context of emerging Asia and bring forth the discussion of how different economic conditions, economic policies, and countries' characteristics can affect transmission mechanism as well as the strength of the causal relationship between the two deficits.

## **2. LITERATURE REVIEW**

### **2.1. Introduction**

This section provides a systematic review and synthesis of the existing knowledge and relevant literature, both theoretical and empirical on the Twin Deficits hypothesis (TDH). A sectoral balances view of the national accounts is developed in the first place to prepare the ground for upcoming analyses. Not only does this framework allow for the observation of both the uses and sources of national income, but it also provides useful insights into the nexus between the government fiscal deficit and the external imbalance. The accounting principles embedded in the sectoral balances perspective asserts that all sectors cannot run surpluses or deficits concomitantly. This carries a crucial implication for the heated contemporary debate of the TDH as it illustrates the flows of funds between the domestic economy and the rest of the world. After constructing the twin deficits identity by rearranging certain variables in the national income identity, the paper proceeds with the discussion of the major existing strands of thoughts regarding the TDH. These include the conventional Keynesian view, the Ricardian Equivalence theorem (RET), the Current Account Targeting hypothesis (CATH), and the Feldstein-Horioka puzzle (FHP). In light of the existing theoretical knowledge, the paper then examines and synthesizes a large volume of relevant empirical literature including those from the early days and those that are from more recent years. Lastly, an integrated conceptual framework of the twin deficits is provided.

## 2.2. Fiscal Balance and Current Account Balance: A Sectoral Balances View of the National Accounts

In an open economy, the national economy can be divided into four main categories<sup>1</sup>. These are consumption by households; investment by private firms, as well as residential investment in housing; government expenditure; and exports to and imports from foreigners. This division can be viewed in two ways – either from the perspective of the sources of total spending or from the perspective of the uses of income generated from those spending sources. Let total national income (GDP) be represented by  $Y$ , total final consumption expenditure  $C$ , total private investment  $I$ , total government expenditure  $G$ , and net exports  $EX - IM$ , from the perspective of the sources of the national income, the expenditure side of the national accounts can be expressed as:

$$Y = C + I + G + (EX - IM). \quad (1)$$

The total national income of an open economy is, therefore, the sum of flows of expenditure of three sectors, namely, private sector, government sector, and foreign sector. Domestic households and firms including banks make up the private sector of a nation's economy. The government sector comprises all level of governments (federal, state, and local) and their agencies that have the right to establish and enforce laws, rules, and other regulations to collect and spend tax revenue. All non-residents including private households, firms, and governments from countries with which a nation trade constitute the external or so-called foreign sector.

Nevertheless, it is worth bearing in mind that for an economy open to international trade, net exports only account for some portion of the financial movements between the national economy and its foreign sector. Therefore, in order to have

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<sup>1</sup> An open economy is a type of economy where economic agents can freely engage in international trade of goods and services.

a comprehensive view and accurate interpretation of the national accounts, it is essential to take into account net income receipts (*NIC*) and net unilateral transfers (*NUT*). Net income receipts are a critical component of the system of national accounts as it encompasses all dividend and income flows accrued to a country's residents through overseas investments as well as the dividend and interest flows paid by them to foreign investors who have financial interests within the country. Net unilateral transfers, also known as secondary income, constitute all current transfers of goods, services, income, or financial items between residents and nonresidents. These international transfers between countries can be defined as international gifts, that is to say, one-sided affairs that take place without any quid pro quo since there is nothing of equivalent economic value that is exchanged in return. Notwithstanding that unilateral transfers do not add to national income, it is important to include them in the system of national accounts because they act as offsetting entries for one-sided transactions that accommodate redistributions of income between nations.

As net income receipts (*NIC*) and net unilateral transfers (*NUT*) are added to the national accounts, *Y* now represents gross national product (*GNP*). The definition of GNP can be derived from the following identity as the sum of total final household consumption expenditure, total investment purchases by firms, total government expenditure, net exports, net income receipts, and net unilateral transfers:

$$Y = C + I + G + (EX - IM) + NIC + NUT. \quad (2)$$

In order to construct the sectoral balances form of the national accounts, net taxes *T* collected from households and firms by the government are subtracted from both sides of equation 2:

$$Y - T = C + I + G + (EX - IM) + NIC + NUT - T. \quad (3)$$

The sectoral balances view of the national accounts is finally obtained by rearranging the components accordingly:

$$(Y - C - T) - I = (G - T) + (EX - IM + NIC + NUT). \quad (4)$$

Private saving ( $S$ ) can be understood as the amount of disposable income that is saved rather than consumed. The term  $(Y - C - T)$  constitutes total national income less total consumption by households less net taxes paid by them to the government. Hence, it represents private saving or household saving. The private domestic sector's overall net saving will then be derived by subtracting total private investment from household saving.  $(Y - C - T) - I$ , thus, represents the domestic private sector's overall net saving. In this regard, the term  $(Y - C - T) - I$  corresponds to the private domestic financial balance ( $S - I$ ). The balance is positive when the sector is spending less than its total income and is negative when its consumption expenditure exceeds its total income. By rearranging the variables in equation 4, another version of the sectoral balances form of the national accounts is obtained:

$$(S - I) + (T - G) = (EX - IM + NIC + NUT). \quad (5)$$

Similarly, the term  $(T - G)$  represents the government financial balance, commonly known as the budget balance or fiscal balance. When the fiscal balance is positive, it is said to be in surplus as government tax revenue is greater than government spending. Antithetical to a fiscal surplus is a fiscal deficit. When a nation's fiscal balance is negative, it is said to be experiencing a fiscal deficit, which means it is living beyond its means. In other words, the government and its agencies have been spending more than the revenues that are collected from taxes and other sources. Fiscal deficits are usually financed through government borrowing from either the central bank or raising money from capital markets through the issuance of government securities such as Treasury bills, bonds, and notes. Thus, the

government fiscal deficit directly reflects the extent to which the government borrows to pay for its expenditure and acts as a useful indicator of fiscal policy.

Whether government fiscal deficits are bad or good has long been a bone of contention among academic economists and policymakers. On the one hand, Elmendorf and Mankiw (1999), representative of the orthodox view of government debt, demonstrate that persistent deteriorations in the fiscal balance will drive up interest rates, crowd out investment, undermine export competitiveness, and ultimately force a country to default on its foreign debt obligations. On the other side of the spectrum, the alternative verdict on the government fiscal deficit claims that much of what is written and said about its undesirable effects is based on flawed logic. Hinging on the conviction that a sovereign government needs never repudiate a debt in its own currency, Eisner (1992) argues that the notion of the government going bankrupt because of its inability to pay back or service its debt is sheer nonsense. He also points out that high interest rates and the financial crowding out effect would have to be the result of a foolishly stringent monetary policy rather than a fiscal stimulus. In furtherance of Eisner's arguments, Wray (2009) develops his so-called in-paradigm view which draws on modern monetary theory (MMT) and underscores the idea that a government as the sovereign currency issuer, such as Australia, the U.K., Japan, and the U.S., faces no financial constraints in a technical sense and hence can run fiscal deficits indefinitely and afford whatever is for sale in its own currency. That being said, the sovereign government should avoid incurring debt in foreign currencies in order to obtain the maximum fiscal space that can be leveraged to exercise its fiscal policy tools of spending and taxation.

Lastly, the term  $(X - M + NIC + NUT)$  amounts to the external financial balance, which is usually known as the current account balance (*CAB*). It measures the difference between the spending and income flows of residents to foreigners and those of foreigners to the domestic economy. Similar to the fiscal balance and other sectoral balances, the current account balance is said to register a surplus if it is positive and run a deficit if negative. When a country runs a current account

deficit, its domestic economy is spending more overseas than foreign investors are spending in the domestic economy. This, in most cases, also means that the country is importing more goods and services than it is exporting – although net external income flows and net unilateral transfers are two subcomponents of the current account balance, they usually make up a small fraction of the total and hence have little impact given the considerably larger size of international trade factors, namely, imports and exports.

The current account can also be expressed in terms of national savings and investment. This approach makes provision for the measurement of both the size and the direction of international borrowing. A current account deficit, in this regard, indicates that the country possesses a low level of national savings relative to investment. When national savings are insufficient to finance national investment, the excess investment over savings will be covered by overseas borrowing equivalent to episodes of foreign capital inflows, which concomitantly runs down the financial position of the national economy as compared with the rest of the world.

All in all, the sectoral balances view of the national accounts showcases the flows of funds among the private sector, the government sector, and the foreign sector through the private domestic financial balance, the government fiscal balance, and the current account balance. In light of fundamental accounting principles, the sectoral balances must necessarily sum to zero because for every financial asset, there is a matching financial liability that equally offsets that financial asset in the T-account. In other words, deficits and surpluses must always cancel out across the financial system. For one sector to run a surplus and accumulate its financial wealth, at least one other sector has to run a deficit which is serviced by borrowing of the same amount from other sectors and increasing its indebtedness. Therefore, the private domestic sector, the government sector, and the foreign sector cannot simultaneously register either surpluses or deficits.

Nevertheless, it is important to note that these movements in the sectoral balances do not provide any direct implication of what sector is driving the other. In reality, the direction of causation can be unidirectional, bidirectional, or there might be no correlation at all. Out of all sectoral balances, the systematic relationship between the government fiscal balance and the current account balance has long attracted the interest of macroeconomists, policymakers, and other professionals in the field. On that account, academics have coined the term twin deficits to describe the co-movements of these two sectoral balances with respect to their deficit side. The debate over the validity of the twin deficits, as well as the direction of causality, has been going on for decades as empirical studies continue to yield mixed and inconclusive results. Further examination of relevant existing literatures and the potential directions of causality between the government fiscal deficit and the current account imbalance is provided in the upcoming sections.

### **2.3. Theoretical Background of the Twin Deficits Hypothesis**

On the theoretical front, while most of the previous literatures conducted on the TDH often refer to the two well-known major theoretical models, namely the Mundell-Fleming framework and the RET, as a solid foundation of their research, there actually exist several other dimensions of the interrelation between the deterioration in the government fiscal balance and the worsening of the current account balances. In an attempt to investigate the validity of the TDH in South Korea, Kim and Kim (2006) demonstrated four possible directions of causality. The first probable causal nexus between the government fiscal deficit and current account deficit is based on the canonical Mundell-Fleming model, which claims that a deficit in the government financial balance will ultimately lead to a proportional deterioration in the external balance. The second testable dimension of causality can be inferred from both the RET and the Permanent Income hypothesis (PIH). These theories postulate that deficits are irrelevant and that there is no correlation between them. The third proposed causal linkage, with respect to the Neo-classical view, operates in the opposite direction with the first one – that is, excessive and chronic current account deficits may result in the

massive worsening of government fiscal balance. Finally, the relationship between the two deficits can be bidirectional. This dimension of causality underscores the notion that while a fiscal deficit can lead to a deterioration in the external balance, the deteriorated external balance, in turn, can worsen the fiscal account.

### **2.3.1. Keynesian Absorption Theory and the Mundell-Fleming Framework**

Temple and Van de Sijpe (2017) define domestic absorption as the total expenditure level of an economy, including household consumption (regardless of the origin of goods and services), gross investment, and government consumption. This concise definition allows for better understanding of the Keynesian absorption theory, which was put forward by Keynes (1936) in *The General Theory of Employment, Interest, and Money*. This theory postulates that the government fiscal deficit and current account deficit exhibit a positive relationship – that is, an increase in the government fiscal deficit will result in a decrease of proportional amount in the external balance but not the other way around. Specifically, the rise in the fiscal deficit induces domestic absorption and hence income expansion. Higher income then leads to a rise in the quantity of imports demanded, thereby aggravating the external balance.

In line with the conventional Keynesian proposition, the Mundell-Fleming model substantiates a systematic relationship between the government fiscal balance and the current account balance in an open economy characterized by high capital mobility. In this regard, Mundell (1963) made a necessary assumption that an increase in government spending is financed by government borrowing. Such a debt-financed expansionary fiscal policy raises the national economy's aggregate demand for home goods and money. Excessive domestic demand then puts an incipient upward pressure on interest rates and fuels inflation. Higher interest rates, in turn, make it attractive for the rest of the world to invest in the domestic market. Under a

flexible exchange rate regime, surges of foreign capital flows into the national economy cause an appreciation in both the nominal and real exchange rate, making imports cheaper and exports costlier. As a result, imports increase; exports decline; and the trade balance deteriorates. Since imports and exports account for the bulk of the external sector, a trade deficit therefore will have an immediate deleterious effect on the current account balance.

A country that has a fixed exchange rate system may also be susceptible to the twin deficits phenomenon. In light of the relative price channel for an open economy when it comes to the compositional effects of sectoral heterogeneity, Fleming (1962) argues that an increase in government expenditure will induce a multiplier effect on income, enhancing tax revenues and boosting employment, output, and imports. The increase in public expenditure and income then provoke a presumably unfavorable shift – that is, a degradation – of the current account balance owing to rises in imports. Indeed, as total national output increases, there will be greater demand for real money, which then gives rise to an increase in interest rates. Following this, an economy under a floating exchange rate regime, as aforementioned, will experience an appreciation in its currency and exchange rate. A country which maintains a fixed exchange rate system, however, may decide to make an exchange market intervention and try to nudge the exchange rate in the desired direction by buying foreign reserves in exchange for domestic currency and hence increasing the money supply. Since money supply increases, prices rise and there will eventually be an appreciation in the domestic currency. The resulting impact of deficit spending on the current account balance, nevertheless, would be weaker than in the case of flexible exchange rates owing to the central bank's timely intervention in response to interest-rate-seeking capital inflows (Abbas et al., 2011).

In delineating the systematic and causal relationship between the government fiscal deficit and the current account deficit, the Mundell-Fleming model takes into account certain assumptions that are made about private

domestic spending and saving behavior. One of the assumptions is that the gap between private saving and investment is zero or stable. This condition, however, rarely occurs in reality.

### **2.3.2. Ricardian Theorem, the Permanent Income Hypothesis, and the Life-Cycle Model of Savings**

The conventional Mundell-Fleming model and the Keynesian approach to the twin deficits were soon called into question by the RET. Barro (1974, 1989), one of the active disciples of the Ricardian alternative, reproaches the TDH for its endorsement of a static relationship between income and expenditure and for its failure to notice the intertemporal budget constraints faced by both the government and households. Indeed, in contrast to the intratemporal trade (relative price changes) paradigm deployed by the standard Mundell-Fleming framework and Keynesian proposition, the RET gives prominence to intertemporal responses of the private domestic sector to a shift in government's fiscal policy. Taking into account the notion of infinite horizons and rational expectations, the RET negates any correlation between the deficit sides of the government fiscal balance and the current account balance. Since an increase in the government fiscal deficit due to tax cuts does not cause any changes in aggregate demand, the real interest rate, or investment, it has no elucidative power in relation to the current account balance. Provided that a given path of government expenditures is constant, an increase in deficit-financed government spending owing to a cut in current taxes would lead to a corresponding increase in future taxes that have the same present value as the initial cut in order to maintain intertemporal government solvency (Haug, 1990). Forward-thinking economic agents who make allowances for future events in their current decisions will therefore rationally reduce spending today and increase their own saving, which will be retroactively needed to pay for future tax burdens. Since private domestic saving rises sufficiently for the national economy to eschew overseas

borrowing, government fiscal deficits will not lead to the worsening of current account deficits.

Aligning himself with the notions of the RET, Friedman (1957) introduced the PIH, which states that there is zero correlation between consumption and transitory components of income. To be precise, private consumption is predominantly driven by changes in permanent income and long-term considerations but is significantly unresponsive to ephemeral fluctuations in current income since individuals have a propensity for consumption smoothing. As a result, household consumption is left unaltered whereas household saving expands when there is a transient increase in current income triggered by tax cuts or actions of government deficit spending. As household or private saving increases, the need for foreign capital inflows to finance the government fiscal deficit diminishes. The transitory increase in current income, therefore, may eventually bring about an improvement in the current account balance (Sachs, 1981). Conversely, a permanent change in real income would have a minor if not zero impact on the current account balance as consumption and income undergo changes of equivalent magnitude.

Prior to Friedman's PIH, Modigliani and his graduate student, Richard Brumberg developed the Life-Cycle hypothesis (LCH) in the early 1950s. However, it was not until 1980 that this collaboration made its first appearance in print in the second volume of Modigliani's collected papers. According to Modigliani and Brumberg (1980), households plan their spending over a lifetime and have a tendency to put aside money, which is driven by their bequest motives, their precautionary motives, or the need to provide for retirement. Therefore, when it comes to spending, households are largely unresponsive to their disposable income at the time of consumption as people have a natural inclination to smooth their consumption over their lifetimes. In the framework of the LCH, private saving is affected by not only household income but also by government fiscal deficits. Based on the

assumption that households are rational and forward-looking, they will be able to recognize that a current government fiscal deficit will lead to higher national debts which must later be serviced by future interest and higher taxes. At the end of the day, national saving remains intact as rational economic agents set aside an amount of money commensurate with the deficit to avoid the detrimental effect of future taxes on their future consumption. As the government fiscal deficit is financed by increased household saving, the national economy will not have to incur foreign debts and run down its financial position vis-à-vis the rest of the world, hence no current account deficit.

### **2.3.3. Neoclassical View and the Current Account Targeting Hypothesis**

While the conventional wisdom of Keynesian economics puts forward a strict unidirectional flow of causality emanating from the government fiscal deficit to the current account deficit, the neoclassical view of the TDH suggests the possibility of a reverse causality, that is – chronic and outrageous current account deficits are conducive to deteriorations in the government fiscal balance. This reverse causality is usually associated with another macroeconomic theory commonly known as the CATH. Summers (1988), in his analysis of the dynamics between tax policy and international competitiveness, argues that a country may aim for a specific position of the current account, preferably a current account balance, by consistently maneuvering the levels of government fiscal deficit policy actions. In other words, government fiscal deficits are deployed as a contrivance to obliterate external imbalances. Such a transmission channel is found particularly prevalent among developing economies and emerging markets which are destitute of domestic resources and hence highly dependent on large amounts of foreign capital inflows from foreign investors to finance productive investments and economic developments (Khalid and Guan, 1999).

Open developing economies that are afflicted by a financial crisis or a government insolvency risk may experience current account targeting as the government strives to eliminate excessive current account deficits and improve the external balance. Indeed, an increase in the current account deficit may prompt an unsustainable appreciation in the real exchange rate. Such an appreciation will undermine the economy's international competitiveness and restrict its exports as well as import substitutes. This is because the overvalued exchange rate makes it costlier for the domestic economy to export and relatively cheaper to import, provide that there is no import restriction. Overvaluation thus diminishes national productivity, which eventually renders the economic growth sluggish and ultimately results in a deterioration of the government fiscal balance. Reisen (1998) conducted a comprehensive investigation into this phenomenon by showcasing a detailed picture of the economic conditions of some Latin American and South East Asian countries, which were characterized by growing macroeconomic imbalances, large external disequilibria, and massive surges of foreign capital inflows, during the 1990s. Such net debtor developing countries had to put aside a huge part of their income for debt financing and interest payments, which would eventually result in a more severe government fiscal deficit.

According to Anoruo and Ramchander (1980), in the case of a small developing economy that is open to international trade, a fiscal expansionary action, as well as a fiscal deficit, can be the result of government consciously widening its expenditure in an attempt to mitigate pernicious effects of excessive current account deficits on the domestic economy. Indeed, consider that a global recession causes the open economy to undergo a current account deficit as its export revenue plummets. Automatic tax changes and incorporated fiscal stabilizers, through their normal operation, may by design give rise to an increase in the government fiscal deficit due to a nosedive in aggregate demand, real GDP, the national income, and tax revenue. In this regard, the direction of causality regarding the two deficits asserted by conventional Keynesian economics has been reversed. In South

Korea's experience, the government implemented a fiscal expansionary policy which allowed for an increase in fiscal deficit to 5% of GDP in 1998 with a view to countering the debilitating recession caused by the currency crisis of late 1997 (Chung, 2003). The discretionary fiscal action in South Korea successfully stimulated the national economy and curbed unemployment as it facilitated the restructuring of financial markets and strengthened the social safety net.

#### **2.3.4. The Feldstein-Horioka Puzzle**

Finally, the relationship between the external and fiscal balances can be bidirectional. This postulation conveys the idea of a vicious circle in which the current account deficit that is previously triggered by a government fiscal deficit shows significant feedback in return and therefore exerts an adverse impact of equal magnitude on the fiscal balance. The interrelationship between these two variables can also be deduced from the dynamic nexus between domestic saving and investment rates under different assumptions about international capital mobility. The latter is commonly associated with the FHP, which constitutes one of the six major puzzles in international economics that have yet to be provided with satisfactory explanation from academic economists and other professionals in the field (Obstfeld and Rogoff, 2000). The FHP carries a crucial implication for investigating the bilateral relationship between the current account and government fiscal deficits: if national saving and domestic investment are indeed uncorrelated, the two deficits are expected to evolve together in the same direction. In reality, the Research Department (1998) of the IMF suggested that in the developing world during the 1970s and 1980s, domestic saving and investment had shown consistent patterns in which they moved in opposite fashions.

With respect to their famous enigmatic puzzle, Feldstein and Horioka (1980) states that the correlation between domestic savings and investment is

contingent on the degree of international capital mobility. On the one hand, assuming there is little or no international capital mobility, in a closed economy without an external sector, national saving and domestic investment must be equal. In this regard, an increase in domestic investment will entail a commensurate improvement in national saving. In other words, under circumstances of international capital immobility, saving and investment exhibit a strong correlation. On the other hand, in a world economy characterized by significant and rapid international capital flows, it can be argued that such a correlation does not exist because countries are cognizant of the gain from intertemporal trade and hence running current account imbalances. Provided that there are no impediments to international capital movements, any incremental saving due to a rise in the national saving rate will be diverted from the domestic economy to wherever in the world returns are maximized. Since not all the additional saving is invested internally, there is no systematic relationship between domestic saving and investment rates.

Yet, Feldstein-Horioka empirical findings in 1980 suggested a strong correlation between national saving and domestic investment across the OCED countries over a protracted period of time. This result was given more substance by a number of other empirical work employing cross-section regressions with period averages, including, but not limited to, Feldstein and Bacchetta (1991, 23 OCED countries, 1974-86), Tesar (1991, 24 OCED countries, 1960-1986), Obstfeld (1994, 22 OECD countries, 1974-1990), and Taylor (1996, 11 OCED countries, 1850-1992). These findings showed that even in an open economy framework, international capital remains immobile due to official restrictions on the export of capital and institutional rigidities which require a large part of saving to be kept at home. As a result, national saving and domestic investment are strongly and positively correlated.

The validity of these results, however, were soon called into question as developing countries are brought into the picture. When non-OCED countries were included in the sample, the correlation between domestic saving and

investment was demonstrated to be much less significant (Fieleke, 1982; Dooley et al., 1987; Summers, 1988). During the 1970s, as a result of an improvement in international liquidity, developing economies and emerging markets experienced large surges of foreign capital inflows. This led to a rise in domestic investment while domestic saving witnessed a decline due to the worsening of the government fiscal deficit. In contrast, the debt crisis in the second half of the 1980s triggered sudden stops in international capital flows. Consequently, the domestic investment rate in these developing countries dropped significantly. At the same time, domestic saving expanded as a result of a stringent fiscal policy and other austerity measures. During these periods, it can be observed that domestic saving and investment rates were highly uncorrelated and even moved in opposite directions, thus giving rise to the co-movements of the government fiscal deficit and current account deficit.

## **2.4. A Survey of Existing Empirical Literature**

The dynamics between the government fiscal balance and the current account balance has long attracted the interest of academic economists, policymakers, and other professionals in the realm of macroeconomics. On the empirical front, a multitude of comprehensive works have been conducted to test the validity and rationality of the TDH as well as its four distinct strands of transmission mechanism. While most of these literatures have paid homage to the original theories and made meaningful contributions to the empirical forerunners, little consensus on the dynamic nexus between the two deficits has been reached. This equivocal and inconclusive outcome can be largely attributed to the variation in the constructs and variables, the employment of econometric techniques and methodologies, the characteristics and uniqueness of the selected samples, and the types of data collected.

Back in the early days, a substantial volume of literatures have given support to the Mundell-Fleming model and conventional Keynesian view of the TDH in the

United States and other developed economies (Milne, 1977; Laney, 1984; Volcker, 1984; Branson, 1985; Hakkio and Higgins, 1985; Kvangsicka; 1985; Bernheim, 1987; Darrat, 1988, Miller and Russek, 1989; Rosenweig and Tallman, 1993). Most of these studies take a holistic approach in scrutinizing the co-movements of the government fiscal deficit and the current account deficit. Out of these early works, Milne (1977) and Miller and Russek (1989) employed ordinary least squares regression (OLS) to analyze cross-country data and found a statistically significant positive correlation between fiscal and external deficits. Using panel data of 59 countries inclusive of both industrial and developing economies, Laney (1984) conducted an international survey to investigate the relationship between the two variables. He discovered that the government fiscal balance was the sheer determinant of the current account balance. This relationship appeared to be even more statistically significant among developing economies and smaller industrial countries. In a time-series data analysis, Bernheim (1987) found out a robust and significant link between government fiscal policy and external deficits in the U.S. and four of its major trading partners over the period 1960-1984. By performing a cross-country comparison, he realized that for the U.S., Canada, the U.K., and West Germany, approximately 30% of the government fiscal deficit was translated into an increase in the current account deficit. The fiscal effect was substantially larger in the case of Mexico, in which a \$1 increase in the government fiscal deficit led to an approximately \$0.85 decline in the current account balance.

The systematic relationship between the government fiscal account balance and current account balance was also revealed in the works of Bryant, Holtham, and Hooper (1998), and Zietz and Pemberton (1990) via the performance of a set of policy simulations on a multi-country macroeconomic model. Aside from these exercises, vector autoregressions are among the most widely used econometric techniques by academic economists and policymakers to examine the co-movements of the two deficits. Using U.S. quarterly observations covering the period 1960:1 to 1984:4, Darrat (1988) carried out multivariate Granger-causality tests and concluded that deteriorations in the government fiscal balance would directly cause external deficits to escalate. The study, however, also found

evidence of a reverse causality running from external deficits to government fiscal deficits. The findings of Bachman (1992) also substantiated the existence of the twin deficits in the U.S. over the period 1974-1988. Using quarterly data measured as a percentage of GNP to estimate bivariate vector autoregressions (VAR), he was able to eliminate the competing variables and arrived at the conclusion that only the government fiscal deficit has the explanatory power regarding the worsening of the current account balance. In terms of policy implications, he asserted that the U.S must improve its government fiscal deficit in order to obliterate its recurring current account deficit as policies aimed at competitiveness are impotent.

More recent empirical works have also yielded results consistent with the Keynesian transmission mechanism of the TDH. Badinger, Fichet de Clairfontaine, and Reuter (2017) examined the relationship between the two deficits with a focus on the roles of fiscal policy actions using panel data of 73 countries over the period 1985-2012. By performing comparison of the least squares dummy variables (LSDV) estimates and implementing a generalized methods of moments (GMM) approach, the study validated the claims of the TDH, indicating a statistically and economically significant positive correlation between the government fiscal balance and the current account balance. On top of that, effective and stringent fiscal policy actions were illustrated as automatic stabilizers that help improve the external balance during phases of government fiscal deficits. Billman and Karaođlan (2020) took into account different real interest rate regimes when inspecting the validity of the TDH in 25 OCED countries with annual data over the period 2005-2016. Hinging on a non-dynamic threshold model, they found evidence of a non-linear relationship between the government fiscal deficit and the current account deficit. This relationship was determined by a critical threshold parameter of 0.965 in the real interest rate. The empirical results from the single threshold model indicated that the TDH only held in countries with real interest rates below the critical level. Furceri and Zdzienicka (2020) also found evidence of the co-movements between the government fiscal deficit and the current account deficit in a sample of 114 emerging markets and developing economies over the

period 1990-2015. After identifying episodes of government fiscal shocks and applying Jorda's local projection method (2005) to estimate the short-run and medium-run impacts of these on the external balance, they went on to compute the magnitude of the twin deficits. The final results suggested that 1 percent of unpredicted GDP increase in the government fiscal balance would lead to an improvement of 0.8 percent in the external balance. The effect was inferred to be larger among countries during recessions, more open to international trade, with less flexible exchange rate systems, and lower government debt-to-GDP ratios.

In contrast with the preceding works, Kim and Roubini (2008) argue that during the 1990s, the U.S. was experiencing a twin divergence – that is, the government fiscal and current account balances move in the opposite directions – rather than the phenomenon of twin deficits when the two balances are afflicted by an output shock. Based on VAR models, their findings for the U.S. under the floating exchange rate regime (1973-2004:1) suggest that government fiscal deficit shocks improve the current account balance and depreciate the real exchange rate in the short run, which is at odds with the anticipation of most conventional theories. Furthermore, a partial Ricardian behavior is also illustrated in the empirical results as private savings increase drastically in response to those fiscal shocks. While Bird, Pentecost, and Yang (2019) did not arrive at such a divergence, they produced mix results regarding the validity of the TDH across a group of 17 advanced OCED countries and the BRICS members excluding Russia over a four-decade period from 1978 to 2017. Out of 170 correlation coefficients, only 51 (30%) were both positive and significant, which suggested the existence of the TDH. Belgium, Canada, France, Italy, Korea, Norway, and Sweden provided a strong support for the TDH by showing both positive and statistically significant correlation coefficients over the full sample, whereas no apparent evidence of the TDH was found in Austria, Denmark, Iceland, the Netherlands, and Spain. With respect to the four non-OCED major emerging economies, China recorded a weak version of the TDH while the others, on the other hand, showed no compliance to the theoretical claims of the TDH. Bird, Pentecost, and Yang attributed this

inconsistent pattern of the TDH to other factors that drive the current account imbalance besides the government fiscal deficit.

The other three possible causal linkages of the twin deficits also emerge from a plethora of empirical works. A large number of studies aimed at both industrial and developing countries have given their support to the RET which negates any correlation between the government fiscal deficit and the current account deficit. Endorsers of this strand of thought argue that although the stringent circumstances and restrictive assumptions entailed by the theory do not hold, the economy's behavior in practice manifests closely the postulations of the Ricardian Equivalence. Among the most eminent works that give strength to the Ricardian Equivalence hypothesis are Kormendi (1983); Evans (1988); Dewald and Ulan (1990); Enders and Lee (1990); Seater (1993), and Becker (1997).

Diverting from the standard approach to modeling private saving and consumption behavior suggested in the works of Bailey (1971) and Barro (1974), Kormendi (1983) developed an alternative and consolidated approach which relates net consumer spending to net national product, government spending, current taxation, government debt, transfer payments, net private wealth, corporate retained earnings, and government interest payments. His parameter estimates provided a strong and direct evidence in favor of the RET, showing that an increase in taxes did not place any impact on consumption whereas rising government expenditure was bound to reduce consumption. That is to say, in reality consumers acted correctly as the RET anticipated. However, the results yielded in Kormendi's work could have provided misleading implications for the U.S. since it included several observations during World War II, when the saving rate was anomalously high due to shortages, rationing, and patriotic appeals to self-restraint.

Later on, Enders and Lee (1990) developed a two-country micro-theoretic model consistent with the Ricardian Equivalence hypothesis for the U.S. Applying VAR techniques with a set of restrictions for a limited group of variables in the system to U.S. quarterly data over the period 1947:3 to 1987:1, they were able to arrive at

the conclusion that an increase in tax revenues as a result of government deficit spending would affect neither private spending nor the current account balance. Yet, their results also revealed that a transitory increase in government spending could lead to the worsening of the current account deficit.

Apart from the conventional Keynesian transmission mechanism and the RET, reverse causality in which deficits of the government fiscal balance leads to deteriorations of the current account balance has been documented in a large quantity of empirical literatures, the majority of which are associated with developing economies and emerging markets. In a multivariate time-series analysis, Anoruo and Ramchander (1998) extended the debate of the TDH to five developing countries in Southeast Asia with varying sample periods, including India: 1957-1993; Indonesia: 1970-1993; Korea: 1967-1993; Malaysia: 1960-1993, and the Philippines: 1957-1993. An augmented Dickey-Fuller (ADF) estimation showed that the time-series regarding the deficit variables and additional control variables were trend-stationary. In the VAR estimation, all these variables were detrended by taking the first difference. The empirical results suggested that the current account deficit Granger-caused the government fiscal deficit and not vice versa for all five countries. In other words, the relationship between the two deficits was unidirectional. This could be well explained by the fact that the central governments of these developing countries expanded their own spending with a view to alleviating the detrimental economic and financial ramifications of an imbalanced external account. Kim and Kim (2006) revisited the TDH in the case of Korea and arrived at the same results as in the preceding work of Anoruo and Ramchander. Applying the Granger causality procedure put forth by Toda and Yamamoto (1995) to an expanded data set over the period 1970-2003, they found no evidence of a causal linkage suggested by the Mundell-Fleming model but a statistically significant causal relationship that ran from the current account deficit to the government fiscal deficit.

A study carried out by Khalid and Guan (1999) among ten industrial countries and developing economies produced similar insights about the causal relationship

between the government fiscal deficit and the current account deficit. Specifically, the sample of developed countries consisted of the U.S., the U.K., France, Canada, and Australia whereas Egypt, India, Indonesia, and Mexico made up the group of underdeveloped economies. Using time-series data ranging from 1950 to 1993, tests for cointegration and Granger causality generated empirical findings that supported a long-run and causal relationship between the external balance and the government fiscal balance among the developing countries whereas either no significant correlation or a causality of conventional wisdom was found among the developed ones. These findings are consistent with the Neoclassical doctrine, which states that developing countries are usually void of sophisticated and efficient capital markets as well as domestic resources and thus are highly dependent on foreign capital inflows to accommodate productive investments and fuel economic developments. In this regard, empirical works of Alkswani (2000) for Saudi Arabia, Marinheiro (2008) for Egypt, Kalou and Paleologou (2012) for Greece, Senadza and Aloryito (2012) for Ghana, Sobrino (2013) for Peru, and Mahuni (2017) for Zambia also demonstrated strong evidence of such reverse causality among countries that are commodity-based exporters.

Bidirectional causality occurs under conditions of efficient financial market integration and high international capital mobility. A number of studies have generated empirical results that substantiate this notion. The findings of Darrat (1988) not only suggested a direct effect of the government fiscal balance on the external balance but also found evidence of significant feedback and a reverse causality rolling back from the current account deficit to the government fiscal deficit, rendering the causal relationship bilateral. The work conducted by Biswas, Tribedy, and Saunders (1992) on the twin deficits in the U.S. resonated closely with Darrat's. By making a distinction between structural and actual government fiscal deficits, they revealed a two-way relation between the actual government fiscal balance and the trade balance for the U.S from 1950-1988. However, the deviation from standard analyses rendered the empirical findings of Biswas, Tribedy, and Saunders problematic. Not only did they apply cointegration tests to annual data instead of quarterly data, but they also performed these tests over the

period 1950-1988, which should have been conducted separately for different exchange rate regimes. On top of that, their weak test based on a final prediction error (FPE) criterion for Granger causality could have employed a stronger approach by performing an F-test with the constraint that all coefficients of the actual government fiscal deficit are zero. This procedure was illustrated in the work of Miller and Russek (1989). With respect to panel data approach, recently, Xie and Chen (2014) revisited the TDH and untangled the causal relationship between the government fiscal deficit and the current account deficit. Applying a panel Granger causality analysis with bootstrap critical values to annual data covering the period 1980-2010 in eleven OCED countries, they pulled in empirical findings which suggested a bidirectional causality between the two deficits.

### 3. CONCEPTUAL FRAMEWORK

The conceptual framework represented by figures 1, 2, 3, and 4 serves as the foundation for this study and is created based on the synthesis of both theoretical and empirical literature with respect to the TDH.

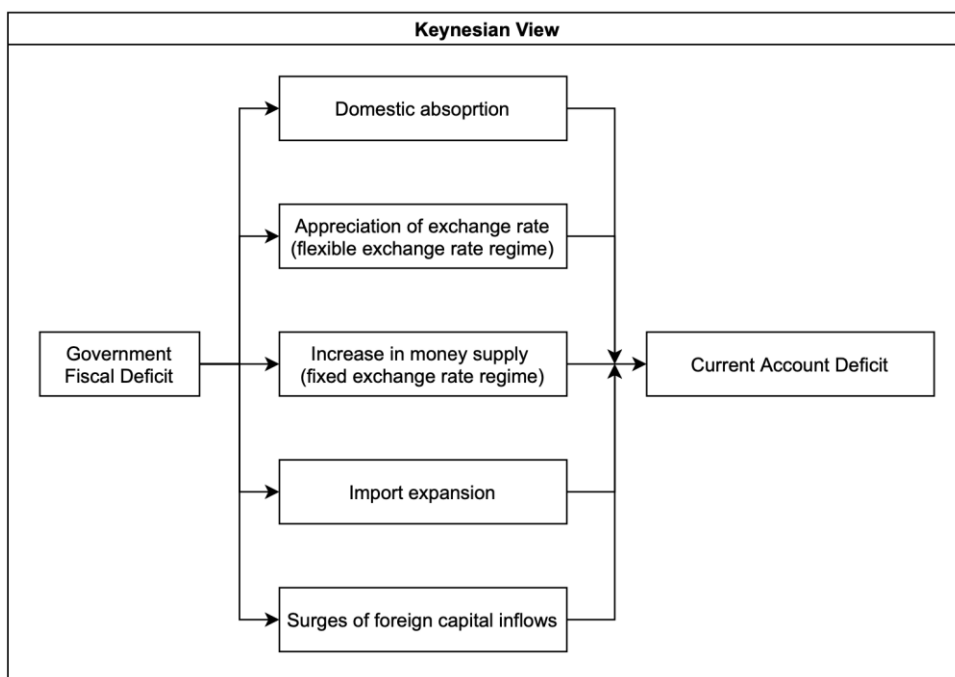


Figure 1. Keynesian view

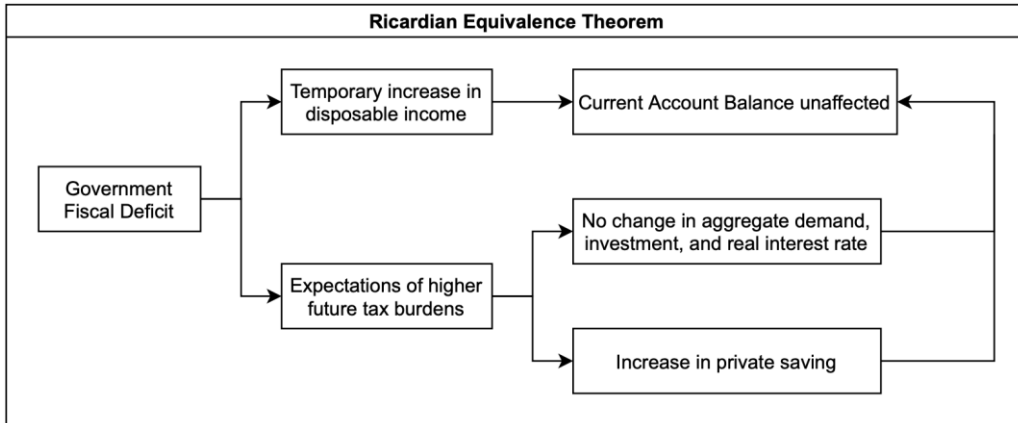


Figure 2. Ricardian equivalence theorem

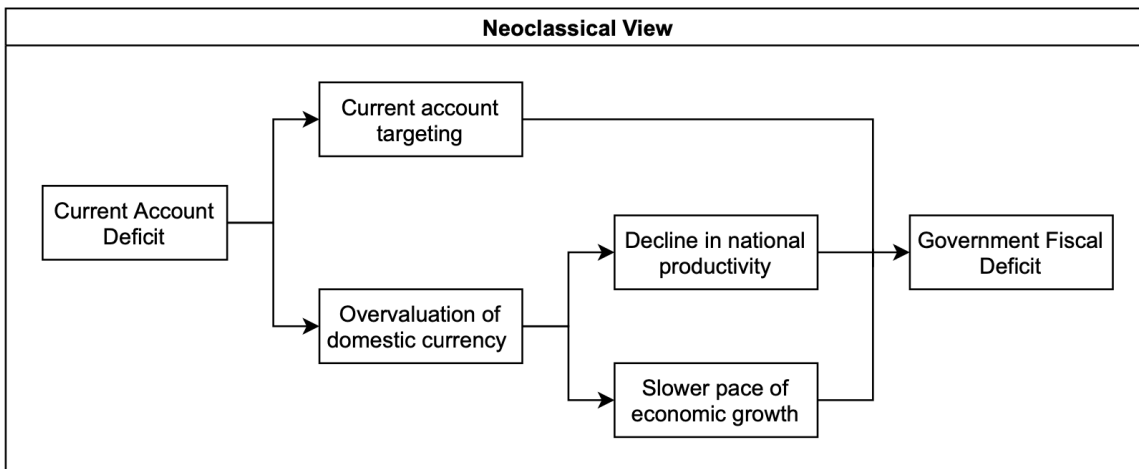


Figure 3. Neoclassical view and reverse causality

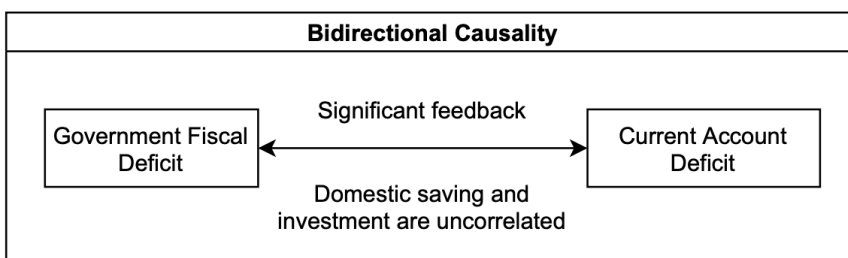


Figure 4. Feldstein-Horioka puzzle and bidirectional causality

At the same time, this conceptual framework illustrates the long-run relationship as well as four possible directions of causality between the government fiscal deficit and the current account deficit as proposed by the conventional Keynesian wisdom, the RET, the neoclassical view, and the FHP. As an extension to the vast volume of empirical works done on the TDH, the paper recognizes the importance of mediating factors aside

from the two deficit variables and therefore accounts for several of them in the conceptual framework. These include real effective exchange rates, real interest rates, inflation, money supply, and the behavior of the private domestic balance – that is, the responses of national saving and investment to changes in the government fiscal balance and the external balance. Nevertheless, for the purpose of simplicity, real effective exchange rates and real interest rates will be employed as the two primary mediating factors of the long-term relationship between the government fiscal deficit and the current account deficit in regression analysis.

## 4. DATA AND EMPIRICAL METHODOLOGY

### 4.1. Data Description

The paper employs data on the government fiscal deficit, the current account deficit, the real effective exchange rate, and real interest rate in the analysis for a group of six emerging Asian market economies. These economies include China, India, Malaysia, the Philippines, and Thailand over the period 1982-2019 and Indonesia over the period 1986-2019. All data are secondary and obtained at an annual level<sup>2</sup>. However, yearly data have their own merits herein as this paper aims to explore the long-term relationship between government financial balance and the external financial balance through the movements of government fiscal deficits and current account deficits.

With respect to data collection, utmost efforts have been made to obtain consistent time-series data from solid, reliable, and authorized sources. Data on the current account deficit and real interest rate are retrieved from the database of the International Financial Statistics (IFS), International Monetary Fund (IMF)<sup>3</sup>. Data regarding the government fiscal deficit of each country are supplied by various data publications of the *Key Indicators for Asia and the Pacific* by Asian Development

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<sup>2</sup> The use of annual data in this paper is due to the unavailability of quarterly and monthly data over the specified timeframe for the studied group of countries.

<sup>3</sup> [www.data.imf.org](http://www.data.imf.org)

Bank<sup>4</sup>. Nominal values of both the government fiscal deficit and the current account deficit are scaled relative to national GDP in order to adjust for the effect of inflation and economic growth. The real effective exchange rate used in this paper are pooled from the database of Bruegel and are presented in the form of weighted average of the real value of a nation's currency in relation to a basket of its 66 trading partners<sup>5</sup>. Essentially, the use of real effective exchange rate and real interest rate helps to eliminate biases caused by inflation.

Figures 5, 6, 7, and 8 give a broad and general picture of the current account deficit, the government fiscal deficit, the real effective exchange rate, and the real interest rate in China, India, Indonesia, Malaysia, the Philippines, and Thailand over the period 1982-2019.

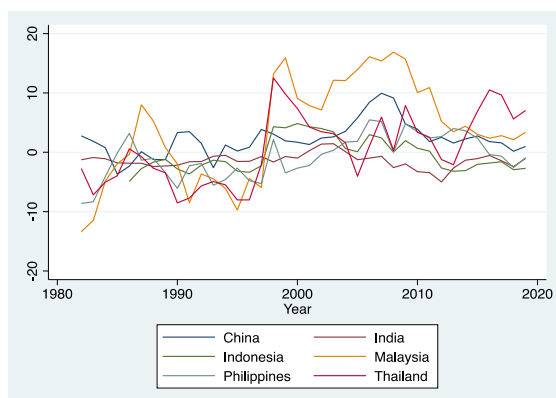


Figure 5. Current account deficit (as % of GDP)

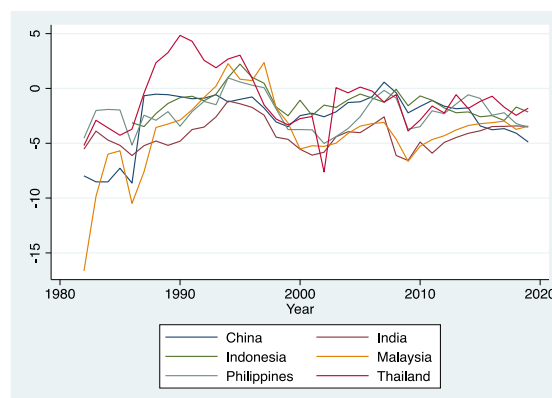


Figure 6. Government fiscal deficit (as % of GDP)

Overall, all countries appeared to possess some common trends for all variables. This is understandable since not only are these countries geographically close to one another, but they are also classified into the same level of economic development in Asia by the IMF. Another plausible explanation for the common patterns regarding the four economic indicators of these countries is that they constitute one of the main trading partners of one another while also having a large number of other trading partners in common out of the Southeast Asian sphere.

<sup>4</sup> [www.adb.org/publications/series/key-indicators-for-asia-and-the-pacific](http://www.adb.org/publications/series/key-indicators-for-asia-and-the-pacific)

<sup>5</sup> [www.bruegel.org/publications/datasets/real-effective-exchange-rates-for-178-countries-a-new-database](http://www.bruegel.org/publications/datasets/real-effective-exchange-rates-for-178-countries-a-new-database)

Another noticeable thing from the graphs is the shift in trend of all variables for all countries around 1997 and 1998. This was due to the onslaught of the Asian financial crisis, which completely wrecked these economies that had earlier been praised by the IMF as the Asian Miracles.

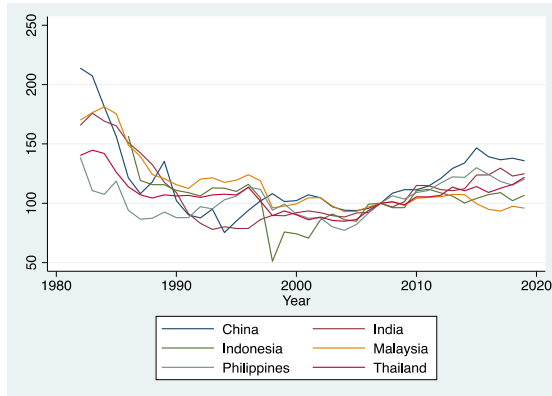


Figure 7. Real effective exchange rate

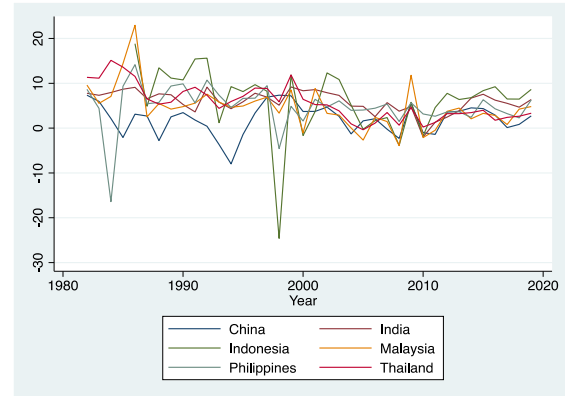


Figure 8. Real interest rate

As shown in the graphs, Indonesia’s real effective exchange rate and real interest rate hit the lowest among studied countries during the financial turmoil. This was the ramification of the Indonesian central bank injecting funds into 16 insolvent banks in order to save them, which in turn aggravated the crumbling rupiah and drove down both interest rates and real exchange rates. All countries displayed signs of recovery since 2000 as the effect of the debt crisis wore out and governments’ actions with respect to fiscal policies and monetary policies started to take off. As a result, interest rates became more stable while real exchange rates saw a gradual increase, which implied improvements in both the financial position and external position for all countries.

Table 1 provides a summary of descriptive statistics for each parameter for each country in the sample. Over the period 1982-2019, on average, India ran the largest current account deficit and government fiscal deficit. Based on the estimated standard deviation, the twin deficits were the most volatile for Malaysia. With respect to the real effective exchange rate and the real interest rate, China and Indonesia had the greatest figures respectively.

<b>Table 1. Summary Statistics</b>						
	<b>Variables</b>	<b>Obs.</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
<b>China</b>	CAD	38	2.177491	2.856798	-3.688996	9.947847
	GFD	38	-2.626535	2.495032	-8.6287	.5703347
	REER	38	118.5031	30.95916	75.2967	213.8306
	RIR	38	2.024545	3.371173	-7.989744	7.356478
<b>India</b>	CAD	38	-1.40576	1.202006	-5.004889	1.443561
	GFD	38	-4.253209	1.339934	-6.573253	-1.149553
	REER	38	110.8159	27.31001	77.96824	175.794
	RIR	38	5.973464	2.384004	-1.983859	9.191247
<b>Indonesia</b>	CAD	34	-4.970332	2.816714	-4.891558	4.843064
	GFD	34	-1.319941	1.241556	-3.47709	2.218853
	REER	34	101.9747	17.98254	51.16673	156.6519
	RIR	34	6.25903	7.51108	-24.60017	18.8261
<b>Malaysia</b>	CAD	38	3.693256	8.483035	-13.37566	16.85963
	GFD	38	-3.982904	3.455008	-16.64723	2.351355
	REER	38	115.248	24.65325	92.89627	181.2014
	RIR	38	4.648167	4.849637	-3.903382	22.95688
<b>Philippines</b>	CAD	38	-.7906127	3.673986	-8.61601	5.454523
	GFD	38	-2.267801	1.545741	-5.165216	.9619997
	REER	38	103.3625	15.07708	77.16157	138.6441
	RIR	38	4.829982	4.755231	-16.39589	14.16267
<b>Thailand</b>	CAD	38	.6009293	5.896567	-8.531562	12.52905
	GFD	38	-.9990604	2.712981	-7.61937	4.831821
	REER	38	106.6678	14.65249	84.81668	144.7135
	RIR	38	5.647019	3.881639	-.3541732	15.12481

## 4.2. Economic and Econometric Models

It is imperative that an empirical paper should present a proper economic model as it provides not only guidance on where and how to look at the data but also a structure on which the rest of the paper can hang. In the spirit of previous works done on the TDH, this paper proposes an augmented economic model based on the classic Mundell-Fleming framework for examining the dynamic nexus between the government fiscal deficit and the current account deficit. Specifically, this economic model includes the real effective exchange rate and the real interest rate

as another two regressors aside from the government fiscal deficit in predicting the value of the current account deficit. The model is expressed as follows:

$$CAD_t = f(GFD_t, REER_t, RIR_t). \quad (6)$$

The econometric model then can be derived from the proposed economic model:

$$CAD_t = \beta_0 + \beta_1 GFD_t + \beta_2 REER_t + \beta_3 RIR_t + \varepsilon_t, \quad (7)$$

where  $CAD_t$  is the current account deficit in year  $t$ ;  $GFD_t$  is the government fiscal deficit in year  $t$ ;  $REER_t$  is the real effective exchange rate in year  $t$ ;  $RIR_t$  is the real interest rate in year  $t$ ;  $\beta_0$  is the intercept of the population regression line;  $\beta_1$ ,  $\beta_2$ ,  $\beta_3$  are the parameters of the population regression line; and  $\varepsilon_t$  is the error term.

### 4.3. Empirical Methodology

In exploring the long-term relationship among the time-series variables, a number of standard econometric tests are performed in succession including stationarity test, cointegration test, and causality test. Stationarity is a fundamental concept when it comes to time-series analysis since it serves as a steppingstone to other useful statistical tests. While several econometric methods do not require the underlying series to be stationary over time, performing stationarity test would still be beneficial since its output can be utilized as meaningful input for these methods. After stationarity test is performed, cointegration test is carried out to establish if there exists a statistical relationship among the time-series variables in the long run. If two or more time-series are cointegrated, the long-term correlation coefficient can then be estimated. Cointegration also implies there is causality in at least one direction between the underlying variables. In order to further investigate the long-term relationship and estimate possible directions of causality between them, causality test is employed to confirm and complement the results generated by cointegration test. The outcome of causality test is significant that it

enables policymakers to fathom out different transmission mechanisms of the twin deficits phenomenon and duly provide meaningful policy recommendations.

Together, stationarity test, cointegration test, and causality test have proven to possess higher power and yield more accurate results than traditional ordinary least squares (OLS) regression which poorly accounts for non-stationarity (Engle and Granger, 1987). These tests have been effectively used in an abundance of empirical works on TDH ranging all the way from early 1990s to recent years including Darrat (1988), Abell (1990), Enders and Lee (1990), Anoruo and Ramchander (1998), Khalid and Guan (1999), Kim and Roubini (2008), Kalou and Paleologou (2012), Makin and Narayan (2013), Nikiforos et al. (2015), Magazzino (2017), Mahuni (2017), Baharumshah and Wohar (2019), Banday and Aneja (2019), and Bucevska (2020).

Although a combination of stationarity test, cointegration test, and causality test can generate more accurate results, there is uncertain whether the models posited in these tests are free from ills and biases. If a model is inadequate, its outcome cannot be reliably interpreted. An effective way to quantify the quality of a time-series model is to evaluate its residuals, which measure the difference between the actual observations and the corresponding values predicted by the model. To do this, residual diagnostics with respect to serial correlation, heteroskedasticity, and normality are employed. Aside from the problems associated with the residuals of the regression, the estimated ARDL and ECM models may also be subject to structural change and parameter instability over time. In economics, structural change and parameter instability can be attributed to a variety of things such as changes in economic policy or changes in the structure of the economy. If these changes are not detected and handled correctly, the regression can be misspecified and provides misleading basis for inference and forecasting. To resolve this problem, the paper follows Ioanna et al. (2014), Senadza & Aloryito (2016) Mahuni (2017), Banday and Aneja (2019), Ncanywa & Letsoalo (2019), and Handoyo et al. (2020) to conduct a series of residual diagnostics as well as model stability tests. The intuition behind these tests is explained in detail in section 4.3.3.

### 4.3.1. Unit Root Tests

Time-series data, along with cross-sectional data and panel data, are frequently used in econometrics for regression analysis and forecasting. Although time-series data can be utilized to explain the dynamic causal effects and produce meaningful economic forecasting, they pose several peculiar challenges when not handled properly, especially when it comes to the issue of stationarity.

Stationarity is one of the most fundamental concepts in econometrics and should be thoroughly investigated when time-series variables are used in regression analysis. While stationary time-series can be leveraged to estimate historical relationships and forecast future patterns based on data in the past, the use of non-stationary time-series will inevitably result in wrongful forecasts and spurious regressions (Granger & Newbold, 1974; Phillips, 1986). Spurious regressions can be understood as regressions that misleadingly indicate a statistically significant linear relationship between two or more non-stationary time-series that are independent of each other.

What distinguishes a stationary time-series from a non-stationary one lies in their statistical properties. A time-series is said to be stationary if its probability distribution and other statistical properties including its mean, variance, and autocorrelation are invariant with respect to the actual time of observation. A non-stationary time-series, by contrast, exhibits stochastic trends that are random and vary over time. Since most time-series contain a stochastic trend or random walk at level (Nelson and Plosser, 1982) – that is, in the original form, their probability distribution and statistical properties change when shifted in time – they must be handled carefully in order to avoid spurious results. Usually, non-stationary time-series are detrended and made stationary by differencing.

In order to detect non-stationary time-series and transform them into stationary ones, formal statistical procedures can be employed to test the null

hypothesis that there is a unit root (stochastic trend) in the series against the alternative hypothesis that there is no unit root<sup>6</sup>. Most commonly used unit root tests in identifying stochastic trends and the order of integration are the Dickey-Fuller test and Augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1979), the Phillips-Perron test (Phillips and Perron, 1988), the KPSS test (Kwiatkowski, et al., 1992), and the ADF-GLS test (Elliot, et al., 1996)<sup>7</sup>. Given the fact that all the time-series used in this study is relatively short – the number of observations is 38 each for China, India, Malaysia, Philippines, and Thailand whereas Indonesia has only 34, the ADF test and Phillips-Perron test are more suitable for checking stationarity in the time-series variables included in this study.

As its name indicates, the ADF test is an augmented version of the standard Dickey-Fuller test as it deals with the problem of autocorrelation by adding lags (past values) of  $\Delta Y_t$  to the original statistic. In this paper, the optimal lag length  $p$  is determined based on the Akaike information criterion (AIC). The autoregressive model for conducting the ADF test is demonstrated as follows:

$$\Delta Y_t = \beta_0 + \delta Y_{t-1} + \sum_{i=1}^p \gamma_i \Delta Y_{t-i} + \varepsilon_t. \quad (8)$$

$H_0: \delta = 0; Y_t$  contains a unit root.

$H_1: \delta < 0; Y_t$  is stationary.

The Phillips-Perron test uses the same autoregressive model as the standard Dickey-Fuller test. Therefore, the test itself is non-parametric. In other words, one does not have to specify the choice of lag length  $p$  in the test's regression model whereas this is required in the ADF test. However, what renders the

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<sup>6</sup> There are two types of trends in time-series data: deterministic and stochastic. A deterministic trend is a nonrandom function of time whereas a stochastic trend is random and varies over time.

<sup>7</sup> Differencing is an econometric method for making non-stationary time-series stationary. The minimum number of differences required to get a stationary series is widely referred to as the order of integration.

Phillips-Perron test different from the standard Dickey-Fuller test is its correction for serial correlation and heteroskedasticity in the error term  $\varepsilon_t$  by using non-parametrically modified test statistics. The null hypothesis and the alternative hypothesis for testing stationarity remain the same as those in the ADF test. Although the ADF test has been proven by Davidson and MacKinnon (2004) to perform better in finite samples than the Phillips-Perron test, the two tests should yield similar and consistent results.

#### 4.3.2. Cointegration Tests

After getting results from the unit root tests, the paper goes on to estimate the long-run equilibrium relationships among the time-series variables by performing a number of cointegration tests. The concept of cointegration was first developed and put forward by Engle and Granger in 1987. Conceptually, two or more time-series variables are said to be cointegrated when they have the same trend component – that is, a common stochastic trend. To put it in a more formal way, time-series variables that are individually non-stationary and integrated of order  $d$ , denoted as  $I(d)$ , are cointegrated if there exists a certain linear combination of these variables and the linear combination is integrated of an order less than  $d$ . For example, suppose that both  $X_t$  and  $Y_t$  are integrated of order one. If, for a particular value of  $\beta$ , the linear combination  $Y_t - \beta X_t$  is integrated of order zero, then  $X_t$  and  $Y_t$  are concluded to be cointegrated with a cointegrating coefficient  $\beta$ . The linear combination  $Y_t - \beta X_t$  in this case is referred to as the error correction term. Since the term  $Y_t - \beta X_t$  is stationary, it can be used in regression analysis to estimate the long-run relationship between  $X_t$  and  $Y_t$  by employing an augmented VAR model which has the first differences of  $X_t$  and  $Y_t$  as the dependent variables and includes  $Y_{t-1} - \beta X_{t-1}$  as an additional regressor.

Cointegration plays a significant role in the world of econometrics since its practice enables researchers to obtain useful information about the long-term relationship between two or more time-series variables. Econometric tools

that are most frequently used to test for cointegration include, but are not limited to, the Engle-Granger two-step method (Engle and Granger, 1987), the Johansen test (1988, 1991), also known as the Johansen and Juselius cointegration procedure (Johansen and Juselius, 1990), the Phillips-Ouliaris cointegration test (1990), the Gregory-Hansen test (1996), and the autoregressive distributed lag (ARDL) bounds testing approach (Pesaran et al., 2001). Out of these methods, this study employs the ARDL bounds testing approach to gauge the long-run equilibrium relationships among the aforementioned time-series variables by comparing the estimated F-statistics of the ARDL models against the critical value bounds for three regressors and observations from 1982 to 2019.

The rationale behind the selection of this method is twofold. First, compared to the Engle-Granger two-step method and the Johansen cointegration test, the ARDL bounds testing approach is much simpler and easier to conduct because it does not require the classification of the time-series variables that are included in the model into different categories of different integration orders. In other words, this method allows for the estimation of cointegration among the underlying variables once the number of lags is defined regardless of whether these variables are integrated of the same orders – that is, the ARDL bounds test can be applied to a combination of variables that are integrated of order zero  $I(0)$  and order one  $I(1)$ . However, it should be noted that this approach cannot be applied in cases where the regressors are integrated of order two  $I(2)$  or higher. Therefore, unit root tests, despite having low power, are a prerequisite for the ARDL bounds test to make sure that the maximum order of integration of the independent variables is one  $I(1)$ . Second, the selection of this method is due to the small sample size of the time-series data in this paper. Pesaran et al. (2001) has demonstrated empirical evidence that the bounds test is relatively more suitable, effective, and robust than other standard cointegration techniques when it comes to a small and finite sample size. The ARDL model employed in this paper is specified as follows:

$$\begin{aligned}
\Delta CAD_t = & \alpha_0 + \beta_1 CAD_{t-1} + \beta_2 GFD_{t-1} + \beta_3 REER_{t-1} + \beta_4 RIR_{t-1} \\
& + \sum_{i=1}^p \alpha_{1i} \Delta CAD_{t-i} + \sum_{i=1}^{q1} \alpha_{2i} \Delta GFD_{t-i} + \sum_{i=1}^{q2} \alpha_{3i} \Delta REER_{t-i} \\
& + \sum_{i=1}^{q3} \alpha_{4i} \Delta RIR_{t-i} + \varepsilon_t.
\end{aligned} \tag{9}$$

Under the null hypothesis  $H_0$ ,  $\beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$  and there is no cointegration. Then, the short-run effect is captured by ARDL models  $(p, q1, q2, q3)$  specified as follows:

$$\begin{aligned}
\Delta CAD_t = & \alpha_0 + \sum_{i=1}^p \alpha_{1i} \Delta CAD_{t-i} + \sum_{i=1}^{q1} \alpha_{2i} \Delta GFD_{t-i} + \sum_{i=1}^{q2} \alpha_{3i} \Delta REER_{t-i} \\
& + \sum_{i=1}^{q3} \alpha_{4i} \Delta RIR_{t-i} + \varepsilon_t.
\end{aligned} \tag{10}$$

If  $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq 0$ , the null hypothesis  $H_0$  is rejected and the alternative hypothesis  $H_1$  is accepted, indicating that there exists cointegration among the time-series variables. In this case, the error correction term  $\lambda ECT_{t-1}$  is then added to equation 11 in order to estimate the Error Correction Model (ECM), which can be used to investigate both short-run and long-run relationships within the specified group of variables.

$$\begin{aligned}
\Delta CAD_t = & \alpha_0 + \sum_{i=1}^p \alpha_{1i} \Delta CAD_{t-i} + \sum_{i=1}^{q1} \alpha_{2i} \Delta GFD_{t-i} + \sum_{i=1}^{q2} \alpha_{3i} \Delta REER_{t-i} \\
& + \sum_{i=1}^{q3} \alpha_{4i} \Delta RIR_{t-i} + \lambda ECT_{t-1} + \varepsilon_t;
\end{aligned} \tag{11}$$

$$ECT_{t-1} = CAD_{t-1} - \alpha_0 - \theta_1 GFD_{t-1} - \theta_2 REER_{t-1} - \theta_3 RIR_{t-1} \quad (12)$$

Coefficients  $\alpha_{1i}$ ,  $\alpha_{2i}$ ,  $\alpha_{3i}$ , and  $\alpha_{4i}$  represent the short-run dynamics of the model's convergence to the long-run equilibrium. The error correction coefficient  $\lambda$  represents the speed of adjustment to equilibrium. The value of  $\lambda$  should be negative and statistically significant to indicate the long-run convergence in the cointegrating relationship. The long-run parameters  $\theta_1$ ,  $\theta_2$ , and  $\theta_3$  for *GFD*, *REER*, and *RIR* respectively can be inferred from equation 12, which can be estimated based on the OLS method.

#### 4.3.3. Diagnostic Tests

After cointegration tests are performed and the results are obtained, it is important to check upon the reliability and robustness of all the specified ARDL and ECM models. The rationale behind doing this is that the results estimated based on these models might be prone to model mis-specification or problems associated with the residuals and hence misleading. By examining the residuals of the regressions, one can quantify the quality of the estimated models and learn if they are adequate in describing the dynamics between the underlying variables (Beggs, 1988). The residuals of a good forecasting model would have the following characteristics:

- The residuals are not serial-correlated. If there is serial correlation in the residuals of the regression, the model might have been inefficiently if not incorrectly specified. This is because there is useful information left in the correlated residuals that could have been utilized to generate better forecasts.
- The residuals are homoscedastic – that is, the residuals must have a constant variance. Otherwise, the regression model suffers from heteroskedasticity and the analysis can be invalid. This is because the

presence of heteroskedasticity violates one of the key assumptions of OLS regression that residuals have the same but unknown variance.

- The residuals are normally distributed. Although this statistical property is not as crucial as the two mentioned above, it allows for easier and more accurate calculations of the prediction intervals.

With respect to residual diagnostics, the paper follows previous literature to perform the Durbin-Watson statistic and the Breusch-Godfrey Lagrange Multiplier test to test for serial correlation, the White test and the Breusch-Pagan-Godfrey test for heteroskedasticity, and the Jarque-Bera test for normality. These are the most commonly used econometric techniques when it comes to residual diagnostics. The null hypotheses and alternative hypotheses of these tests are presented in Table 1.

As mentioned earlier, the ARDL and ECM models may also suffer from structural change and parameter instability aside from problems associated with the residuals of the regression. To detect structural change and examine parameter stability as well as model stability, the paper employs the cumulative sum (CUSUM) test and cumulative sum of squares (CUSUMSQ) test which are based on the use of recursive residuals<sup>8</sup>. If the values of the cumulative sum and the cumulative sum of squares of recursive residuals fall outside an expected range, structural change is present, indicating the model is not stable over time. The CUSUM and CUSUMSQ tests, which were first introduced by Brown et al. (1975), have a significant advantage over the Chow (1960) test. Specifically, these two tests do not require prior knowledge of when the structural change or the so-called breakpoint takes place whereas the breakpoint date must be specified in the Chow test. Because the CUSUM and CUSUMSQ tests can separately outperform each other under certain circumstances, the two tests are usually used together to complement

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<sup>8</sup> Recursive residuals are uncorrelated, independently distributed, and homoscedastic with zero mean and constant variance.

one another<sup>9</sup>. The null hypotheses and alternative hypotheses for the CUSUM and CUSUMSQ tests are illustrated in Table 2.

<b>Table 2. Residual Diagnostics and Stability Diagnostics</b>		
<b>Test statistic</b>	<b>Econometric technique</b>	<b>Hypotheses</b>
Serial correlation	Durbin-Watson statistic	$H_0$ : There is no serial correlation
	Breusch-Godfrey Lagrange Multiplier test	$H_1$ : There is serial correlation
Heteroskedasticity	White test	$H_0$ : There is no heteroskedasticity
	Breusch-Pagan-Godfrey test	$H_1$ : There is heteroskedasticity
Normality	Jarque-Bera (Skewness Kurtosis) test	$H_0$ : The residuals are normally distributed
		$H_1$ : The residuals are not normally distributed
Stability	CUSUM test	$H_0$ : The model is not stable
	CUSUMSQ test	$H_1$ : The model is stable

#### 4.3.4. Granger Causality Tests

When the long-run relationships among the time-series variables are identified, the next step is to conduct Granger causality test to further investigate the causal dynamics and the direction of causality. Consider two time-series  $X_t$  and  $Y_t$  that are both stationary at pure level with zero means, according to Granger (1969),  $X_t$  is said to Granger-cause  $Y_t$  if  $X_t$  and its lagged terms contain information that generates better prediction of the future values of  $Y_t$  than when the past values of  $Y_t$  are used alone. In terms of econometric tools and techniques, a VAR model can be employed to investigate the direction of causality among the time-series involved in the analysis. However, according to Charemza and Deadman (1992), the use of VAR models is propitious only when all the underlying variables are stationary. Thus, should the underlying time-series variables be cointegrated, Granger causality test must be conducted in the environment of a restricted

<sup>9</sup> The CUSUM test demonstrates higher power when the structural change takes place in the intercept whereas the CUSUMSQ test performs better when the change occurs in the slope or the variance of the error term (Turner, 2010).

VAR system in which all non-stationary variables are rendered stationary by means of differencing. This process of differencing, however, might not be very ideal since it causes a significant loss of meaningful information regarding the long-run relationships among the time-series variables at their pure levels. In order to avoid such misspecification and omission of important information, it is imperative that the causality test be performed under the Vector Error Correction Model (VECM) which reintroduces the long-run relationships that are eliminated because of differencing.

This paper takes an alternative approach to Granger causality test by employing Toda and Yamamoto's renowned modified Wald statistic. This improved modification has a number of advantages over the original Granger causality test. Firstly, not only does the modified Wald (MWALD) test have the edge on the standard F-test in Granger causality statistic in terms of computational simplicity, but it is also more preferable in cases where the sample size is finite and relatively small. Although small and finite samples might be susceptible to size distortion, the level of distortion due to poor approximation is less severe in the MWALD test compared to others (Kurozumi and Yamamoto, 2000). Another advantage of the MWALD test is its robustness, which is especially noticeable when it comes to dealing with integration and cointegration since it does not require the pre-testing of unit roots in the underlying time-series variables. As a result, the test is free from biases and uncertainty caused by low power unit root tests. Nevertheless, it is essential that the maximum order of integration  $d_{max}$  of all variables involved in the analysis be determined in order to conduct the MWALD test for Granger causality. For example, consider a mixture of time-series variables integrated of order zero  $I(0)$ , order one  $I(1)$ , and order two  $I(2)$ . In this scenario, the maximum order of integration is two ( $d_{max} = 2$ ).

In conducting the MWALD test for Granger causality, this study estimates a multivariate VAR system in which all the underlying time-series variables are presented in their pure level form. After the optimal lag length  $p$  for the VAR

model and the maximum order of integration  $d_{max} = m$  for the group of time-series being studied are determined, an augmented level VAR with  $p + m$  lags is posited to test for Granger causality with  $GFD$ ,  $CAD$ ,  $REER$ , and  $RIR$  being the dependent variable respectively. The MWALD test for zero restriction on the coefficients of the first  $p$  lagged values of the regressors excluding the last  $d_{max}$  lagged vectors is asymptotically Chi-square distributed. The VAR model employed for conducting the MWALD test is presented as follows:

$$CAD_t = \beta_{10} + \sum_{i=1}^{p+m} \beta_{1i} CAD_{t-i} + \sum_{i=1}^{p+m} \gamma_{1i} GFD_{t-i} + \sum_{i=1}^{p+m} \delta_{1i} REER_{t-i} + \sum_{i=1}^{p+m} \lambda_{1i} RIR_{t-i} + \varepsilon_{1t} \quad (12)$$

$$GFD_t = \beta_{20} + \sum_{i=1}^{p+m} \beta_{2i} CAD_{t-i} + \sum_{i=1}^{p+m} \gamma_{2i} GFD_{t-i} + \sum_{i=1}^{p+m} \delta_{2i} REER_{t-i} + \sum_{i=1}^{p+m} \lambda_{2i} RIR_{t-i} + \varepsilon_{2t} \quad (13)$$

$$REER_t = \beta_{30} + \sum_{i=1}^{p+m} \beta_{3i} CAD_{t-i} + \sum_{i=1}^{p+m} \gamma_{3i} GFD_{t-i} + \sum_{i=1}^{p+m} \delta_{3i} REER_{t-i} + \sum_{i=1}^{p+m} \lambda_{3i} RIR_{t-i} + \varepsilon_{3t} \quad (14)$$

$$RIR_t = \beta_{40} + \sum_{i=1}^{p+m} \beta_{4i} CAD_{t-i} + \sum_{i=1}^{p+m} \gamma_{4i} GFD_{t-i} + \sum_{i=1}^{p+m} \delta_{4i} REER_{t-i} + \sum_{i=1}^{p+m} \lambda_{4i} RIR_{t-i} + \varepsilon_{4t} \quad (15)$$

The null hypotheses and alternative hypotheses for the MWALD test are presented in Table 3.

Table 3. Hypothesis Testing for the MWALD Test	
Dependent variable	$i = 1, 2, 3, \dots, k.$
$CAD_t$	$H_0: \gamma_{1i} = \delta_{1i} = \lambda_{1i} = 0$ ; there is no causality $H_1: \gamma_{1i} \neq \delta_{1i} \neq \lambda_{1i} \neq 0$ ; there is causality
$GFD_t$	$H_0: \gamma_{2i} = \delta_{2i} = \lambda_{2i} = 0$ ; there is no causality $H_1: \gamma_{2i} \neq \delta_{2i} \neq \lambda_{2i} \neq 0$ ; there is causality
$REER_t$	$H_0: \gamma_{3i} = \delta_{3i} = \lambda_{3i} = 0$ ; there is no causality $H_1: \gamma_{3i} \neq \delta_{3i} \neq \lambda_{3i} \neq 0$ ; there is causality
$RIR_t$	$H_0: \gamma_{4i} = \delta_{4i} = \lambda_{4i} = 0$ ; there is no causality $H_1: \gamma_{4i} \neq \delta_{4i} \neq \lambda_{4i} \neq 0$ ; there is causality

## 5. EMPIRICAL RESULTS AND DISCUSSION

### 5.1. Unit Root Tests

In the ADF test and Phillips-Perron test, if the value of the test statistic is lower than the 5% critical value and the p-value is lower than 0.05, the null hypothesis that the time-series has a unit root can be rejected. Unlike the Phillips-Perron test, the ADF test requires the determination of the optimal lag length to account for autocorrelation. In this paper, the optimal number of lags is determined based on the Akaike information criterion (AIC). The results obtained from the two tests are consistent with each other and show that  $CAD_t$  and  $GFD_t$  are non-stationary and integrated of order one  $I(1)$  for most countries except for the Philippines whereas  $REER_t$  and  $RIR_t$  are stationary at level for most countries except for Thailand and India. The maximum order of integration of the four time-series variables is one ( $d_{max} = 1$ ) for all countries included in the sample. Since the sample contains a mixture of  $I(0)$  and  $I(1)$  series, the ARDL bounds testing approach constitutes an ideal econometric tool for testing cointegration among the underlying time-series variables. The detailed test results from the ADF test and Phillips-Perron test are provided in Table 4.

<b>Table 4. Results of Augmented Dickey-Fuller Tests &amp; Phillips-Perron Tests</b>			
		<b>ADF</b>	<b>PP</b>
<b>China</b>	CAD(I <sub>0</sub> )	-2.195 (0.2081)	-2.318 (0.1663)
	CAD(I <sub>1</sub> )	-5.646 (0.0000)**	-5.643 (0.0000)**
	GFD(I <sub>0</sub> )	-2.523 (0.1099)	-2.484 (0.1195)
	GFD(I <sub>1</sub> )	-6.527 (0.0000)**	-6.520 (0.0000)**
	REER(I <sub>0</sub> )	-3.619 (0.0054)*	-3.483 (0.0084)*
	RIR(I <sub>0</sub> )	-3.810 (0.0028)**	-3.799 (0.0029)**
<b>India</b>	CAD(I <sub>0</sub> )	-2.471 (0.1227)	-2.572 (0.0989)
	CAD(I <sub>1</sub> )	-6.138 (0.0000)**	-6.145 (0.0000)**
	GFD(I <sub>0</sub> )	-2.469 (0.1231)	-2.698 (0.0744)
	GFD(I <sub>1</sub> )	-5.901 (0.0000)**	-5.900 (0.0000)**
	REER(I <sub>0</sub> )	-2.093 (0.2472)	-2.002 (0.2858)
	REER(I <sub>1</sub> )	-3.974 (0.0030)**	-3.986 (0.0015)**
	RIR(I <sub>0</sub> )	-3.248 (0.0174)*	-3.206 (0.0196)*
RIR(I <sub>1</sub> )			
<b>Indonesia</b>	CAD(I <sub>0</sub> )	-2.138 (0.2294)	-2.213 (0.2016)
	CAD(I <sub>1</sub> )	-5.216 (0.0000)**	-5.225 (0.0000)**
	GFD(I <sub>0</sub> )	-2.468 (0.1236)	-2.550 (0.1037)
	GFD(I <sub>1</sub> )	-6.174 (0.0000)**	-6.157 (0.0000)**
	REER(I <sub>0</sub> )	-3.816 (0.0027)**	-3.806 (0.0028)**
	RIR(I <sub>0</sub> )	-5.859 (0.0000)**	-5.854 (0.0000)**
<b>Malaysia</b>	CAD(I <sub>0</sub> )	-2.407 (0.1396)	-2.461 (0.1262)
	CAD(I <sub>1</sub> )	-5.694 (0.0000)**	-5.689 (0.0000)**
	GFD(I <sub>0</sub> )	-4.564 (0.0002)**	-4.362 (0.0003)**
	REER(I <sub>0</sub> )	-2.238 (0.1928)	-2.223 (0.1979)**
	REER(I <sub>1</sub> )	-4.330 (0.0004)**	-4.286 (0.0005)**
	RIR(I <sub>0</sub> )	-5.004 (0.0000)**	-5.075 (0.0000)**
<b>Philippines</b>	CAD(I <sub>0</sub> )	-3.091 (0.0272)*	-3.041 (0.0312)*
	GFD(I <sub>0</sub> )	-3.054 (0.0301)*	-3.227 (0.0185)*
	REER(I <sub>0</sub> )	-2.562 (0.1011)	-3.227 (0.0185)
	REER(I <sub>1</sub> )	-6.660 (0.0000)**	-6.664 (0.0000)**
	RIR(I <sub>0</sub> )	-6.160 (0.0000)**	-6.178 (0.0000)**
<b>Thailand</b>	CAD(I <sub>0</sub> )	-2.147 (0.2259)	-2.184 (0.2120)
	CAD(I <sub>1</sub> )	-5.947 (0.0000)**	-5.992 (0.0000)**
	GFD(I <sub>0</sub> )	-2.723 (0.0701)	-2.775 (0.0619)
	GFD(I <sub>1</sub> )	-7.276 (0.0000)**	-7.254 (0.0000)**
	REER(I <sub>0</sub> )	-2.201 (0.2059)	-2.228 (0.1961)
	REER(I <sub>1</sub> )	-4.342 (0.0004)**	-4.440 (0.0003)**
	RIR(I <sub>0</sub> )	-2.254 (0.1872)	-2.079 (0.2530)
	RIR(I <sub>1</sub> )	-7.590 (0.0000)**	-7.952 (0.0000)**

Note: \* and \*\* denote critical value at the 5% significance level and 1% significance level respectively.

## 5.2. Cointegration Tests and Diagnostic Tests

### 5.2.1. Cointegration Tests

After examining the stationarity in the underlying time-series variables for all countries, a series of ARDL bounds tests for cointegration can be exercised based on equation 9. The optimal lag length for each time-series variable included in the ARDL models is chosen based on the AIC. The maximum number of lags for the dependent variable and regressors are set at two

because of the small sample size. The F-statistic is employed in evaluating the test results. If the calculated F-statistic is higher than the upper bound  $I(1)$  critical values, the null hypothesis that there is no cointegration is rejected. However, if the calculated F-statistic turns out to be lower than the critical values for the lower bound  $I(1)$ , the null hypothesis cannot be rejected and hence no long-run relationship. In cases where the F-statistic falls between the lower bound and upper bound critical values, the conclusion is that a long-run relationship among the time-series variables are is indeterminant.

The results of cointegration tests for China, India, Indonesia, Malaysia, the Philippines, and Thailand are provided in Table 5.

<b>Table 5. Cointegration Test Results</b>							
<b>ARDL model</b>		<b>Critical values for the bound test: no constant and no trend</b>					
		<b>90% LB</b>	<b>90% UB</b>	<b>95% LB</b>	<b>95% UB</b>	<b>99% LB</b>	<b>99% UB</b>
		2.01	3.10	2.45	3.63	3.42	4.84
		<b>Calculated F-statistic</b>					
China	ARDL(1,0,1,0)				4.734		
India	ARDL(1,1,0,0)						6.234
Indonesia	ARDL(1,1,0,0)				3.712		
Malaysia	ARDL(2,2,1,1)				4.359		
Philippines	ARDL(1,1,2,1)				3.974		
Thailand	ARDL(2,0,1,1)		3.520				

Note:  $CAD_t$  is the dependent variable in all ARDL models.

The test statistics give evidence to the existence of long-run relationships among  $CAD_t$ ,  $GFD_t$ ,  $REER_t$ , and  $RIR_t$  for India at 1% significance level. China, Indonesia, Malaysia, and the Philippines all demonstrates cointegration among the underlying time-series variables at 5% significance level. The long-run relationship, nevertheless, is found to be rather weak for Thailand as it is only valid at 10% significance level based on the calculated F-statistic.

Based on the results yielded by the ARDL bounds tests for cointegration, ECM models are estimated for China, India, Indonesia, Malaysia, and the Philippines to investigate the long-run dynamics among the underlying variables. The short-run dynamics are estimated for Thailand based on its

ARDL model. The short-run causal effect is captured by the t-statistic of the explanatory variables whereas the cointegrating and long-run relationships among the underlying variables can be inferred from the t-statistic of the coefficient of the lagged error correction term. The estimations for both short-run and long-run dynamics are presented in detail in Table 6.

<b>Table 6. Long-Run and Short-Run Estimations for Cointegration</b>					
			<b>Coefficient</b>	<b>t-statistic</b>	<b>Prob</b>
<b>China</b>	ADJ (ECT)	CAD(-1)	-0.23676	2.28	0.029
	Long run	GFD	2.90961	2.14	0.040
		REER	0.05819	2.48	0.019
		RIR	-0.96221	-2.10	0.044
<b>India</b>	ADJ (ECT)	CAD(-1)	-0.42155	3.97	0.000
	Long run	GFD	0.30009	2.29	0.029
		REER	-0.03603	-3.02	0.005
		RIR	0.45992	3.24	0.003
<b>Indonesia</b>	ADJ (ECT)	CAD(-1)	-0.23861	-2.73	0.011
	Long run	GFD	0.98127	3.60	0.002
		REER	-0.13514	-3.76	0.001
		RIR	-0.14752	-1.60	0.120
<b>Malaysia</b>	ADJ (ECT)	CAD(-1)	-0.68663	-4.13	0.000
	Long run	GFD	1.48376	-3.58	0.001
		REER	-0.17503	-1.80	0.083
		RIR	-0.44777	-1.65	0.109
<b>Philippines</b>	ADJ (ECT)	CAD(-1)	-0.44998	-3.59	0.001
	Long run	GFD	0.14306	2.24	0.033
		REER	0.01764	0.80	0.433
		RIR	-0.84907	-2.27	0.031
<b>Thailand</b>	Short run	CAD(-1)	0.72739	4.59	0.000
		GFD	0.73398	2.69	0.012
		REER(-1)	0.29465	1.97	0.059
		RIR	-0.06993	-0.25	0.802

As expected, all the error correction coefficients for China, India, Indonesia, Malaysia, and the Philippines are both negative and statistically significant, indicating convergence and strong cointegrating relationships. Based on the estimations of the coefficients of the error correction terms, it can be inferred that approximately 23.68%, 42.16%, 23.86%, 68.66%, and 44.99% of the disequilibrium in the previous year's shock to the current account deficit is being corrected for the long-run equilibrium in the current year for China, India, Indonesia, Malaysia, and the Philippines respectively. This result implies that the feedback effect of the current account deficit, as well as its speed of convergence to the long-run equilibrium, is greatest for Malaysia.

Estimations of both short-run and long-run coefficients of *GFD*, *CAD*, *REER*, and *RIR* are statistically significant at 5% level in most of the cases, indicating that a minor change in the government fiscal deficit, real effective exchange rate, and real interest rate can have an immediate and significant feedback on the current account deficit. With respect to the long-run dynamic nexus between the two deficits, 1% of unanticipated change in the government fiscal deficit is associated with 2.91%, 3.00%, 0.98%, 1.48%, and 0.14% change in the current account deficit for China, India, Indonesia, Malaysia, and the Philippines respectively. As for Thailand, 1% change in the government fiscal deficit is correlated with 0.73% change in the current account deficit in the short run.

### **5.2.2. Diagnostic Tests**

In order to check the reliability of the ARDL and ECM models, a series of fundamental robustness tests including residual diagnostic tests and model stability tests are conducted. Residual diagnostics are one of the most useful econometric tools for examining whether the estimated econometric models are well-specified and the degree to which they are affected by biases caused by problems associated with serial correlation, heteroskedasticity, normality, model misspecification, and the like. Stability tests, which is also a part of the diagnostic process, are no less important since they provides an effective and efficient way to check the stability of the underlying parameters which can be subject to structural change and regime shifts. With respect to residual diagnostics, the paper employs the Durbin-Watson test, the Breusch-Godfrey Lagrange Multiplier test, the White's test, the Breusch-Pagan-Godfrey test, and the Jarque-Bera test to test for serial autocorrelation, heteroskedasticity, and normality. Under the null hypotheses, there is no autocorrelation, no heteroskedasticity, and normality respectively. The paper makes use of the CUSUM and CUSUMSQ test in examining and evaluating the models' stability.

Table 7, 8, and 9 show the results of residual diagnostic testing for all ARDL and ECM models employed in studying the long-run and short-run dynamics among the time-series variables. The results of stability tests are provided in Table 10.

<b>Table 7. Autocorrelation Test Results</b>		
	<b>Durbin-Watson test</b>	<b>Breusch-Godfrey test</b>
	(d-statistic)	(p-value)
China	1.819135	0.6266
India	2.044090	0.7804
Indonesia	1.895907	0.4330
Malaysia	1.865585	0.7206
Philippines	2.218585	0.1185
Thailand	2.117560	0.5883

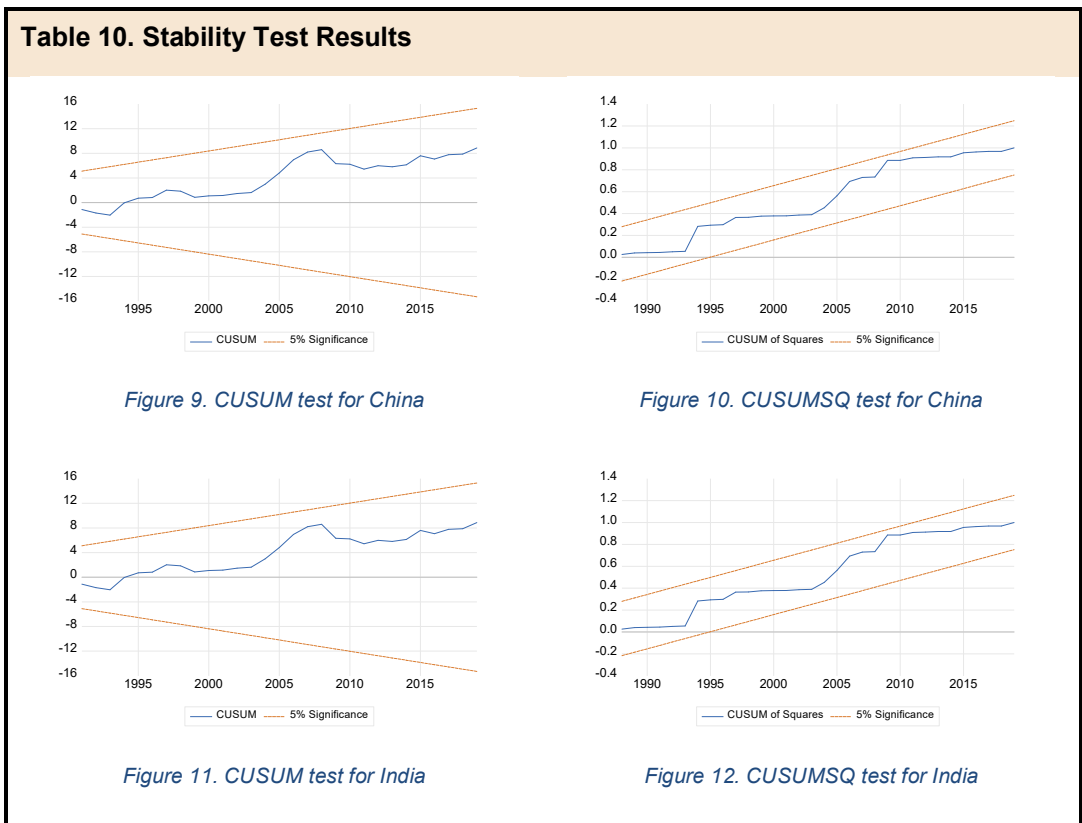
Essentially, the Durbin-Watson (DW) statistic always has a value between 0 and 4. A value of 2 will completely rejects the presence of serial correlation in the residuals of the regression. If the value of the DW statistic falls between 0 and 2, there is positive serial correlation. If the value of the DW statistic falls between 2 and 4, there is negative serial correlation. In practice, there is a rule of thumb that any value between 1.5 and 2.5 indicates the residuals are relatively uncorrelated. As the DW statistics for all countries comply with this rule, it can be said that the estimated ARDL and ECM models do not suffer from serial correlation. This is consistent with the result of the Breusch-Godfrey test, whose p-values are not statistically significant enough to reject the null hypothesis that there is no serial correlation.

<b>Table 8. Heteroskedasticity Test Results</b>		
	<b>White's test</b>	<b>Breusch-Pagan-Godfrey test</b>
	(p-value)	(p-value)
China	0.0930	0.1207
India	0.2505	0.4860
Indonesia	0.8748	0.8444
Malaysia	0.4215	0.2405
Philippines	0.4215	0.5676
Thailand	0.1645	0.2746

The White's test and the Breusch-Pagan Godfrey test for heteroskedasticity yields consistent results as all the p-values from both tests are considerably greater than 0.05. This means the null hypothesis of homoskedasticity cannot be rejected. In other words, there is no evidence of heteroskedasticity in the residuals of the estimated ARDL and ECM models.

Table 9. Normality Test Results	
	Calculated p-value for Jarque-Bera test
China	0.8998
India	0.3816
Indonesia	0.8999
Malaysia	0.8570
Philippines	0.7109
Thailand	0.7744

It can be seen from the table that all the p-values from the Jarque-Bera test are far from statistically significant. This means the null hypothesis that the residuals are normally distributed cannot be rejected.



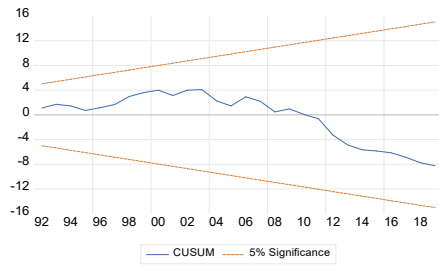


Figure 13. CUSUM test for Indonesia

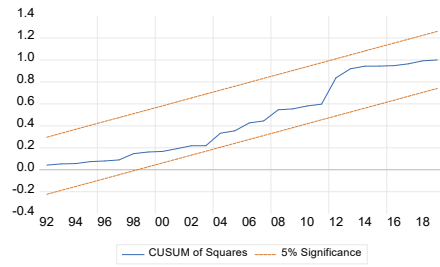


Figure 14. CUSUMSQ test for Indonesia

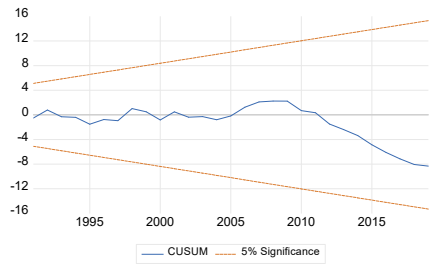


Figure 15. CUSUM test for Malaysia

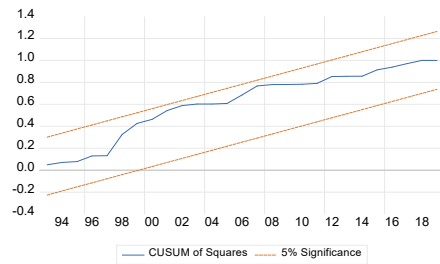


Figure 16. CUSUMSQ test for Malaysia



Figure 17. CUSUM test for Philippines

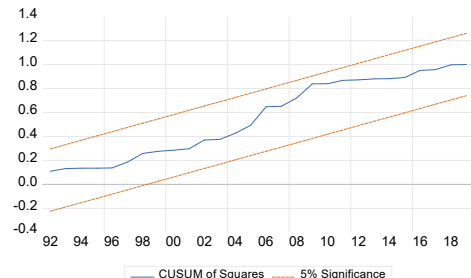


Figure 18. CUSUMSQ test for Philippines

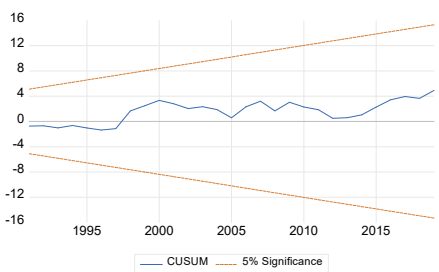


Figure 19. CUSUM test for Thailand

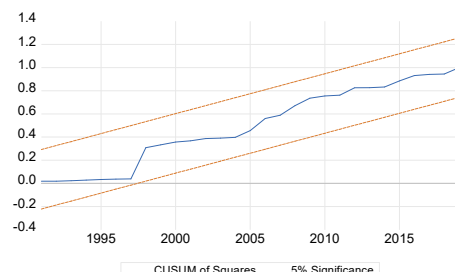


Figure 20. CUSUMSQ test for Thailand

The results of the CUSUM and CUSUMSQ tests are consistent in checking the stability of the estimated ARDL and ECM models. The cumulative sum

and the cumulative sum of squares of the residuals fall within the area bounded by the upper and lower 5% critical lines. This suggests that all models are well-specified and stable over the studied period.

As the estimated ARDL and ECM models pass all the diagnostic tests and stability tests, the results generated from these models can then be trusted and reliably interpreted.

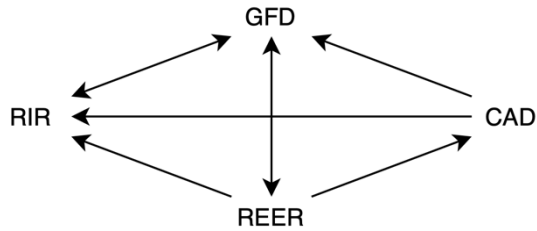
### 5.3. Granger Causality Tests

Once cointegration is detected among the underlying time-series variables, Granger causality tests are employed as the final step to assess the direction of causality of the estimated short-run and long-run relationships. The paper follows the MWALD test proposed by Toda and Yamamoto (1995) as an alternative approach to Granger causality. The results are presented in detail in Table 11 and are visualized for easier and better interpretation in Table 12.

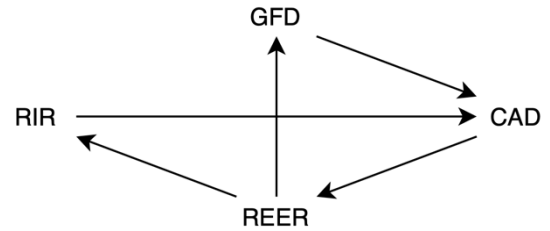
Table 11. Results of Granger Causality Testing									
	Equation	Excluded	Chi2	Prob		Equation	Excluded	Chi2	Prob
<b>China</b>	CAD	GFD	.73869	0.445	<b>India</b>	CAD	GFD	61.995	0.000
	CAD	REER	1.0773	0.022		CAD	REER	3.0379	0.219
	CAD	RIR	5.0347	0.060		CAD	RIR	15.717	0.000
	GFD	CAD	6.2669	0.016		GFD	CAD	.80287	0.669
	GFD	REER	21.237	0.000		GFD	REER	5.9928	0.050
	GFD	RIR	6.1626	0.039		GFD	RIR	.58368	0.747
	REER	CAD	3.4347	0.592		REER	CAD	7.7493	0.021
	REER	GFD	.36279	0.000		REER	GFD	1.8558	0.395
	REER	RIR	.96209	0.164		REER	RIR	1.0815	0.582
	RIR	CAD	1.918	0.036		RIR	CAD	.4561	0.796
RIR	GFD	5.3219	0.000	RIR	GFD	4.1591	0.125		
RIR	REER	7.2925	0.001	RIR	REER	9.6398	0.008		
<b>Indonesia</b>	CAD	GFD	16.182	0.001	<b>Malaysia</b>	CAD	GFD	.22538	0.893
	CAD	REER	17.316	0.001		CAD	REER	5.1796	0.075
	CAD	RIR	1.3074	0.727		CAD	RIR	1.4158	0.493
	GFD	CAD	12.864	0.005		GFD	CAD	11.534	0.003
	GFD	REER	7.6392	0.054		GFD	REER	5.4724	0.065
	GFD	RIR	11.432	0.010		GFD	RIR	2.3987	0.301

	REER	CAD	3.1894	0.363		REER	CAD	1.3118	0.519
	REER	GFD	17.135	0.001		REER	GFD	6.206	0.045
	REER	RIR	12.263	0.007		REER	RIR	.36992	0.831
	RIR	CAD	1.5569	0.669		RIR	CAD	3.3504	0.187
	RIR	GFD	6.3093	0.097		RIR	GFD	13.478	0.001
	RIR	REER	10.231	0.017		RIR	REER	26.652	0.000
<b>Philippines</b>	CAD	GFD	5.5993	0.231	<b>Thailand</b>	CAD	GFD	13.189	0.010
	CAD	REER	4.3292	0.363		CAD	REER	7.0108	0.135
	CAD	RIR	10.822	0.029		CAD	RIR	2.443	0.655
	GFD	CAD	11.12	0.049		GFD	CAD	9.1717	0.057
	GFD	REER	14.317	0.006		GFD	REER	6.7752	0.148
	GFD	RIR	11.327	0.023		GFD	RIR	63.437	0.000
	REER	CAD	8.9059	0.063		REER	CAD	12.953	0.012
	REER	GFD	15.264	0.004		REER	GFD	13.023	0.011
	REER	RIR	4.6119	0.329		REER	RIR	27.464	0.000
	RIR	CAD	3.3775	0.497		RIR	CAD	8.7871	0.067
	RIR	GFD	2.069	0.723		RIR	GFD	19.641	0.001
	RIR	REER	7.6661	0.105		RIR	REER	16.345	0.003

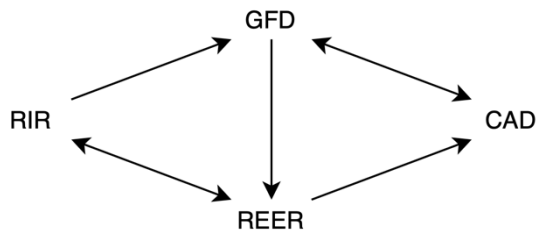
**Table 12. Visualization of Granger Causality**



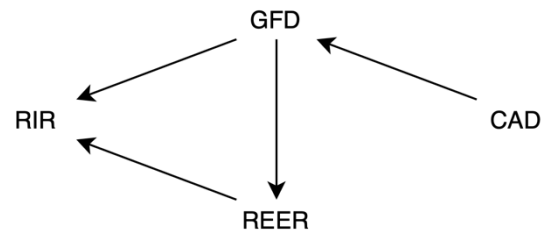
*Figure 21. Granger causality for China*



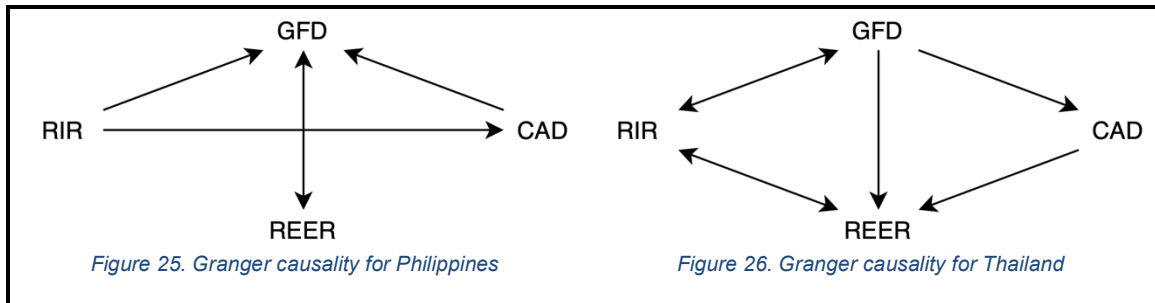
*Figure 22. Granger causality for India*



*Figure 23. Granger causality for Indonesia*



*Figure 24. Granger causality for Malaysia*



The results from the MWALD tests for the estimated ARDL and ECM models indicate both unidirectional and bidirectional causality among the underlying time-series variables at 5% significance level. Undoubtedly, these results refute the RET, which claims that the government fiscal deficit and the current account deficit are uncorrelated. With respect to the deficit variables, the results for China, Malaysia, and the Philippines indicate long-run unidirectional causality emanating from the current account deficit to the government fiscal deficit. This complies with the logic of the neoclassical view and the CATH, which attribute the worsening of the government fiscal deficit to the rising current account deficit. Evidence of unidirectional causality among the two deficits is also found for India in the long run and Thailand in the short run. However, the transmission channel is different for these two countries as the government fiscal deficit is found to Granger-cause the current account deficit. This result supports the conventional Keynesian wisdom and the Mundell-Fleming model. As for Indonesia, the results indicate strong bidirectional causality among the government fiscal deficit and the current account deficit. This significant feedback relationship can be linked to one of the key implications of the FHP for the twin deficits phenomenon: if national saving and domestic investment are uncorrelated, the government fiscal deficit and the current account deficit are expected to evolve together in the same direction.

Based on the test results, the real effective exchange rate plays a critical role in mediating the long-run dynamics between the two deficits. In particular, the real effective exchange rate significantly mediates the one-way systematic relationship between the government fiscal deficit and the current account deficit for China, India, and Indonesia. Therefore, the real effective exchange rate can potentially be exploited by policymakers to nudge the fiscal balance and the current account

balance in the desired direction. Surprisingly, the real interest rate does not exert a profound mediating effect on the dynamic nexus between the deficit variables. However, it does help generate better predictions of the values of the government fiscal deficit, the current account deficit, and the real interest rate separately.

#### **5.4. Discussion**

Despite the difference in the approach to testing the validity of the twin deficits hypothesis for the same countries, the findings of this study, mostly confirming the neoclassical view and the CATH, are consistent with most of the recent work done on the TDH, such as Baharumshah and Lau (2007) Badinger et. al (2017), Bandy and Aneja (2019), Baharumshah et al. (2019), Mohanty (2019), and Handoyo et. al (2020). There are a number of reasons to this consistency. First, the studied period in this research is relatively similar to the ones examined in the previous works. If a different time span were to be employed in the analysis, the results might not be the same. Second, all the ARDL and ECM models estimated in this research are well-specified, robust, and stable. Therefore, the outcome generated in this research can be trusted reliably compare against the outcome in previous empirical works notwithstanding different testing approaches. In the following paragraphs, the paper discusses its findings within the context of a number financial and economic crises as they provide valuable insights into the dynamics and transmission mechanism of the twin deficits.

The discovered reverse causality between the government fiscal deficit and current account deficit for China, Malaysia, and the Philippines can be attributed to large surges of international capital flows to their domestic economies since the 1980s with the liberalization of goods, services, and financial markets. While increased trade openness allows for more efficient financial market integration, improves the trade balance, and attracts foreign investors who develop financial interests in developing economies, it also renders these economies vulnerable to spillovers of global or regional financial crisis. Indeed, the 1997 Asian debt crisis, which started in Thailand and mostly engulfed Southeast Asia and East Asia, was the result of

excessive financial liberalization accompanied by weak institutional environments and insufficient regulation of international capital flows.

Malaysia's domestic economy was heavily struck by the financial turmoil as its exports and investments collapsed whereas China and the Philippines were relatively less affected by the crisis thanks to increasing competitiveness in the export markets and low financial leverage respectively. As postulated by the logic of the CATH and neoclassical view on the TDH, Malaysia witnessed sluggish economic growth during 1998 and 1999. As part of the recovery efforts to steer its economy back to the normal state, Malaysia opted to incorporate capital controls and expand its government economic role to shield the domestic economy from the volatility of international capital inflows as well as to prevent the significantly large current account deficit from further deteriorating the government fiscal deficit. In particular, the Malaysian government instituted a fiscal stimulus program of approximately 7 billion Malaysian Ringgits (RM) while also increasing the existing funds dedicated to the country's leading industries so that these industries could finance their activities and developments at a moderate cost. Same measures were also taken by the Malaysian government as an immediate response to the global financial crisis in 2008. Specifically, two fiscal stimulus packages introduced in 2008 and 2009 worth RM 7 billion and RM 60 billion respectively were reported to have significantly alleviated the adverse effect of the crisis on Malaysia (Nambiar, 2009). Although these fiscal stimulus packages led to larger government fiscal deficits which had been persistent since the 1997 crisis, the country was able to correct for demand shocks in exports, improve its current account balance, and achieve higher GDP growth.

Even though China and the Philippines were able to weather the regional crisis, both countries witnessed shrinks in net exports and hence deteriorations of the current account balance. As a result of persistent current account deficits, the Philippines' government fiscal deficit significantly widened in 1998 despite a small surplus in 1997 whereas China recorded an over twofold increase in the government fiscal deficit in 1999 relative to 1997. Unlike other countries that were

severely affected by the financial crisis, Philippine government initiated a fiscal adjustment which led to an approximately 70 percent scaled-down expenditure program in 1998. Although exemptions from the government expenditure cut were made towards the provision of essential social services and safety nets for economic agents that severely suffered from the financial turmoil, these were not executed immediately. As a result, there was an increase in the country's level of poverty and serious deterioration of essential living conditions. The country also recorded the highest unemployment rate in 1998 due to the contraction of the economy. Clearly, the Philippine government could have responded better to the contagious crisis by implementing expansionary fiscal policy and introducing stimulus packages to improve the economic conditions and correct for the escalating current account deficit.

Indeed, although both China and the Philippines were not immediately and severely affected by the regional crisis, China was able to maintain its financial and economic stability by choosing a different response from the Philippines to boost domestic demand and stimulate economic growth through expansionary fiscal and monetary policies. Specifically, the Chinese government issued CNY 100 billion of treasury bonds to finance infrastructural construction and investment. Social stability in China was also secured as the government dedicated CNY 18 billion to social insurance programs and safety nets (Cheng, 1999). On top of that, the costs of exports were substantially reduced thanks to an increase in the rebate rates of the value-added tax for exports. As a result, China registered an increase in its exports, albeit marginal, whereas total exports for Asia fell by approximately 20%.

The global financial crisis in 2008 caused an unprecedented collapse in exports in Asia. Despite the fact that China, the Philippines, and other countries within the region managed to recover more quickly and strongly than the rest of the world, they did not come through the peril unscathed. As a response to the external demand shock and the deterioration of the current account deficit, both China and Philippines announced fiscal stimulus packages worth 12 percent and 10 percent of GDP respectively. The timely announcement of felicitous stimulus programs was

one of the key determinants of the resilience of these economies in the midst of the global financial turmoil. Overall, this helps reinstate foreign investors' confidence in the economy, prop up domestic demand, and ward off massive unemployment in the labor market.

The transmission mechanism of the TDH is found to emanate from the government fiscal deficit to the current account deficit for India in the long run and Thailand in the short run. In the case of India, the twin deficits can be traced back nearly two decades ago to the 1991 Indian economic crisis. India's 1991 balance of payments (BoP) crisis was essentially different from the 1997 Asian financial crisis as the Indian economy was relatively closed with very restrictive capital controls. Most of the international capital flows to the domestic economy was in the form of foreign aids, commercial borrowings, and non-resident Indian (NRI) deposits. Economic conditions and developments in India conformed with the Mundell-Fleming model for a closed economy characterized by low capital mobility and fixed exchange rate regime. Up until the 1991 BoP crisis, India's government fiscal deficit had been escalating since 1979 as a result of poor economic policies, fiscal imprudence, and political instability. The deficit was primarily financed by domestic capital, commercial borrowings from the Reserve Bank of India (RBI), and external borrowings from the IMF, the World Bank, the Bank of England, and the Union Bank of Switzerland. Along with the liberalization of trade, investment and financial markets, the widening government fiscal deficit led to domestic absorption (growing domestic demand), import expansion, and ultimately the significant deterioration of the current account deficit. The twin deficits became unsustainable and continued to worsen the economic turmoil in India as the Indian rupee witnessed a sharp depreciation and the Indian government was on the verge of defaulting on its foreign debt obligations. The co-movements of the government fiscal deficit and the current account deficit remain an acute problem for India in the recent years as they slow down economic growth, lead to increasing interest rates, and discourage foreign investors from expanding into the country. To overcome this problem, India will need to seek more stable sources of money, preferably foreign direct investment (GFDI), invest more in its infrastructures,

create a better environment for businesses, and loosen some regulations with respect to foreign investment.

The short-run systematic relationship between the government fiscal deficit and the current account deficit in Thailand can be extensively discussed within the context of the 1997 Asian financial crisis. Although the test results for Thailand indicate that the government fiscal deficit Granger-causes the current account deficit and not vice versa, its economic conditions and developments during the crisis strongly conformed with the neoclassical view and the CATH, which support reverse causality and hold for China, Malaysia, and the Philippines. Prior to the crisis, Thailand attracted enormous capital flows from overseas into the domestic economy thanks to its increasing competitiveness in the banking system and liberalization of the financial system. The country was able to maintain good-looking economic conditions as inflation was kept at relatively low rates and the government fiscal balance was always in surplus. On top of that, Thailand witnessed magnificent growth in its GDP from 1991 to 1995. The Thai economy grew quickly; however, the growth was not so healthy and stable as most of the capital inflows were portfolio investment which was speculative and much more volatile than GFDI. This could be attributed to the reckless liberalization of the financial market and imprudent lending practices by financial institutions. The major downfall in the Thailand's exports in 1996 significantly reduced foreign creditors' confidence in the country's ability to service its excessive current account deficits and pay back its financial liabilities. This triggered a series of speculative attacks on the Thai baht, which later resulted in a currency crisis and subsequently an economic downturn. Measures to stabilize the situation were soon taken though not easily. Along with the restructure of the financial sector and the redesign of monetary policy to ward off inflation, the Thai government implemented expansionary fiscal policy with a view to stimulating the aggregate demand and providing social safety nets for those who were adversely afflicted by the crisis. Increasing government fiscal deficits by spending more was necessary and important for Thailand for the time being as this significantly mitigated excessive current account deficits and facilitated economic recovery. Indeed, the current

account balance improved quickly and even registered a surplus in 1998. Positive growth was regained toward the end of 1998 and maintained at between 4% and 5% in 1999 and 2000.

Finally, when it comes to Indonesia, the relationship between the government fiscal deficit and the current account deficit is found to be bidirectional. This means there is significant feedback going back and forth between the two deficits, which can be due to domestic saving and investment being highly uncorrelated according to the FHP. Indeed, a number of empirical works have demonstrated that national saving and domestic investment even move in opposite directions for Indonesia. These include Jiranyakul and Brahasrene (2009a), Jiranyakul and Brahasrene (2009b), Andriansyah (2016), Zargar et al. (2019), Hasanah (2020), and Shrestha and Nursamsu (2020). Compared to other Southeast Asian countries, Indonesia possesses a relatively low national saving rate whereas its investment rate is relatively high. This strong uncorrelation between domestic saving and investment indicates high capital mobility in Indonesia. In fact, the Indonesian economy has attracted rapid and large surges of international capital inflows owing to its great degree of economic openness and financial liberalization since 1980s. Prior to the Asian financial crisis in 1997, massive capital flows into the domestic economy fueled an increase in domestic consumption and investment. One of the major drivers of these foreign funds was inadequate domestic saving to finance economic development. In fact, Indonesia's domestic saving rate had been running relatively low due to the country's chronic government fiscal deficits. In the midst of the economic turndown in 1997, the gap between national saving and investment grew even bigger. While domestic saving ratios remained relatively stable and even slightly increased as a result of stringent monetary policy, fiscal policy and austerity measures, there was a sharp decline in investment activities from 30.4% in 1996 to 21.7% in 1999 due to high perceived risk and uncertainty. Overall, domestic saving and investment were highly uncorrelated in Indonesia during both crisis and non-crisis periods. This economic characteristic gave way to the bilateral feedback between the current account deficit and the government fiscal deficit.

## 6. CONCLUSION AND SUGGESTIONS FOR FUTURE RESEARCH

The paper has empirically examined the validity of the twin deficits hypothesis in six Asian emerging market economies including China, India, Indonesia, Malaysia, the Philippines, and Thailand over the period 1982-2019. The underlying time-series variables that are included in the analysis are the government fiscal deficit (*GFD*), the current account deficit (*CAD*), the real effective exchange rate (*REER*), and the real interest rate (*RIR*). The study adopts a series of ARDL bounds tests and MWALD tests to search for the presence of cointegration among the time-series variables and assess possible directions of causality between them.

The results from the bound tests indicate long-run relationships among the *GFD*, the *CAD*, the *REER*, and the *RIR* for all countries except for Thailand. Therefore, the short-run dynamics among the variables are estimated for Thailand based on the ARDL model whereas long-run relationships are captured by constructing an ECM for each of the remaining countries. As for Thailand, the results indicate that 1% change in the government fiscal deficit is associated with 0.73% change in the current account deficit in the short run. With respect to the long-run dynamic nexus between the two deficits, 1% of unanticipated change in the government fiscal deficit is associated with 2.91%, 3.00%, 0.98%, 1.48%, and 0.14% change in the current account deficit for China, India, Indonesia, Malaysia, and the Philippines respectively. Among these countries, Malaysia has the most negative error correction coefficient (-0.68663), indicating that its current account deficit in the current year is adjusted back to the long-run equilibrium from the disequilibrium in the previous year the fastest.

Results from the MWALD tests, aside from confirming those of the cointegration tests, reveal different transmission channels of the twin deficits. The transmission channel of the twin deficits aligns with the neoclassical view and the CATH for the majority of the countries. Specifically, the current account deficit is found to Granger-cause the government fiscal deficit in the long run for China, Malaysia, and the Philippines. The Keynesian absorption theory and the Mundell-Fleming model hold for India in the long

run and for Thailand in the short run, blaming chronic government fiscal deficits for the deterioration of the external balance. As for Indonesia, the two deficits are found to exert significant feedback on each other, implying the presence of a bidirectional causal relationship. The real effective exchange rate plays a critical role in mediating the long-run dynamics between the two deficits for China, India, and Indonesia. This means these countries can implement exchange rate adjustment policy along with a combination of fiscal and monetary policies in solving the twin deficits conundrum. The real interest rate, however, does not appear to be a significant mediating factor in the dynamic nexus between the government fiscal deficit and the current account deficit.

In terms of policy implications, a good number of economists and policymakers argue that chronic current account deficits can be effectively corrected and improved by increasing domestic savings and reducing government fiscal deficits. Nevertheless, reverse causality emanating from the external deficit to the government fiscal deficit and even the possible bilateral relationship between these two deficits indicate that government cannot just rely on cutting back the fiscal deficit in curing the acute current account deficit. Despite the fact that discretionary fiscal policy carries major macroeconomic implications, it must work in alignment with monetary policy in solving the twin deficits conundrum by increasing national savings, appropriately adjusting the exchange rate and improving economic productivity.

Future research on the TDH may consider extending the economic model employed by this study by including a number of other relevant variables such as international capital inflows, domestic savings, domestic investment, and money supply to investigate the relationship between the government fiscal deficit and the current account deficit. Reality has shown that these economic indicators play a significant role in explaining the dynamic nexus between the twin deficits. Another suggestion is that the relationship between the government fiscal deficit and the current account deficit is studied under different periods such as pre-crisis, during crisis, and post-crisis. In terms of the testing approach, aside from the CUSUM and CUSUMSQ tests, future studies may consider conducting other econometric tests for structural change such

as the Chow test and the Zivot-Andrews test if possible as the results from these tests can be more reliable under some circumstances.

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