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STAFF STUDIES

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CENTRAL BANK OF SRI LANKA

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Financial Crises and Impacts of Recent Financial Crises on Sri Lanka[1/]

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Abstract

The subject of financial crises has been widely addressed in the current literature. A series of researches has been conducted, and substantial volume of literature is available worldwide on various aspects of financial crises. This paper describes, among other things, about the Sri Lankan situation in regard to financial crises, particularly the recent crisis started in the United States of America (US). The paper briefly explains different views of financial crises that have evolved around the world. It identifies some possible causes of financial crises based on the experiences faced by different countries while presenting case studies explaining financial/economic crises in Argentina, Chile, Mexico, South-East Asia and the latest in the US. As regards the US crisis, a reference has been made to effects of the crisis and the responses made by the authorities to resolve it. The paper also highlights some lessons that could be learnt from the US financial crisis. In relation to Sri Lanka, this paper presents a description under four sub-topics, i.e., a brief account of the previous financial crises in Sri Lanka, effects of the recent US crisis on the Sri Lankan economy, the measures that contributed to minimise the impact of the US crisis on the Sri Lankan economy and how the Sri Lankan economy revived.

1/ The author is thankful to Dr. N. E. H. Sandaratne, who was a former central banker, for making editorial corrections. Mrs. C. S. Jayaweera and Mrs. C. R. Kurera, Personal Assistants of the Central Bank helped in word processing.

1. Introduction

A situation in which financial institutions or assets suddenly lose a large part of their value is considered as a financial crisis. Financial crises are not new to the world. According to available literature, financial crises in the world date back to 1819 when there was a major financial crisis in the United States of America.

There are two schools of thought on the causes of financial crises and bank failures (Thomas, Balino, 1987). The first focuses on macro economic causes of financial crises which are generally beyond the control of individual financial institutions. One sub group suggests that financial crises are caused by a loss of public trust in the ability of banks to honour their commitments which is aggravated by errors in monetary policy. The loss of trust can be triggered by deterioration in the quality of bank loans. A second sub group indicates that financial crises are an integral part of business cycles. In such a context, economic agents have insufficient liquid asset to meet their liabilities and a crisis is triggered by errors in judgment by debtors and creditors.

The second school of thought focuses on causes of financial crises that are related to financial systems or to individual financial institutions. These authors emphasise fraud and irregularities in bank management as major causes of bank failures. Mismanagement, cut-rate lending, aggressive liability management, blunders and lack of controls are considered major causes of bank failures.

Finally, some writers adopt a different view using both macro and micro economic elements to explain bank failures. According to them factors such as general macro economic conditions; real interest rates; disparity in regional economic growth and regulatory changes are causes of bank failures.

In the recent past there have been many financial crises. The causes of these financial crises are different. In the 19th and early 20th centuries, many financial crises were associated with bank runs, systemic banking crises and banking panics. Many recessions coincided with these panics (Kindleberger & Aliber, 2005). Financial crises can be banking crises, international financial crises and wider economic crises (*i.e.*, recessions and depressions). A situation where a commercial bank suffers a sudden rush of withdrawals by depositors is called a bank run. In such situations, banks cannot immediately fulfill the entire demand for money by the general public, because the bank may have invested its money in a variety of assets, gains of which may be realised during a long period of time. This may lead to a bank panic or banking crisis. Examples of bank runs were seen in the USA during 1931. An international financial crisis may occur when a country is suddenly forced to devalue its currency because of a speculative attack. This may be referred to as a currency crisis or a balance of payments crisis. Likewise, when a country fails to pay back its sovereign debt,

it is referred to as a sovereign default. A balance of payment crisis along with a sovereign default can lead to a sudden stop in capital inflows or a sudden increase in capital flight. During 1992 – 1993, some countries in Europe faced this type of an international financial crisis. Further, there were international financial crises in many Latin American countries, when they defaulted their debt repayment in early 1980s. A wider economic crisis may consist of a recession or a depression.

A slowdown in economic growth for a continuous period is usually called a recession. A prolonged recession may be referred to as a depression. Since these phenomena affect much more than a financial system, they are not usually considered financial crises *per se*. The Great Depression in the 1930s is an example for a depression. Similarly, the recent sub-prime mortgage crisis and the real estate bubble experienced around the world starting in 2008 led to a recession in the US and in a number of other countries.

2. Causes of Financial Crises

The causes of financial crises vary depending on their nature. The following provides some of the causes of financial crises that can be identified from the recent history of a series of crises that occurred in different countries. Sometimes, recognition of only one cause of the crisis may be difficult as a crisis may take place as a result of many causes.

(a) Macroeconomic Circumstances

Adverse macroeconomic developments are blamed for financial crises. The trigger of a financial crisis may be due to errors in macroeconomic policies adopted by relevant authorities. High interest rates, shift of exchange rate regimes and unnecessary slowdowns or sharp increases in inflation are some of the macroeconomic reasons to trigger a crisis. High interest rates may attract more capital flows which may be for a short duration and could therefore be destabilising. High interest rates which may create difficulties for financial institutions and for governments, and over-valuation of exchange rates may lead to a financial crisis. When countries are unable to maintain exchange rates, they automatically try to shift into different exchange rate regimes causing imbalances in the external sector. Examples of these can be seen during the Mexican crisis from 1995 to 1957 and the South-East Asian crisis from 1997 to 1998. Instability in prices for a continuous period will cause uncertainties among economic agents in an economy and may lead to financial crises.

Prolong deficits in the current accounts may lead to unstable macroeconomic conditions in an economy creating financial crises. Countries which have budget deficits will have problems in financing their budgets, mobilizing savings and debt management.

The Mexican Crisis during 1995-97 was brought about by deficits in the current account of the Balance of Payments (BOP), while the South East Asian Crisis was partly due to capital flight. Shifting of exchange rate regimes and high short-term borrowings created instability in these countries and led ultimately to capital flight causing a financial crisis.

High dependency on short-term foreign finance by way of borrowings or investment can lead to a financial crisis if there is a sudden withdrawal of short term foreign finance which is on lending or short-term investment. The crisis in the South East Asian countries was an example for this type of crisis.

(b) Supervisory Concerns

In most countries, the supervisory role of financial institutions is vested with the Central Banks or monetary authority. Weaknesses in supervisory activities, either due to insufficient legal framework or weaknesses in supervision, may not detect the problems of financial institutions early. This type of supervisory failures may lead to downfall of one or many financial institutions. This in turn could affect the entire financial sector and result in a financial crisis. Sometimes, financial institutions may attempt to conceal information from the supervisors in order to obtain short term advantages and it may lead to a crisis in the long-run. There are instances where some financial institutions have adopted the practice of keeping separate data sets, in an attempt to avoid tax payments. This may give a short-term financial benefit to financial institutions but in the long run it leads to a failure, which is a common cause for failure of financial institutions in emerging markets. Examples for these types of financial crises can be found in Sri Lanka where several finance companies failed during 1988–89. Anton Valukas, the court appointed examiner into Lehman's bankruptcy, produced a magisterial 2,200 page report last year of the bank's systematic failures of risk management and governance (The Economist, 2011, February 05). Perhaps best of all is a concise, confessional report issued by the Union Bank of Switzerland (UBS), in April 2008 into the failures of management that led it to take billions of dollars in write-offs and turned to the Swiss taxpayers for help.

(c) Other Reasons

Credit delivery is an essential activity for the survival of financial institutions. In addition to credit granted by financial institutions expecting benefits there may be credit extended in response to government directions. Excessive credit may create credit bubbles, the bursting of which may lead to failure of financial institutions. Sudden withdrawals of bank credit will develop serious situations where the borrowers

are unable to repay the credit they obtain. The credit crunch in the US during 2007–2009 was one of the causes that led to a financial crisis and extended to a global financial crisis. Many leading financial institutions in the US failed during the crisis in 2007–2009 as a result of their inability to recover the loan repayments.

Government directions manifested by political reasons can lead to a financial crisis. For instance, sub-prime mortgage crisis in the US was created partly as a result of an oversupply of construction which was encouraged by government directions. The credit extended this way for house building led to an oversupply of houses resulting in a drop in the prices and creating difficulties for financial institutions to get their loans recovered. This led financial institutions to become insolvent and collapsed. Fanie Mea, Freddie Mac, and several other financial giants in the US failed due to these developments.

Financial products, if managed properly, would help to develop financial markets. However, an expansion of sophisticated financial derivatives beyond the safety levels may lead to a collapse of financial markets. One good example is the financial crisis in the US for which sophisticated and unmanageable derivative products are partly responsible. In this market new derivative products erupted based on sophisticated technology that ended up with complications and ultimately lead to a financial crisis.

In several countries, financial crises have occurred due to political developments. The Mexican Crisis occurred partly due to political reasons. The assassination of political leaders in that country created financial sector chaos and resulted in a withdrawal of short-term foreign finance due to fear of subsequent political developments.

Undue developments in the debt market, particularly in government debt, are one of the common causes of financial crises for which there are examples from many countries. During 2010–11 failures in Greece, Ireland and several European countries occurred due to excessive levels of public debt. Sometimes excessive borrowings have taken place in these countries for political purposes. Several of these countries were bailed out by supporting schemes of the IMF.

The foregoing explanation supports the fact that financial crises may occur due to one or a series of causes. Numerous examples for financial crises can be found from the history of different countries. At the initial stage, one or several causes would initially adversely affect one sector such as commercial banking which would impact other sectors creating worse situations. Sometimes, a crisis that occurred in one country may result in a crisis in other countries. For instance, the South-East Asian financial crisis initially started in Thailand and spread to neighbouring countries subsequently. Therefore, a contagion effect is also a cause for a financial crisis. The US crisis

subsequently spread to most of the other countries in the world. Therefore, depending on the severity of the crisis in one country there would be global effects.

A number of authors have attempted to rationalise the causes of financial crises, especially looking at the background of recent financial crises. The following are ten most important causes of crises, particularly referring to the recent US crisis (Heath, 2011).

(1) Loose, ultra-interventionist monetary policy from central banks that kept stepping in whenever growth slowed or the stock market fell. Interest rates were kept too low; the belief was that as long as consumer prices didn't surge, the economy would be stable. The money supply and credit exploded, and investors became complacent, fuelling bubbles.

(2) Global imbalances, exacerbated by government intervention: nationalized savings, forex manipulation and sovereign wealth funds in China, Japan and the Middle East, combined with unfunded state pensions and profligate governments in the West brought about crises. Asia did all the saving and financed budget and trade deficits in the West, which spent too much and didn't produce enough. Asia purchased trillions of Western assets, especially bonds, pushing down yields and pumping the world full of cheap money.

(3) There was no bankruptcy code for failed multinational banking groups. Regulatory stupidity meant that they were treated like ordinary firms: the choice was either a collapse, or a bail-out. Other network industries – airports, nuclear plants – have long operated under special bankruptcy codes, ensuring an orderly winding-down and handover of assets. Unlike every other private businesses big banks knew they would never be allowed to go bust. So they took too many risks and leveraged themselves to the hilt to maximize returns on capital (and hence profit and pay); while lending criteria were slowly relaxed.

(4) Bondholders knew they would be bailed out. This meant that shareholders had access to cheap, state-insured credit. This promoted leverage to maximize upside; debt holders didn't care.

(5) Depositors knew they would be bailed out by the state and therefore didn't monitor banks' soundness. Property investors convinced themselves that prices would never fall. Financially illiterate consumers borrowed recklessly.

(6) Intellectual errors concerning the modeling of risk, the power of diversification, default chances, complete markets, liquidity and the existence of bubbles were widespread. These were caused by the neo-classical general equilibrium paradigm prevalent in universities, central banks and the private sector.

(7) One result of (6) above was that firms were forced to follow mark-to-market accounting rules. Liquidity problems became a solvency crisis.

(8) As a result of (3) and (7) above, institutions held insufficient capital and the wrong kind of capital: a problem compounded by off-balance sheet vehicles. These arrangements were all approved of by international regulators, the Basel accords and accounting rules.

(9) US politicians' promotion of homeownership among groups was shunned by lenders. This involved legislation and the use of the state-chartered Fannie Mae and Freddie Max to promote and securitise sub-prime mortgages. While dodgy loans were eventually embraced by Wall Street, their origin lay in Washington.

(10) Other errors: AIG misused credit default swaps and writing insurance against losses, yet did not keep enough capital to make good on its promises. Credit rating agencies – whole number was limited by regulators – failed miserably.

3. Some Examples of Financial Crises

The following are some examples of recent financial crises.

3.1 The Argentinean Banking crisis of 1980–82

In 1980, a failure of one of the largest private banks in Argentina created a root for a financial crisis. This led to a series of crises of Argentina's financial system which resulted in 71 financial institutions being liquidated in 1980–1982 with consequences not only to the financial system but also to overall economic policies. Several economic elements prevailed during that time, the weaknesses in bank supervision, high interest rates for both deposits and lending, weaknesses in the macroeconomic policies and business failures were highlighted as causes of such financial crisis.

It was observed that 16 per cent of assets of commercial banks and 35 per cent of total assets of finance companies were affected due to this crisis. The Central Bank/government was able to contain the propagation of the crisis by implementing various measures.

3.2 The Chilean Banking Crisis during 1981–83

The Chilean banking crisis is one another widespread crisis, aggressively handled and having positive results later on. The origins of the banking crisis in Chile

were related largely to the severe macro economic problems experienced by the country and Latin America specially, during 1981–1982. Weaknesses in liberalization policies, increase in inflation to unmanageable levels, foreign currency management problems, enhanced trade deficit and increased debt were some of the macro economic causes which created the crisis.

By the end of 1982, a macro economic crisis was apparent and banks became insolvent. In 1983, government intervened in the insolvent institutions and immediately liquidated some of the banks which experienced problems while implementing debt relief measures, the purchase of risky loans by the Central Bank, recapitalization of intervened banks and implemented thorough supervisory and prudential regulations which were successful in handling Chilean banking crisis.

3.3 The Mexican Economic Crisis during 1995–97

The Mexican economic crisis is another one that took place during the 1990's. There are opposing views among the analysts about the origin of this economic crisis. Weaknesses in managing exchange rates which led to exhaust Mexican foreign exchange reserves, political uncertainties, weaknesses in debt management and fiscal monetary policies were some of the causes highlighted to this crisis.

This financial crisis was resolved by implementing many strategies. Mexican Government's last resort loans along with deposit insurance system to reassure foreign investors were helpful in recovering from the crisis. Government also took initiatives to afford long term liabilities by way of issuing long-term bonds. The switch onto a flexible exchange rate regime was also another solution.

3.4 The Asian Financial Crisis in 1997–98

The Asian financial crisis occurred in a number of countries beginning in July, 1997. The crisis started in Thailand with the collapse of the Thai Baht caused by the decision of the Thai government to float the Baht, cutting its peg to the US dollar, after exhaustive efforts to suppress it in the face of a severe real estate bubble. Indonesia, South Korea and Thailand were the countries most affected by the crisis. Hong Kong, Malaysia, Laos and the Philippines also had contagion effects of the slump. China, India, Taiwan, Singapore, Brunei and Vietnam were less affected. The political leadership in Thailand and Malaysia was forced to step down as a result of the crisis.

Initially, Thailand's economy developed into a bubble fuelled by "hot money". The same type of situation happened in Malaysia and Indonesia too.

Availability of a large amount of credit based on short-term capital inflows generated a highly leveraged economic climate and pushed up asset prices to an unsustainable level. These asset prices eventually began to collapse, causing individuals and companies to default on debt obligations. The resulting panic among lenders led to a large withdrawal of credit from the crisis countries, causing a credit crunch and further bankruptcies causing investors to withdraw their money, thus putting depreciation pressure on their exchange rates. Accordingly, the crisis happened due to withdrawal of foreign finance from the crisis driven countries. Ultimately, the effects of the crisis ended by IMF's bailout package for most affected economies and advocating reforms to the Asian currency, banking, and financial systems. The IMF's support was conditional on a series of economic reforms under a financial supported scheme called "Structural Adjustment Package", (SAP).

3.5 The US Sub-prime Mortgage Crisis Starting from 2007

The US sub-prime mortgage crisis was one of the worst hit and recent financial crises. The crisis began with the bursting of the United State's housing bubble and high default rates on "sub-prime" and adjustable rate mortgages, beginning in approximately 2005/06. In the US, borrowers are rated either as "prime" or as "sub-prime". The prime borrowers have a good credit rating based on their track records while sub-prime borrowers have track records in repaying loans below par. Loans given to sub-prime borrowers are categorized as sub-prime loans. Typically it is the poor and the young who form the bulk of sub-prime borrowers.

A major contributory factor for the attractiveness of the sub-prime loan market was the boom in the supply of housing, which resulted in falling prices and increase in the default rate among sub-prime borrowers, many of whom were no longer able to repay their loans. Another factor was the collateral for the houses, which in US was typically the home being bought, and which increased the supply of houses for sale while there was a low demand which resulted in declining house prices. This coincided with the slow down in the US economy making matters worse.

The repayment capacity of sub-prime borrowers was in any case doubtful. Further, lenders devised new sophisticated instruments, such as derivative products to reach out to more sub-prime borrowers. The links of complex derivative products on the loan portfolios were very complicated. Therefore, there were more doubts about the ultimate re-payers.

Not only the reckless lenders, but also big institutions such as, Freddie Mac and Fannie Mae, which owned or guaranteed more than half of the outstanding in home mortgage in the US and widely thought as being more prudent than others in their lending practices suffered billions of losses. The crisis affected institutions such as Citigroup and Merrill Lynch which are global banks and brokers who had to write-off billions of sub-prime losses. Despite efforts by the US Federal Reserve to offer some financial assistance, crisis led to the collapse of Bear Sterns, one of the world's largest investment banks and securities trading firms. The crisis also extended to Lehman Brothers, and American Insurance Group.

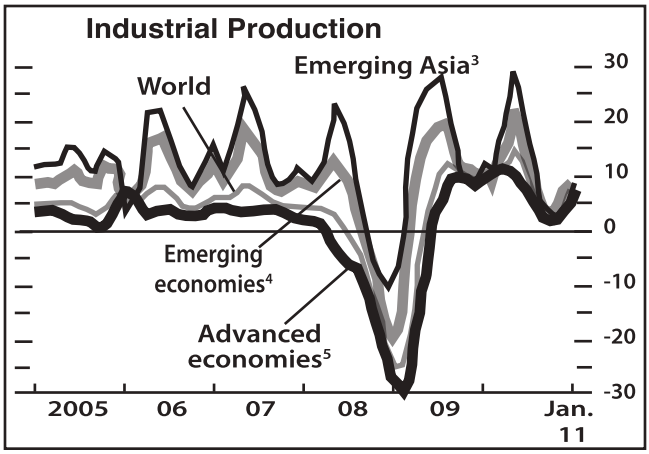
The crisis affected not only these American institutions but also too many banks in other parts of the world. Since the US was the biggest borrower in the world, most countries which held their foreign exchange reserves in dollars and invested in the US Securities were badly affected. Countries like Japan, China and India that had invested in the US had direct adverse impacts from this crisis. Also the global equity markets got hit from this crisis. Other than these, countries which had trade links with the US were affected due to down-turn in the US. Therefore, the effects of the US crisis were not only limited to the US economy, but also to the global economy.

3.5.1 Consequences of the US Crisis

As a result of the mortgage crisis, lenders in the US were unable to recover their loans. A number of financial institutions collapsed, and businesses of many non-financial institutions, such as car producers, garment sellers and food sellers faced difficulties in selling their products. Consumer prices in Advanced Economies, as identified by the IMF, grew only by 0.1 per cent in 2009. Mortgage giants such as, Fannie Mea and Freddie Mac were affected extensively. The fourth largest investment bank in the US, Lehman Brothers, Wall Street's fifth largest bank Bear Stearns, which was acquired by another organisation, and Merrill Lynch collapsed. A number of financial institutions declared bankrupt, merged, acquired by other organizations, bailed out by the governments or were nationalised. An Insurance major, American Insurance Group, was also under severe pressure and collapsed. Not only the US, but also in the other countries in the Euro banking sector, a number of financial institutions as well as producing firms collapsed due to the crisis in US. For instance, Northern Rock and European Banking and insurance giant Fortis were partly nationalised to ensure their survival. General Motors (GM), the car producing firm in the US and Mark & Spencer were faced with declining sales.

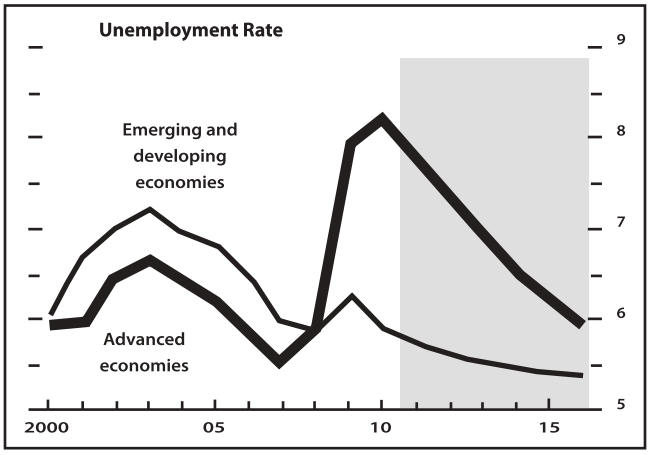
Rating Agencies downgraded their investment ratings of a number of financial institutions. Industrial production in many countries dropped and as a result world industrial production dropped (Figure 1).

Figure 1



Source : IMF World Economic Outlook 2011

Figure 2

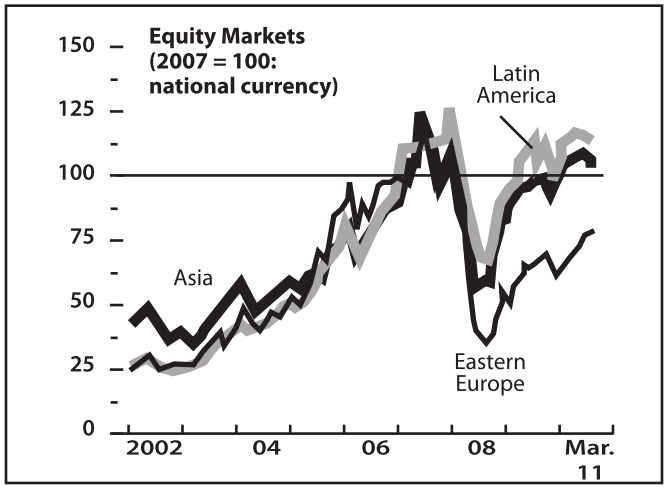


Source : IMF World Economic Outlook 2011

Unemployment surged and employment growth was negative in several countries (Figure 2). Unemployment in Advanced Economies (as classified by the IMF) increased by 8 per cent in 2009. The Chief Executive Officers of several banks (Citi Group and Merrill Lynch) stepped down.

The World Bank and the IMF predicted slow rates of economic growth in the richest nations and globally. Current Account balances in a number of advanced countries became negative. Countries suffered due to lack of demand for their goods and services and fell into a recession. Prices of houses and goods and services fell. The stock markets suffered with fallen prices and collapsed (Figure 3). A US recession was officially declared by the National Bureau of Economic Research, a leading panel including economists from major academic institutions. The Figures indicated that more US workers lost their jobs in 2008 than any year since the World War II. The US, UK and many other European countries suffered negative growth in 2008. The growth of world output too became negative (-0.5 per cent), (IMF World Economic Outlook, 2011).

Figure 3



Source : IMF World Economic Outlook 2011

Not only the US and European economies suffered but also other countries such as China, Japan and India faced their biggest decline in exports. This was common to other exporting countries in Asia and Africa. IMF warned that the

world economic growth was to fall to just 0.5 per cent in 2009. However, world output in 2009 grew by -0.6 per cent. The International Labour Organisation predicted that as many as fifty one million jobs worldwide could be lost in 2009 because of the global economic crisis.

3.5.2 Responses to the Crisis

Various actions were taken by the authorities of many countries (as named in Table 1) since the crisis became apparent in August 2007. These solutions vary from country to country. The Bank for International Settlements (BIS) has summarised, as given below, the different policies suggested by many countries to tackle the issues that arose from the US crisis.

Table 1
Policy Measures adopted by Countries

Summary of policy actions taken in North America, Europe, Asia and the Pacific[1]																	
	CA	US	EU	CH	UK	AU	CN	HK	IN	ID	JP	KR	MY	NZ	PH	SG	TH
Ease monetary policy	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Introduce fiscal stimulus		√	√		√	√	√	√	√	√	√	√	√	√	√	√	√
Liquidity assistance in local currency	√	√	√	√	√	√		√	√	√	√	√		√	√	√	
Lend foreign exchange	√		√	√	√	√		√	√	√	√	√		√	√	√	
Expand deposit insurance		√	√		√	√		√		√		√	√	√	√	√	√
Guarantee non-deposit liabilities	√	√	√		√	√						√		√			
Prepare bank capital injection		√	√	√	√		√	√	√		√	√					√
Create demand for assets	√	√	√	√	√	√	√		√	√	√	√	√				
Impose short sale restrictions	√	√	√	√	√	√		√		√	√	√				√	
Relax mark to market rules		√	√[2]	√	√					√	√	√	√		√		

CA = Canada; US = United States; EU = Euro area; CH = Switzerland; UK = United Kingdom; AU = Australia; CN = China; HK = Hong Kong SAR; IN = India; ID = Indonesia; JP = Japan; KR = Korea; MY = Malaysia; NZ = New Zealand; PH = Philippines; SG = Singapore; TH = Thailand.

[1] As of July 2009. This table summarises policy actions proposed but not necessarily implemented. Details in Annex A. [2] Applies to economies whose companies report under IFRS.

Source : Bank for International Settlements

It is to be noted that US, the UK, the Euro Zone and Japan used unconventional monetary policies which are known as Quantitative Easing (QE) to stimulate their economies when conventional monetary policy has been ineffective. Under

these the central banks continued to buy government bonds and other financial assets, with new money created, in order to increase money supply and the excess of reserves of the banking system. QE shifted monetary policy instruments away from interest rates, towards targeting the quantity of money. QE used to expand the excess reserves in the banking system and lowering interest further.

The following are details of some of the measures adopted by different countries to overcome the effects of the US crisis.

3.5.2.1 Monetary Policy Actions

The central banks as regulators implemented monetary policy measures to remedy the crisis since the crisis involved banks and financial institutions. Federal Reserve (Fed) of the US slashed interest rates in December 2008 to zero which was the lowest. In January 2009, Bank of England cut interest rates to a 315 year lowest of 1.5 per cent. In March 2009, the European Central Bank cut their bench mark interest rates to the lowest level ever. In September 2008, China cut its interest rates for the first time since 2002. India too started cutting down interest rates. Other than interest rates cut under the monetary policy, Fed and other central banks have conducted open market operations to ensure member banks have access to liquidity. Under these programmes, the Central Bank made available short-term loans to member banks under collateral of government securities. Also the frequency of conducting auctions was increased by certain central banks. Some other measures, such as inclusion of commercial papers as collateral for loans were also implemented to address the liquidity concerns.

3.5.2.2 Legislation and Regulatory Arrangements

Other than monetary policy measures legislation relating to lending practices, bankruptcy protection, tax policy, housing, credit counseling, education, and licensing of lenders were drafted or amended by countries including the US. Especially, the US government considered amending the regulatory powers of the Fed. Legislation relating to exemption of non-depository banks from capital reserve requirements and legislation for the companies to not become "too big to fail" were also suggested by eminent economists like Joseph Stiglitz (Recommendations of the Stiglitz Commission on Finance, 2009). The UK regulator announced a temporary ban on short sales of financial stocks. The Australian Federal government announced an investment of funds in non-bank lender mortgaged backed securities. The then US President, George

Bush signed a law for economic stimulus package to help stimulate economic growth. The US also took action to pass Housing and Economic Recovery Act of 2008 to restore confidence in the domestic mortgage industries. This act included provisioning of insurance, establishing a new regulator, raising limits of mortgages, provision of loans for the refinance of mortgages, enhancing mortgage disclosers and extending community assistance to help local governments to buy foreclosed properties. Federal courts were flooded with a number of cases, some of which were to claim compensation from different financial institutions.

3.5.2.3 Government Bailouts

Countries such as the US and UK introduced a series of government bailouts for the institutions which failed. The Fed took-over Freddie Mac and Fannie Mae. Bear Stearns was acquired by J P Morgan Chase. Merrill Lynch was acquired by Bank of America. Lehman Brothers declared bankruptcy. The Fed provided emergency loans to AIG Washington Mutual. In the UK, Northern Rock faced difficulties and approached the Bank of England which was the lender of the last resort. Ultimately, Northern Rock, Bradford & Bingley, a British bank was nationalized by the UK government.

In addition to above, the US government announced plans to purchase large amounts of illiquid risky mortgage backed securities from financial institutions. Several governments initiated action to get approvals from their national legislatives to extend bailouts amounting to billions of dollars as a measure to tackle the crisis. The US government approved a dollar 700 billion rescue plan for the US financial system in 2008. Other countries, such as UK and Germany approved bailout packages for the financial institutions in their countries. Other than the individual countries, the IMF also approved loan facilities amounting to trillion dollars to many Western European countries, being the first IMF loan for some of the European countries since 1976. In November 2008, the US Fed announced an injection of another dollar 800 billion into the economy to stabilize the financial system and encourage lending. In the same month, the European community unveiled an economic recovery plan worth of 200 billion Euros to protect millions of European jobs. Several Asian countries took action to establish bailout packages for financial institutions. Some financial institutions obtained new capital from their governments. In order to facilitate the growth of small businesses European banks increased the amount of loans to small and medium sized enterprises. Australian Federal government also announced packages worth billions of dollars. India increased

refinance schemes in billions of dollars. Bank of Japan injected billions of dollars into its financial systems.

Other than the above measures, a number of regulatory measures and accounting standards were also proposed by many countries. Awareness programmes, moral suasion and other measures were taken by the governments and central banks as measures to reduce the adverse impacts of the crises.

3.5.2.4 Combined Policy Actions

The Federal Reserve Bank, the European Central Bank, the Bank of England, the Bank of Japan, the Bank of Canada, the Swiss National Bank and the Swedish Riks Bank announced measures to release liquidity to financial institutions while simultaneously reducing policy interest rates. These banks also eased the credit conditions in the non-bank sector. Central banks in emerging economies too started a number of measures and bail-out packages for their financial institutions. Provision of foreign currency liquidity to foreign exchange markets helped to protect the decline in domestic currencies. A series of macroeconomic policy measures was also implemented in tandem with monetary policy measures implemented by affected countries.

4. Lessons from the Financial Crises

As described above, financial crises are not new to the world. They have occurred throughout history. These financial crises have taught many lessons to the regulators, governments, financial institutions and to the general public at large. In spite of many lessons learnt from the historical financial crises, financial crises have occurred repeatedly. The lessons learnt may be of macro or micro importance. Some argue that in order to avoid financial crises solutions should be tried. Conversely, Alan Greenspan, the US Federal Reserve's previous chairman, suggests that no one should try any action and says that things went well over the long period of deregulation and light-touched oversight, while arguing that the global financial system is now "unredeemably opaque" that policy makers and legislators cannot hope to address its complexity. However, some argue that Greenspan is wrong and crisis that threatened the foundation of the American economy, led to soaring unemployment, a continuing foreclosure crisis and weakened economies in the US and Europe. It would have been a grave mistake not to address problems of inadequate regulation and lax oversight (Barney Frank, 2009). Hence, the arguments for and against actions to be taken to prevent financial crises are different.

Based on these crises, the following lessons can be highlighted for regulators and financial institutions in order to overcome or at least to reduce adverse impacts from possible crises.

- Many financial crises have taught the necessity of strengthening regulations to tackle the behaviour of financial institutions. From the US crisis, it was emphasized that regulations are required to tackle institutions that are too big to fail. From the recent financial crisis, it appears that the weaknesses in regulatory mechanisms fueled failed financial institutions and led to a financial crisis which had wider repercussions. The regulations are required not only to regulate financial institutions but also to regulate new products such as derivatives, to evade troubles. Further, these laws increase transparency through new financial services that will give powers to regulators to access information about the entire financial system. The mechanisms such as Basel II, Basel III *etc*. also have imposed some capital requirements which will ensure the stability of institutions. These mechanisms are ex-ante preventive measures anticipating possible weaknesses in advance. However, some may argue that these regulations may impose controls preventing the liberalization philosophy.

- Krugman (2000) argues that poor economic "fundamentals" also can be a reason for the Asian financial crisis. It was said that nations exposed themselves excessively to speculative movements of capital and short term capital flows, with no regulations and controlled mechanisms set up in advance. This was purely because of the prevailing philosophy of openness to all kinds of financial flows. Therefore, regulators have to be careful. The fact is that Asia became very dependent on foreign investors whose concern was not whether a country had its fundamentals in order but what other speculators were thinking. This created a very volatile structure and ultimately a chain reaction of crises. Short-term foreign borrowing increases vulnerability to shocks. The short term flows coming in can quickly flow out. Thailand was an example for this where withdrawals of short-term finances created the financial crisis in South East Asia. At present, the IMF supports imposition of controls on short term finances.

- The crises have taught us the necessity of proper macroeconomic management. In that, controlling inflation, prudent exchange rate management, deficit financing management have been shown to be of great importance. Some small economies such as Singapore and New Zealand have both liberalised capital accounts and floating exchange rates under their macro-economic framework. Accordingly, under macro-economic management proper external and internal economic management has to be in place to avoid crises.

- Crises which led to a reduction of expenditure of households ended up with recessions. When there is a crisis, restrictions in the monetary side and credit will take place, resulting in a decline in demand for goods and services. These measures may impose

restrictions on small and medium-sized enterprises. The US crisis, which provides an example, led to a reduction in consumption of the households and resulted in a drop of demand for goods and services produced by firms. This ultimately led to a world-wide crisis, adversely affecting exports of emerging economies while it created a recession in many countries including USA and the UK.

- Another lesson that can be learnt is the avoidance of overreaction to short-term domestic and external developments. For instance, Korea at end of 1997 experienced an unanticipated sharp exchange rate devaluation that triggered an unprecedented banking crisis. Therefore, in monetary and fiscal management countries have to consider long term perspectives rather than short term goals. Long term policies would contribute to maintain stability avoiding rooms for crises.

- The effects of the crisis are long term and costly. Many countries happen to spend a lot of tax payers' money to rescue failed financial institutions. This was clear from the US crisis when billions of dollars were pumped from the government to bail out failed institutions. This was not limited to the US, but also to many countries in the world that came up with financial assistance from the governments to rescue financial institutions both in the government and the private sectors. Even in Sri Lanka during the period where there was a distress in financial companies, the government (central bank) extended financial assistance to rescue finance companies from collapsing, an activity that had a cost.

- It is required to have sufficient supervision and adequate public disclosures to prevent the failure of financial institutions. Strong supervisory measures have been implemented by many countries which faced the adverse impacts of crises while countries such as US and those in G20 came up with strong legislation in order to strengthen supervision. Financial institutions should respond to this supervision favourably to prevent possible collapses. Even in Sri Lanka prudential supervision and timely action on financial institutions protected the country from the adverse effects of the several crises that occurred around the world. Because of the strong supervision and timely measures implemented in Sri Lanka, the country was able to protect itself from adverse effects of the South-East Asian and US crises. The Korean financial crisis in 1997 was due to lax provisioning, poor standard of concentration of risk and large exposures, lack of good internal liquidity management controls, and weaknesses in supervision and regulatory arrangements. Therefore, financial institutions should respect supervision and regulatory arrangements to avoid future crises.

- Mechanisms such as Deposit Insurance Schemes to protect the depositors provide favourable grounds to avoid adverse effects of the crises. In 1996, Japan came out of a deposit insurance scheme. Steps that Sri Lanka undertook to establish a deposit

insurance scheme may be a part of risk management, which provided authorities with improved flexibility to deal with failed financial institutions. The IMF has stated that world's largest and most important banks should pay additional fees to address the risk of liquidity shortfall in their institutions that may cause wider damage to the financial system.

- From the experience of crises a need has arisen for the private financial institutions to act proactively to regulators' actions in order to avoid adverse impacts. The perception that official resources can be used to bail out creditors generates moral hazards. It could lead to excessive risk taking by lenders and funding of less economically defensible projects and may aggravate the possibilities of crises. After the adverse experiences of the recent crisis in the US, regulators are considering imposition of regulations to limit gearing capacity, enhance capital adequacy, and to conduct stronger stress tests on financial institutions. The private sector responses to governments' or the regulators' actions are required to prevent crises.

- Financial Institutions, especially banks, should carefully arrange investment portfolios drawing attention to both liquidity assets and profit-generating assets to maintain public confidence which is very important for their functions. Liquid assets and profit-generating assets have two ends, and their proper maintenance may ensure confidence of the public as well as profits of the financial institutions. The global financial crises have taught lessons emphasising the importance of maintaining a healthy financial system based on public confidence and generating profits.

- Financial crises have shown the importance of risk management for financial institutions. The US financial crisis in which a number of financial institutions failed due to poor risk management revealed the importance of this activity. The dealing with sophisticated derivative products which was the main cause behind the US crisis carried enormous risks to financial institutions. Therefore, financial institutions should pay greater attention to manage both current and future risks.

- One of the prominent characteristics behind financial crises has been the insufficient awareness of the financial products and activities of financial institutions. During the crises it was evident that the staff of the financial institutions as well as the general public did not have proper knowledge of the financial products. The general public usually goes for high returns without much consideration of the security of the assets thus creating substantial losses to the depositors. Therefore a greater awareness of the staff members of the financial institutions on various developments is also essential. A team of well-qualified and experienced staff is required for financial institutions for which training and capacity building are essential.

- Some crises have erupted due to political reasons. The crises that occurred with this background have created unemployment and problems in income distribution resulting in changes in political environment. For instance, in Thailand, the Prime Minister was forced to resign and President Suharto in Indonesia stepped down after 32 years of autocratic rule. In South Korea the autocratic government of Kim Young Sam was replaced by relatively untainted regime of Kim Dae Jung. So, the lesson learnt from this is that a financial crisis may lead to a political crisis as well.
- Crises have shown the importance of international relationships. The crises such as in South East Asia and the US have proved the necessity of coordinated policy actions among major central banks to counter adverse effects of the crises. The US requested co-operation from Europe to tackle the financial crisis which had global repercussions. A number of countries in Europe responded to this request by adopting parallel monetary and fiscal policy measures. The European Central Bank, Bank of England, Bank of Japan, Bank of Canada, Swiss National Bank, and the Swedish Riksbank announced measures to release liquidity directly to financial institutions and reduction in policy rates. Therefore, to tackle a crisis, international co-operation is required. Corea (1998) argues that casualties of financial crises have come due to lack of North-South dialogue.

The above mentioned lessons can be treated as global lessons that we have learnt from the crisis situations. Sri Lanka was not adversely affected due to the recent crisis in the US because of an improved macroeconomic situation, favourable regulatory background, prudent supervision and the timely action taken by relevant authorities. Central Bank of Sri Lanka (CBSL) (Annual Report of the CBSL 2009, p.17) highlighted the necessity of global solutions, quick and decisive policy actions, long term view of policies, proactive communications, early implementation of necessary macroeconomic policies, forward looking risk management, strong regulatory and supervisory role, early recognition of global developments and implementation of package of policies rather than relying on one to avoid adverse impacts of crises.

5. Financial Crises and the Sri Lankan Economy

5.1 Financial & Economic Crises in Sri Lanka – The History

So far, Sri Lanka has not faced a severe financial or economic crisis. However, the country has faced some difficult economic situations particularly in the finance sector. The banking crisis occurred in Sri Lanka during 1860s and 1870s

required the intervention of the government to bail-out some affected banks (Karunatilake, 1986). Other than this crisis, no evidence is found to trace a noticeable financial crisis that has taken place in the history of Sri Lanka.

Several financial companies in the country collapsed during 1988 and 1989. The Central Bank of Sri Lanka responded to this crisis by extending financial support for distressed finance companies (CBSL Annual Report, 1989). Financial assistance was made available to finance companies in distress in order to pay the depositors. Some of the collapsed finance companies were closed and some were rehabilitated. However, this crisis was not widespread. Mismanagement and difficulties of portfolio management were identified as causes for the collapses.

The government's re-capitalization of State Banks, *i.e.*, Bank of Ceylon, Peoples' Bank and the National Savings Bank in 1993 & 1996 (Hemachandra, 2005, p.74) cannot be considered as a crisis situation but a step taken to strengthen government banks.

In addition to these situations there were several occasions that the country faced some hardships in regard to the country's balance of payments and fiscal management where the government and the central bank obtained financial assistance several times under the standby arrangement facility of the IMF to set the economy on the right path. Since 1965, the first time that the country received IMF funds under this arrangement, there were seven other instances up to date when the government has sought financial assistance from the IMF to overcome difficult situations in Sri Lanka. The latest IMF assistance was obtained by Sri Lanka to resolve difficulties faced by the country in its international reserves which arose as a result of the US financial crisis. As a result, coupled with the decline in export earnings Sri Lanka's foreign reserve situation deteriorated and the country started to defend its exchange rates which the Sri Lanka rupee was pegged to US dollar. In this latest bail-out, which was similar to the procedures followed by most of the other countries in the world, Sri Lanka too obtained funds under the standby arrangement and the country was able to increase its reserve levels which helped to build the confidence of the international investors whose investment were expected. However, Sri Lanka's financial system stability was not affected due to the US financial crisis. Country was able to revive and to achieve a higher economic growth, *i.e.*, 8 per cent in 2010 partly due to these measures.

5.2 US Financial Crisis and the Sri Lankan Economy

In this section the impact of the US financial crisis on the Sri Lankan economy is analysed. It is analysed so as to show how the US crisis impacted on certain economic activities of the country. The US crisis was the latest financial and economic crisis which impacted on trade and economic growth of many countries including Sri Lanka.

There were adverse macro economic impacts arising from the US crisis on countries depending on their level of interactions with the global economy. In the case of Sri Lanka, because of the fact that the capital account has not been fully liberalized and that many local banks did not deal with complex financial instruments, the direct impact of the global financial crisis on the Sri Lankan economy was minimal. Due to the same reasons the contagion effect of the South–East Asian crisis was also minimal on the Sri Lanka economy. However, with the intensification of the crisis that has spilled over into the real sector of the economy, the effects of the US crisis was felt strongly in the Sri Lankan economy.

As a result of the financial crisis, many foreign investors who had invested in short-term investments repatriated their investments back to their countries for meeting rising liquidity requirements in their countries. The foreign funds which were invested in debt instruments, such as Treasury bills and long-term bonds in Sri Lanka were withdrawn from the country partly as a result of the global financial crisis. At the end of 2008, there was a sudden reversal of short-term capital inflows to Sri Lanka. The net outflow amounted to US $ 213 million due to withdrawal of US $ 430 million in the last quarter of 2008.

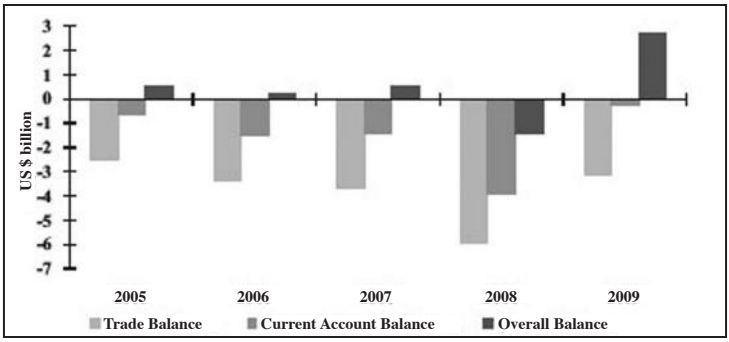
The demand for Sri Lankan exports, particularly apparel products declined substantially due to a slow down in the crisis-driven countries. This was a combined effect of the reduction in the global demand for Sri Lankan textile exports and stiff competitiveness among exporters. There was a decline in exports such as tea and rubber from Sri Lanka. The decline in exports was a result of the downfall in demand for these products from trading partners such as Middle East countries and Russia and decline in prices. The growth of textile and leather product category recorded a slow growth of 3.1 per cent in 2008 compared to 7.3 per cent in 2007 due to the downturn in the demand from US and European countries. Also the growth of industrial sector was low in 2008 compared to 2007. In addition, exports of rubber-based products, diamond and jewellery industries were also affected due to the decline in demand. In order to avoid some of the adverse effects, the government had to unveil an economic stimulus package.

In the meantime, some local industries resorted to short-term lay-offs of workers as a result of the depressed demand for export products. The services sector growth also declined from 7.1 per cent in 2007 to 5.6 per cent in 2008 (Annual Report of the CBSL, 2008).

Another sector affected due to global crisis was the tourism sector. Tourist arrivals dropped by 11.2 per cent in 2008 partly due to the global crisis (Annual Report of the CBSL, 2008). The tourist arrivals from the Western Europe and North American countries dropped by 15 per cent in 2008 when compared to 2007.

The decline in export earnings and withdrawal of short-term investments by foreigners, particularly in the government securities market, resulted in a balance of payments difficulty in Sri Lanka. The high growth of imports and lower growth of exports too contributed to expand the trade deficit in 2008. As a percentage of GDP, the trade deficit deteriorated from 11.3 per cent in 2007 to 14.4 per cent in 2008. As a result of these developments, the balance of payments which recorded a surplus of US $ 515 million as at end of July 2008 turned into a deficit of US $ 1,225 million at the end of 2008 (Figure 4).

Figure 4
Balance of Payment Position



Source : Central Bank of Sri Lanka

The increase in the value of imports was further intensified due to an increase in the prices of imports, particularly of petroleum. Owing to slow growth of exports and low demand for exports from the Western Countries that resulted from the crisis contributed to this adverse impact on reserves and thereby to build a

pressure on the exchange rate to devalue. The central bank sold its foreign reserves to protect the exchange rate from devaluation. At the end of 2008 total external official reserves dropped to US $ 1,594 million indicating reserves were sufficient to finance only 1.4 months of imports although accepted number is 3 months. This depletion of reserves, coupled with decline in export earnings prompted the policy makers to search for mechanisms to increase the level of reserves.

Crisis in the US and its contagion effects in western countries required Sri Lanka to change its external portfolio investments to minimise risks. The CBSL had to take a concerted effort to manage its investments of foreign reserves by changing strategies and shifting them into safer destinations. This was required for minimising risks while at the same time increasing returns.

The impact of the global crisis through the channels as explained above ultimately resulted in a slow rate of economic growth in Sri Lanka. The impact on economic growth due to crisis and recession in the world was severely felt during last quarter of 2008 and first half of 2009. The GDP growth dropped to 4.3 per cent in Q4 of 2008 compared to 6.3 per cent in Q3 and 7.0 per cent in Q2 of 2008. The lowest economic growth of 1.6 per cent in the first quarter 2009 indicated the adverse effects of the global crisis on the Sri Lanka economy. Economic growth in 2009 was 3.5 per cent compared to 6 per cent in 2008, which showed the adverse impact of the financial crisis on the Sri Lankan economy.

Partly due to the adverse effects of the crisis there was a lower growth in government revenue which was significantly below the target level. The total revenue as a per cent of GDP declined to 14.6 per cent in 2009 compared to 14.9 per cent in 2008. The borrowing requirement increased both due to slow growth of revenue and increased expenditure as a result of undertaking massive projects under infrastructural development and requirements in the North and East. Due to tight liquidity conditions in the international capital markets it led the government to depend heavily on domestic borrowings during the first half of 2009. Lower growth in GDP and increased government borrowings resulted in an increase of debt/GDP ratio to 86.2 per cent in 2009. An effort had to be made to borrow from the international market due to tight situation.

The financial system of the country was not directly affected by the crisis. No banks collapsed in Sri Lanka due to contagion effects of the crisis. The regulated openness of the banking sector and the prudential bank supervision in Sri Lanka contributed to these favourable results. Although some registered finance companies faced difficulties in 2008, there was no threat from a financial crisis to financial stability in the country. However, it was required to maintain

the public confidence about financial institutions and to avoid panics. The CBSL had to intervene in order to create public confidence which was deteriorating due to adverse developments in the financial institutions around the world. Central Bank attended to this requirement through wide public awareness programmes and press conferences *etc*. There were no adverse effects on price stability due to the crisis. The average inflation in 2009 was 3.4 per cent, the lowest since 1985. Amidst the financial crises in other countries, Sri Lanka was able to relax its tight monetary policy stance that was maintained prior to third quarter of 2008. Coordinated and timely adoption of monetary policy of the CBSL and the fiscal policies of the government helped in preserving financial system stability of the country despite the crisis took place in the West.

5.3 Measures that Contributed to Minimise the Adverse Impacts of the US Financial/Economic Crisis on Sri Lanka.

Similar to the monetary authorities in other countries which were affected by the recent crisis in the US, the CBSL too initiated and pursued a series of precautionary and prudential measures to minimise the impact of the crisis on the domestic financial system. As shown in the previous section, the impact of the financial crisis on the Sri Lankan economy was not severe compared to the adverse impacts experienced by the western countries. However, a prudent management of foreign reserves by the country was required while maintaining a reasonable stability in the exchange rates for other reasons. In order to improve the foreign reserve position and to move away from possible adverse effects on the external sector, the country was required to implement appropriate policies and measures for export growth. In addition to looking after the external sector, the country was also required to maintain financial system stability. Carrying out prudential bank supervision and adopting appropriate regulations were required to protect the financial institutions in the country.

The country was required to change its policies, while at the same time maintaining existing policies and regulatory measures to maintain the stability in the financial system. The following are some of the measures which helped to maintain the system stability in Sri Lanka during and after the difficult time.

5.3.1 Exchange Control Measures

- The impact of external shocks had not impacted in an extensive way in the Sri Lankan economy partly due to the country's capital account not being

fully liberalised. The restrictions on movements of foreign capital flows in Sri Lanka such as permitting the deposits in foreign currencies under specific schemes, requirement of prior approvals for debt capital and other capital transactions and permitting investments in shares through share investment external rupee account, and requirement to maintain foreign currency deposits subject to certain limits helped to minimise adverse impacts of the recent finance crisis. Foreign investments in government securities are subjected to a total cap of 10 percent of outstanding government securities. Although, the CBSL opened the Treasury bill and Treasury bond market to foreigners, these limits were helpful to avoid any threat to external finance from a sudden capital flight. Requirement of foreigners to open a separate account in a licensed commercial bank in Sri Lanka and the permitted limit at 10 percent of the total value of outstanding Treasury bills and Treasury bonds were helpful in preserving Sri Lanka's reserve position.

- The regulatory mechanisms implemented in the country for releasing of foreign exchange only for importers who have licenses issued by Controller of Imports and Exports was also another contributory factor to manage foreign currency situation. There are limits in respect of capital transfers, which have been changed from time to time. Capital account has been prevented from being falling into vulnerabilities through these control measures. These policy measures have been helpful in preventing sudden capital outflows from Sri Lanka.

- The CBSL has implemented some measures, such as allowing limited entry into forward contracts for sale and purchase of foreign exchange, preventing pre-payment on import bills and raising margin deposit requirements against Letters of Credit for importing motor vehicles under the Central Bank's vigilance to maintain a stable exchange rate. These policies were helpful to relieve the pressure on external reserves which may impact due to volatility in the domestic foreign exchange market.

- Further, as a measure to reduce the pressure on the real sector, the CBSL, considering several adverse impacts on domestic economy, favoured a limited depreciation of the Sri Lankan rupee against foreign currencies. As a result, the export sector was not affected too much during the crisis period. The imposition of 100 per cent cash requirement on Letters of Credit opened for the imports of some specific items was also helpful to reduce the outflow of foreign exchange during the crisis period.

- The maintenance of CBSL's reserves with highly rated international commercial banks ensured 100 percent security and safety of country's reserves. The earnings of foreign currency investments in the international market enabled the CBSL to supply a part of the foreign exchange requirements to meet the demand for external funds. Also, the CBSL revised its operating instructions issued to authorized dealers in respect of foreign currency sales and purchases enabling the banks to prevent any kind of misuse of foreign currencies. Therefore, the foreign currency dealers are bound to do their business under strict guidelines issued by the Central Bank, which helped to maintain safety in external positions.
- the CBSL intervened in the foreign exchange market in such a way that it stabilised the exchange rate during the crisis period. During the first four months of 2009 increased foreign exchange outflow exerted the pressure on the exchange rate to depreciate and the CBSL supplied foreign exchange. Increased inflows since May 2009 exerted pressure to appreciate exchange rate and the CBSL intervened to maintain stability by buying foreign exchange from the market.
- Issuance of directions to commercial banks by the CBSL for releasing of foreign currencies for travel and other purposes depending on the purpose was another measure to protect foreign currencies of the country. The requirement of producing documentary evidence was helpful to regulate the movements of foreign exchange transactions.
- In order to create confidence among investors/public, the CBSL created a sinking fund thus avoiding undue pressure from withdrawals in the exchange market.

5.3.2 Bank Supervision Measures

- Banks operating locally did not have direct exposures to US mortgage securities or to financial instruments that failed. This, as well as existed regulatory framework, safeguarded the domestic financial system. Under the procedures and policies adopted for supervision, the adaptation of Basel II capital adequacy standards for commercial banks in Sri Lanka, effective from January 2008, provided a framework to foster integrated risk management in banks. All banks were required to maintain their capital adequacy ratios and credit ratios as per the guidelines in Basel II which has contributed to promote higher standards of risk management among the banking institutions thus mitigating risks.

- The issuance of some directions to financial institutions under the corporate governance ensured the improvements in common standards of their behaviour improved the public confidence and thereby contributed positively towards financial stability despite the adverse experiences faced by western financial institutions. Application of the assessment of fitness & propriety to officers in executive grades of banks came under the corporate governance directions.
- The strict guidelines for maintenance of non-performing loans (NPL) were also helpful to maintain levels of loans as well as to reduce the risk arising from delivery of credit.
- Improving of the financial structure with systems, such as business continuity planning, commencing of risk based supervision and the first time implemented measures such as Know Your Customer (KYC) policy for banks were the other prudential measures implemented by the CBSL to avoid the impacts of crisis.
- Licensed Commercial Banks were instructed not to effect pre-payment of import bills in order to minimize the pressure on external reserves. The CBSL imposed a 100 per cent margin on specific items to avoid possible un-healthy speculating foreign exchange transactions and to help minimizing the risk of banks.
- As a measure to avoid the impact of crisis on financial institutions, the CBSL also appointed managing agents for some banks and finance companies. The directions on the existing Boards of Directors prevented possible un-healthy situations in operations of financial institutions. It also helped to minimise the risk of banks.
- The CBSL also placed limits on the borrowings of Commercial Banks and introduced credit guarantee schemes for bank loans granted to registered finance companies and specialized leasing companies. This was also helpful to protect banks from falling into vulnerabilities.
- Under the legal arrangements several laws relating to financial institutions were amended and guidelines for banks were issued. Some guidelines imposed limitations on payments to executive staff.
- The liquidity problems of some of the domestic banks (*eg.,* Seylan Bank) and some finance companies arose partly due to drying up of external credit lines for their operations were resolved by measures directing them to issue shares and banks to get listed in the Stock Exchange. Also the CBSL, in

conjunction with Ministry of Finance, introduced special stimulus packages to assist troubled finance companies.

- These carefully thought and timely implemented measures by the CBSL and the government contributed towards ensuring public confidence to maintain stability. Investor awareness programmes and advertisements by the CBSL were also helpful in creating public confidence thus avoiding panics which are harmful to the stability.

5.3.3 Other Measures

Other than the above measures, some other measures adopted by the CBSL as given below were helpful in maintaining the price and the financial system stability without impacting much from the crisis.

- Under its monetary policy, the CBSL took several measures. It relaxed its tight monetary policy to supply liquidity to the market. Under a series of measures, Statutory Reserve Requirements (SRR) and restrictions in accessing the Reverse Repo Facility of the CBSL by Commercial Banks and Primary Dealers were removed. These measures were supported by reducing policy rates of the CBSL which helped managing liquidity situation in the market and enabling the banks to lend at a lower rate.

- In order to increase the level of foreign reserves the CBSL and the government took several steps. (*a*) negotiating with three countries for SWAP arrangements (for US $ 200 mn) (*b*) promoting investments in Treasury bills and bonds among Sri Lankan Diaspora and migrant workers. (*c*) paying bonus interest of 20 per cent in rupee terms on interest earned on NRFC & RFC deposits.

- The CBSL and the government negotiated with the IMF for a standby arrangement to improve the external reserve position of the country. The IMF under this arrangement promised 2.6 billion US dollars to be given to Sri Lanka. This measure, in addition to improving the foreign currency situation of the country helped creating, more importantly, the confidence of foreigners for investments and other dealings with Sri Lanka. The supply of IMF funds to Sri Lanka increased the level of foreign reserves, substantially in the country. As at end of March 2011, Sri Lanka had received US$ 1.7 billion under seven tranches out of 8 tranches for US$ 2.7 billion in totality.

- Timely implementation of monetary policy adjustments helped in maintaining price stability and low inflation. In 2008 there was a tight monetary policy resulting in a low inflation of 7.6 per cent by end of February 2009

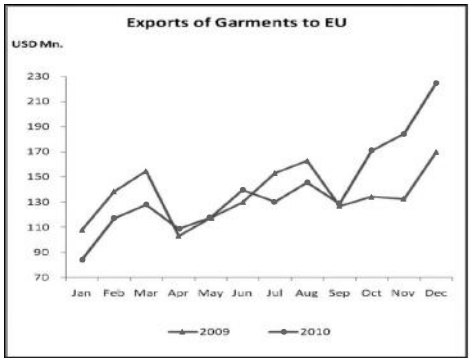
(effect delayed due to time lag) compared to 28.2 per cent in June 2008. Under its tight monetary policy, the CBSL conducted aggressive open market operations (OMO), imposed restrictions of market participation at OMO and a penal rate of 19 per cent for extra borrowings, and refrained from subscribing to primary and secondary Treasury bill markets. Deceleration of inflation as a result of prudent monetary policy allowed CBSL to further relax its monetary policy in 2009. Under these policies, penal rate of 19 per cent and the repo/reverse repo rates were brought down gradually. During 2010 an accommodative monetary policy with further moderation of interest rates continued.

- Coupled with prudent monetary policy, external sector policies with regard to external trade and exchange rates were helpful in achieving price and economic stability during 2008–2010.

6. Recovery of the Sri Lankan Economy

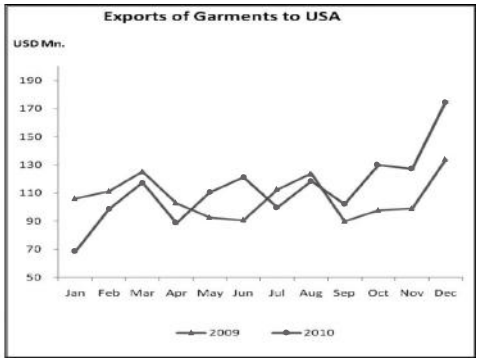
The measures implemented during the crisis period were helpful for Sri Lanka to recover well in the latter part of 2009 and in 2010. The economic growth of 8 per cent recorded in 2010 was impressive. However, the progress achieved by Sri Lanka was not only due to policies implemented to recover from the financial crisis but also due to persistent favourable socio economic conditions, including the conclusion of the civil war which was fought for a period of three decades. Monetary and fiscal policies implemented during 2008–2010 also helped in achieving a remarkable performance of the economy during 2010.

Figure 5



Source : Central Bank of Sri Lanka

Figure 6



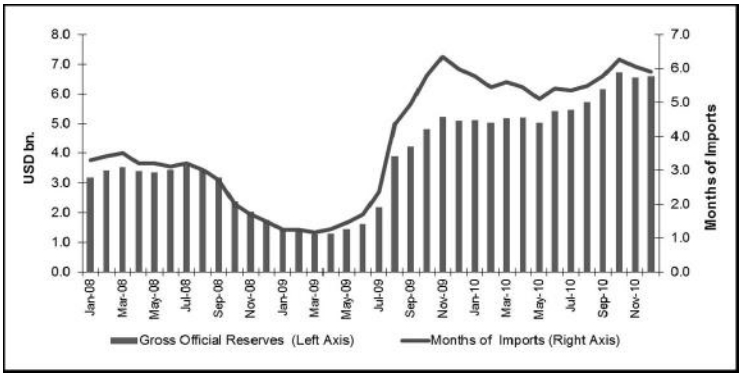
Source : Central Bank of Sri Lanka

The drop in exports and imports in 2009 reversed in 2010. Exports to major markets increased substantially in 2010. Figure 5 and Figure 6 show rising trends in garment exports to EU countries and to US in 2010 compared to 2009 during which there were some difficulties partly due to slack demand.

Due to external sector policies, coupled with impressive level of foreign remittances especially from the Sri Lankans working abroad and due to government foreign borrowings country's external reserve position improved. External reserves, which dropped to the level of 1.8 months sufficiency for import of goods and services in 2008, rose to a sufficiency of 5.5 months in 2009. The rise in external reserves after policies were implemented is shown in the Figure 7. Total external reserves at end of 2010 amounted to US $ 6,619 showing 5.9 months of import sufficiency.

Figure 7

External Reserves in Sri Lanka

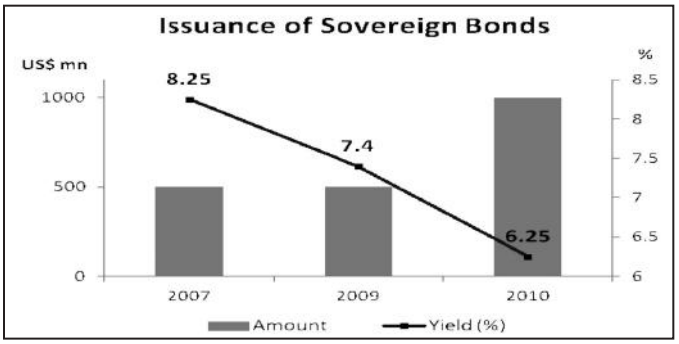


Source : Central Bank of Sri Lanka

The BOP showed a noteworthy improvement starting from the second half of 2009. The country's BOP, which was in a deficit of US $ 1,225 mn at end of 2008 improved to a surplus of US $ 2,725 mn in 2009 and to US $ 921 mn in 2010 along with supportive macroeconomic policies that were implemented. The inflows of foreign exchange increased due to several reasons including receipt of the Standby Arrangement from the IMF, floating of 2nd international sovereign bond of US $ 501 mn in October 2009, and foreign investments due to renewed investor confidence and stable exchange rates. Coupled with these, low international interest rates encouraged foreign inflows to government securities, which attracted US $ 1,369 mn inflows in 2009 as against net outflow of US $ 213 mn in

2008. In 2010 third international sovereign bond of US $ 1.0 bn with a tenure of 10 years was floated successfully (Figure 8). Increased remittances from the workers abroad and improvements in tourism contributed to strengthen the BOP situation.

Figure 8



Source : Central Bank of Sri Lanka

Improved socio-economic conditions after concluding the war and favourable developments in political environment in the country were helpful to increase output of factory industry and services sector along with revival of demand from both external and domestic sectors. These conditions resulted in an improved performance of the Colombo Stock Exchange (CSE) in which market capitalisation increased to Rs.2.2 trillion at end of 2010 from Rs. one trillion at end of 2009 showing a rise in the ratio of market capitalisation/ GDP to 42 per cent in 2010 compared to 23 per cent in 2009. Share price indices increased substantially during 2010 (Figure 9) resulting the CSE becoming one of the best performing markets in the world. The All Share Price Index increased by 98 per cent at October 2009 in contrast to a 41 per cent decline recorded in 2008.

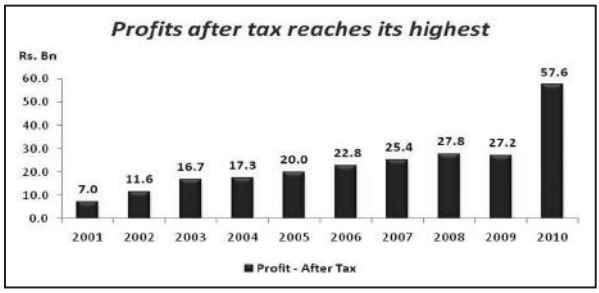
The pickup in domestic economic activities and strong recovery in imports increased government revenue which as a percent of GDP increased to 14.6 per cent in 2010. The overall budget deficit declined to 7.9 per cent of GDP in 2010 compared to 9.9 per cent of GDP in 2009. This was helpful in reducing borrowings from domestic banks and therefore in conducting monetary policy.

Figure 9
Colombo Stock Exchange Price Indices

Source : Central Bank of Sri Lanka

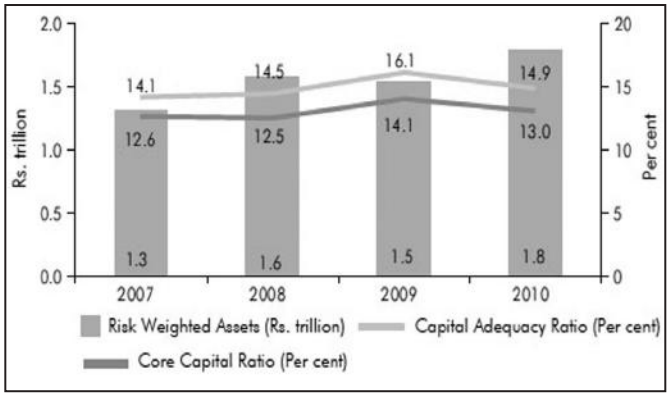
The banking sector was resilient to external and domestic developments. No bank in Sri Lanka collapsed due to financial crisis in the world. Financial System stability improved due to implementation of supportive regulatory and supervisory measures. Investor confidence improved and schemes such as mandatory deposit insurance helped improving confidence among the public. Profitability (Figure 10) and capital adequacy of banks (Figure 11) increased. Performances of finance companies in distress also improved in 2010. Credit to private sector from banks grew (Figure 12) and economic activities reactivated. Coupled with these developments supportive regulatory and supervisory framework ensured improved performances in the financial sector and system stability.

Figure 10
Profitability of Banks



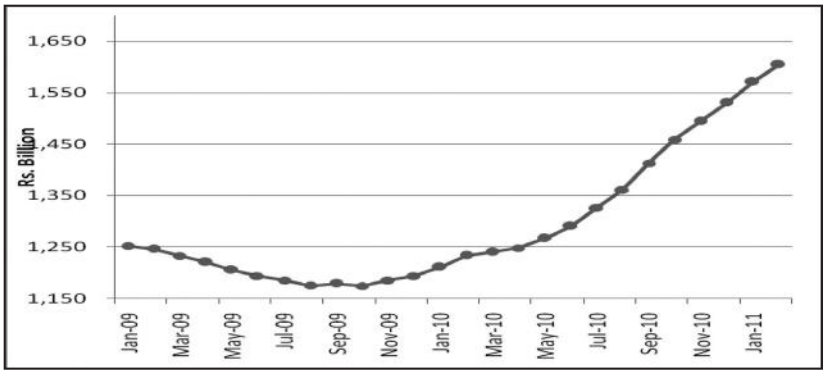
Source : Central Bank of Sri Lanka

Figure 11
Capital Adequacy of Banks



Source : Central Bank of Sri Lanka

Figure 12
Credit to Private Sector by Banks



Source : Central Bank of Sri Lanka

Banking services expanded. Expansion in financial institutions (Table 2) at the grass root level provided better services to the public. Bank branch network expanded to grass root level, particularly to the North and East areas, which had suppressed financial performances due to unsettled conditions for many years. Payment and settlement systems with state-of-the art technology ensured confidence and convenience in financial transactions/services.

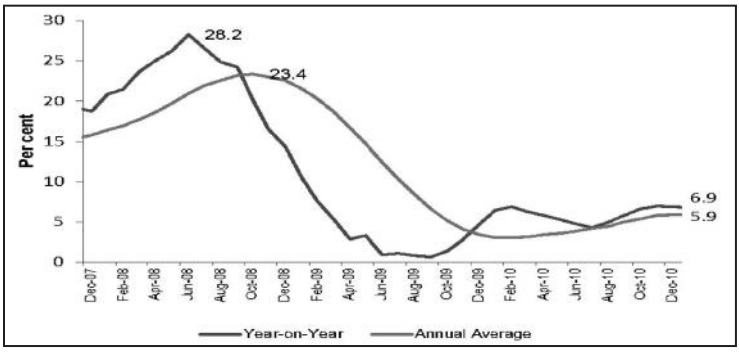
Table 2
Improvements in Selected Financial Services

Item	End 2009	End 2010	Change in 2010	
			Total	Of which: North & East
Bank Branches	1,847	1,937	90	29
Other Banking Outlets	890	988	98	23
ATMs	1,876	2,009	133	36
Registered Finance Companies	289	376	98	41
Specialised Leasing Companies	145	224	44	15

Source : Central Bank of Sri Lanka

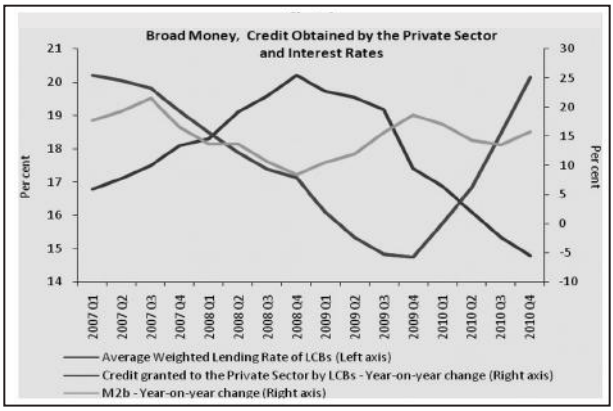
Price stability was maintained due to prudent macroeconomic policies. Inflation was under check and maintained at a low level between 4.3 per cent (year-on-year) and 6.9 per cent in 2010 compared to 28.2 per cent in June 2008 (Figure 13). Favourable inflation outlook enabled the CBSL to ease its monetary policy stance further in 2010. The CBSL reduced its policy interest rates several times which resulted in downward adjustments in market interest rates. The money supply growth was under control and remained within the targets. The relaxed monetary policy stance allowed credit to expand (Figure 14) while managing excess liquidity arose from absorption of foreign exchange inflows which increased as a result of issue of sovereign bonds, increase in net foreign investments in government securities and other inflows of foreign exchange for both the government and the private sector.

Figure 13
Achievement of Colombo Consumer Price Index



Source : Central Bank of Sri Lanka

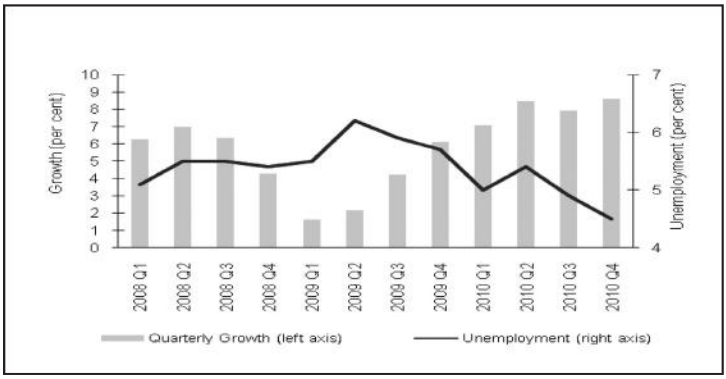
Figure 14
Money, Credit and Interest Rates



Source : Central Bank of Sri Lanka

As a result of the conducive environment for economic activities, the economy grew at a faster pace. Unemployment rate declined to 4.9 per cent in 2010 which was 8.8 per cent in 2002. Economic growth at 8 per cent in 2010 showed the results of the recovery after the economic crisis of 2008-2009 (Figure 15).

Figure 15
Economic Growth and Unemployment.



Source : Central Bank of Sri Lanka

As per the above explanation, Sri Lanka has shown that it has recovered from the impacts of financial and economic crises that started in the USA and later on spread globally. The higher economic growth at 8 per cent and the stability in the financial sector have proved that Sri Lanka's macroeconomic settings are on a correct path. However, the country should not be complacent over the 8 per cent economic growth that it has achieved in 2010 as many challenges are ahead due to global and domestic developments. What the country needs is a sustainable growth which requires a considerable effort.

7. Summary

This paper attempted to explain the basis for financial crises and their consequences for the countries which suffered from such crises while identifying the measures that the countries have adopted to handle the financial crises, with a particular attention to Sri Lanka.

In the introduction, the paper identified theoretical perspectives of financial crises. Secondly, it identified the causes of the financial crises based on the experiences of financial crises evolved in the recent history of several countries. Some crises occurred due to a combination of several factors. External sector problems such as balance of payments, exchange rates and capital flights were the roots for some crises while excessive debt and credit crunch were some other reasons. From the technological side creation of sophisticated derivative products has contributed to some financial crises. Developments in political front have also been causes for several financial crises. The US crisis and Asian crisis created crises in other countries due to contagion effects. In this study, financial crises evolved in Argentina, Chile, Mexico, Several Asian countries and the US were highlighted as examples. It analysed the sub-prime mortgage crisis started in the US in 2007. The study explained the effects of the US crisis and identified responses to it by US and other countries. Responses, as identified by the study, included monetary policy actions, regulations and legislation measures, government bail-outs and combined policy actions initiated by different countries.

The paper identifies some lessons from the financial crises that were helpful in minimising impacts of the financial crises. It concludes that the latest financial crisis (the US sub-prime mortgage crisis) has not impacted much on the Sri Lankan economy and, as a result of the measures implemented and limited openness of the financial institutions to the external parties, the country was able to recover from adverse impacts.

In the section six indicators are provided to confirm that the economy has recovered from the adverse impacts of the latest financial crisis. The indicators provided include external trade performance with trends in exports, imports and external reserves, performances of stock market, resilience of banking sector with trends in profitability, capital, credit

provided and improvements in services of financial institutions. Favourable developments in monetary sector were analysed in the light of trends in interest rates, credit and inflation. Finally, it confirms that economic recovery is seen from the high economic growth and lower unemployment rate experienced in Sri Lanka during post-crisis period. However, to face all challenges and to achieve a sustainable growth with stability, a continuous implementation of appropriate policies is required while being vigilant on domestic and international developments. In this process, the policy makers cannot be complacent due to the requirement of pursuing on achieving a sustainable growth while resolving renewed global and domestic challenges.

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An Empirical Investigation of the Twin Deficit Hypothesis: Evidence from Sri Lanka

Anil Perera

and

Erandi Liyanage

Abstract

Theoretical and empirical evidence proves that prolonged fiscal expansions contribute to current account imbalances and hence, there exists a positive-long run relationship between budget deficits and current account deficits. This relationship is referred to as 'twin deficit hypothesis.' Significant fiscal expansions and external imbalances, which caused macroeconomic instability in a large number of advanced countries and emerging countries, have motivated examining the issue of twin deficits. Like many other emerging countries, for a long period of time, Sri Lankan economy has been experiencing persistently high budget deficits and current account deficits. In this study, we attempt to explore the twin deficit hypothesis interacting with key financial variables using both annual and quarterly data for Sri Lanka and employing multivariate empirical methodology. We find evidence for long run relationships between twin deficits in Sri Lanka. At the same time, we detect unidirectional causation between twin deficits, which enables into draw several policy implications.

Key Words: Twin Deficits, Cointegration, Granger Causality
JEL classification : E2, E4, E6, F32, H62

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1. Introduction

The budget deficits (defined as total government expenditures minus total tax revenues) and the current account deficits (defined as the difference between revenues and costs from trade plus net transfers to the country) are considered as major macroeconomic concerns in any economy. It has been argued that maintaining sustainable budget deficits as one of the major pre-conditions for an economy to thrive. At the same time, large current account deficits assumed to be one of the major macroeconomic ailments, which jeopardises the external stability in particular and the macroeconomic stability in general.

According to open economy macroeconomics, a government budget deficit leads to a current account deficit and this phenomenon is termed the twin deficits hypothesis (TDH) (Salvatore, 2006). Accordingly, TDH contends that there is a strong positive relationship between a national economy's current account balance of the balance of payments (BOP) and government budget balance. The theoretical explanation for the TDH is based on the well-known Mundell-Fleming (Fleming, 1962; Mundell, 1963) framework. According to this model, an increase in budget deficit induces upward pressure on interest rates that in turn trigger capital inflows and appreciation of the exchange rate. In particular, a debt financed expansionary fiscal policy raises the interest rates and given that most countries adopt a free capital movement policy, the rise in interest rate makes it attractive for investors to investments in that country's financial market. This raises the demand for the country's currency causing it to appreciate which would in turn make imports cheaper and exports more expensive relative to the prices of foreign goods. Hence, the appreciation of the domestic currency will lead to an increase in imports and ultimately in current account deficit (Leachman and Francis, 2002; Salvatore, 2006). In sum, a fiscal expansion, *i.e.*, an increase in fiscal deficit raises output and thus imports creating a trade deficit and ultimately a current account imbalance with the appreciation of exchange rate (Blanchard and Sheen 2009).

The relationship between deficits in the external current account and the government fiscal account has important policy implications for a number of reasons. First, persistent large deficits cause indebtedness due to borrowing internally and externally and hence, impose a burden on future generations (Harko, 2009). At the same time, current account deficits coupled with increases in budget deficits and resultant inflation could lower the country's sovereign ratings and trigger a capital flight while creating difficulties on external financing. Also, growing fiscal and current account imbalances cause macroeconomic imbalances and hence, affect long-term economic progress of a country (Baharumshah, Lau and Khalid, 2006).

In this context, establishing and understanding the relationship between twin deficits would help to formulate appropriate macroeconomic policies for a country. Particularly, if the views with regard to the causal role of the budget deficit are incorrect, then simple reductions in budget deficits may not resolve current account imbalances. Also, as a result, scarce economic resources will be diverted from relevant and urgently needed policy options (Belongia and Stone, 1985). To that end, investigating the relationship between these two deficits appears to be much important.

In economic literature, two prime approaches are known to have explored the relationship between the current account deficit and budget deficit of a country: the conventional Keynesian preposition and the Ricardian Equivalence.

Based on the Mundell-Fleming framework, Keynesian proposition argues that the budget deficit does have a significant impact on the current account deficit. If the budget is in deficit, then the government have to borrow money from private sector or from other countries. This leads to crowd-out some private borrowing. Then total national saving which is the sum of private saving plus the government fiscal balance will decrease. With a lower level of national savings, the interest rates should increase leading to an appreciation in the exchange rate triggering foreign inflows. The appreciation of domestic currency will make exports less attractive and imports more attractive, subsequently worsening the trade balance, which is the major component in the current account deficit. Hence, the Keynesian absorption theory suggests that an increase in budget deficit would induce domestic absorption and import expansion causing an increase or worsening in current account (Kouassi, Mougoue´ and Kymn, 2004). As per these theoretical arguments, the Keynesian proposition can be summarised as follows. First, a positive relationship exists between current account and budget deficits. Second, there exists a unidirectional Granger causality that runs from budget deficit to current account deficit (Baharumshah, Ismail and Lau, 2009). Accordingly, the TDH states that a budget deficit will lead to a current account deficit and a budget surplus will improve the current account deficit.

The Ricardian Equivalence Hypothesis (REH) claims an absence of any relationship between the current account deficit and budget deficit (Barro, 1974 and 1989; Buchanan 1976).This approach reveals that shifts between taxes and budget deficits do not impact the real interest rate, the quantity of investment, or the current account balance. The effect of the present tax cut or increase in government expenditure does not alter the mix of current consumption and investment since rational agents foresee the present tax cut as a tax burden in future. Therefore, they will increase savings in order to pay for

future tax increases. Hence, as Ricardian reveals the tax cut is considered as a temporary procedure. The decrease of public saving will be compensated for by an equal increase of private saving, and hence the national saving will not be affected. In other words, the absence of any causal relationship between the two deficits is in accordance with the REH.

Although previous literature mainly focused the discussions on the twin deficits based on these two major theoretical models, these are not the only possible outcomes between the two deficits. In fact, there are four testable hypotheses arising from the twin deficits phenomena. First, causality runs from budget deficit to current account deficit. Second, an absence of any relationship between the two deficits is also possible, indicating these deficits are independent. Third, a unidirectional causality, which runs from current account to budgetary variable also, may exist. Finally, a bi-directional causality between the two deficits could also exit (Mukhtar, Zakaria and Ahmed, 2007; Baharumshah *et al*., 2009).

For a long period of time, researchers and policy makers have been concerned over the state of the current account and budgetary imbalances. Particularly, a renewed interest on twin deficits can be observed during last twenty years. For example, Taylor (2002) discusses the developments of current account deficits over a period of about 120 years and shows that external imbalances have been an important feature of the world economy, although their role has changed several times. At the same time, Frankel (2004) argues that the fiscal policy of the current decade in many respects mirrors the fiscal policy of the 1980s and growing budget deficits are reflected in growing current account deficits.

The discussion over TDH is motivated by the emergence of twin deficits mainly in the US economy (Normandin, 1999; Mann, 2002). However, the close connection between current account and budget deficits was not unique to the economy of the United States. Europe, Germany and Sweden faced similar problems in the early part of the 1990s when the rise in the budget deficits was accompanied by a real appreciation of their national currencies that adversely affected the current accounts (Ibrahim and Kumah, 1996). Such growing fiscal and current account imbalances have been considered as the major cause of macroeconomic imbalances and instability in many countries (for example: Edwards, 2001).

On the other hand, many argue that the experiences in emerging countries in regards to twin deficits are very different from that of developed countries. For example,

Anoruo and Ramchander (1998) argue that there could be wide disparities in emerging countries in the macroeconomic dynamics governing fiscal and current account deficits due to inefficient public enterprises, deficient infrastructure, tight trade controls, regulations in the financial sector and political uncertainty.

In the late 1970s, many emerging/developing countries were running large budget deficits to finance large and growing government spending and in order to finance these deficits, governments borrowed heavily in global capital markets. The large and growing budget deficits led to significant current account imbalances and the accumulation of large stocks of foreign debt (Baharumshah *et al*., 2009). Accordingly, most developing countries experienced problems with external debts in the early 1980s as a result of weak fiscal positions due to unsustainable budget deficits. This has led the discussion on TDH and it was argued that the relationship between budget deficits and current account deficits is even much stronger in developing economies (for example: Laney, 1984). Since 1980s, the discussion on twin deficits in these countries has been continued into recent decades (for example: Anoruo and Ramchander, 1998; Khalid and Teo, 1999; Lau and Baharumshah, 2006). Given the importance of emerging countries in the present global economic context, further investigation on the TDH in emerging countries remains significant and timely.

Like many other developing countries, for a long period of time, Sri Lanka has experienced persistently high budget deficits as well as current account deficits. This issue has received some attention of International Monetary Fund and the World Bank (Saleh, Nair and Agalewatte, 2005). However, the issue of TDH for Sri Lanka has been explicitly examined only in a few occasions although there are some attempts to explore the issue with regard to budget deficits and related issues in Sri Lanka (for example: Colombage, 1991). Moreover, Saleh *et al*. (2005) examined TDH for Sri Lanka only by concentrating on the relationship between current account imbalance and budget deficit. Meanwhile, Chowdhury and Saleh (2008) study the current account and budget deficit relationship for Sri Lanka in the presence of saving and investment gap and trade openness. Both these studies support the Keynesian view and hence, confirm the existence of TDH for Sri Lanka. These attempts are extremely important in understanding the link between twin deficits; however, there still remains a significant research gap in regards to twin deficits in Sri Lanka. Accordingly, the overall goal of this study is to revisit the issue since a careful and critical assessment of twin deficits would help to deepen the understanding of macroeconomic dynamics of the Sri Lankan economy and hence, formulate better calibrated macroeconomic policies.

This study however differs from the existing literature in the following ways. First, this study attempts to examine the TDH for Sri Lanka including most important financial variables such as interest rates and exchange rates, which are known to influence the twin deficits process. On the one hand, this is important as the discussion surrounding deficits and interest rates has been controversial (Abell 1990). On the other hand, the endogeneity of two deficit variables in many countries warrants investigating the indirect causality that may exist in the twin deficits nexus by way of including the role of the causing variables, *i.e*. interest and exchange rates (Baharumshah *et al*., 2006). However, existing studies for Sri Lanka do not consider the direct or indirect effects of deficits *via* other variables such as interest rates and exchange rates on the deficits, *etc*.[1] However, probe into TDH requires explicit examination of the most relevant set of variables that may relate meaningfully to fiscal and external balance relations. Second, previous studies use annual data, but we resort to both annual and quarterly data in order to capture the dynamics of variables that could omit when using annual time series data.

Hence, to shed further insight on the twin deficit issue in Sri Lanka, this study addresses the following two questions: (*i*) Is there a strong relationship between budget deficits and current account deficits in Sri Lanka? (*ii*) What is the impact of interest rates and exchange rates in the budget deficits and current account deficits nexus?

The remainder of the paper is organised as follows: Section 2 presents the theoretical framework of the TDH while Section 3 contains relevant empirical evidence. Section 4 briefly elaborates on the developments in twin deficits in Sri Lanka. Section 5 outlines econometric models used to assess the TDH. Section 6 contains empirical findings and the discussion and Section 7 concludes the study.

2. Theoretical Underpinnings of Twin Deficit Hypothesis

The connection between the budget deficit and current account deficit can be derived from the national account identity:

1 Baharumshah and Lau (2006) investigate twin deficits for a panel of South East Asian Central Banks (SEACEN) countries including Sri Lanka and consider the role of the two financial variables. However, as the investigation is based on panel data analysis, they do not explicitly provide evidence for Sri Lanka. Saleh and Chowdhury (2008) consider financial variables using a surrogate variable of openness [(X+M)/Y] in order to capture the combined effect of exchange rate and interest rate.

$$GNP = C + Ip + G + (X - M) \quad (1)$$

GNP is gross national product, which is the sum of private consumption (*C*), private investment (*Ip*), government expenditure on goods and services (*G*) and exports (*X*). Imports (*M*) are treated as a negative component to avoid double counting of consumption or investment of good purchased domestically, but produced abroad. (*X – M*) represents net exports plus net factor income, *i.e.* current account balance of balance of payments.

GNP is simply the sum of the income received by all individuals in the economy. Hence, an individual has four possible uses of this income; it can be consumed (*C*), saved (*Sp*), paid in taxes (*T*) or transferred abroad (*Tr*). Accordingly, equation (1) can be written as;

$$GNP = C + Sp + TG + Tr \quad (2)$$

By equating the two expressions for *GNP* specified above and also rearranging terms, the following equation can be derived to highlight the relationship between budget deficits and current account deficits.

$$X - M - Tr = (T - G) + (Sp - Ip) \quad (3)$$

where, $$X - M - Tr = CA \quad (4)$$

CA is current account balance. Hence, the relationships in equations (3) and (4) can be interpreted to state that current account balance is equal to the surplus of private saving over investment and the gap between government tax receipts and government expenditures on goods and services, that is, the government budget balance.[2] Hence,

$$CA = BD + SD \quad (5)$$

[2] Equation (3) is useful in a number of ways. It shows that, for a given savings rate, a budget deficit will either crowd out private investment or lead to an inflow of foreign capital (or both). By definition, anything that affects budget deficits, investment, or savings, in turn, affects both capital flows and the trade deficit (Abell, 1990).

where, *CA* represent the net exports plus net factor income (current account balance), *BD* is the budget deficit, representing the difference between public revenue and public expenditure and *SD* is the saving deficit, symbolising the difference between private saving and private investment.

The relation (3) is derived from an accounting identity. Accordingly, left side of the equation explains the foreign deficit. Right side of the equation is composed of two deficits, the budget deficit and the private saving deficit.

Current account shows the size and the direction of international borrowing. When a country imports more than exports, there arises a current account deficit, which is financed by borrowing from abroad. Hence, a country with a current account deficit must be increasing its net foreign debt by the amount of deficit. To that end, a country with a current account deficit is importing present consumption and or investment (if investment goods are imported) and exporting future consumption and or investment spending.

Alternatively, the relationship between budget deficit and current account deficit can be further illustrated as follows.

According to the national account identity, national saving (*S*) in an open economy is given by;

$$S = Y - C - G - CA \tag{6}$$

Alternatively,

$$S = I + CA \tag{7}$$

where, $Y - C - G = I$

National savings can be divided into two components; private saving (*Sp*) and government saving (*Sg*):

$$S = Sp + Sg \tag{8}$$

Sp is a part of personal disposable income (*Yd*) that is saved rather than consumed. Hence,

$$Sp = Yd - C = (Y - T) - C \quad (9)$$

Also,

$$Sg = T - (G + R) = T - G - R \quad (10)$$

Government savings (*Sg*) is defined as the difference between government revenue collected in the form of taxes (*T*) and expenditure in the form of purchases (*G*) and transfers (*R*). Accordingly, equation (8) in an identity form can be written as;

$$S = Sp + Sg = (Y - T - C) + (T - G - R) = I + CA \quad (11)$$

In order to analyse the effects of government saving decision in an open economy, the above identity can be written as,

$$Sp = I + CA - Sg = I + CA - (T - G - R) \quad (12)$$

And, alternatively, it can be said that;

$$CA = Sp - I - (G + R - T) \quad (13)$$

where, $(G + R - T)$ is consolidated public sector deficit.

Based on the macroeconomic identity, two extreme cases are possible. If the difference between private saving and investment is stable over time, the fluctuations in the budget deficit will be fully translated to the current account and hence, the TDH will hold. The second case is REH, which assumes that the change in the budget deficit will be fully offset by change in saving.

Going forward, under the discussion on open economy macroeconomics linkages within a flexible exchange rate system, the relationship of interest rates and

exchange rates in the budget deficit-current account deficit nexus can be explained as follows. The analysis is based on the loanable fund and Mundell–Fleming models (Salvatore, 2006).

Under the loanable funds model, large budget deficits put upward pressure on real interest rates and those high rates make such economy a relatively attractive place in which to invest and thus led to an inflow of foreign capital. In particular, high real interest rates stimulate private domestic savings, discourage private domestic investment, and encourage net capital inflows from abroad. While easing some of the strain on domestic credit markets and helping to finance the budget deficit, the foreign capital flows increases the value of domestic currency relative to the currencies of trading partners. This, in turn, affects the external competitiveness. In other words, the rise in the real exchange rate or real appreciation of the domestic currency results in a gradual increase in the current account deficit or net imports.[3]

Salvatore (2006) argues that Mundell–Fleming model can be used to analyse more explicitly the short-run dynamic relationship between budget and current account deficits for an open economy operating under a flexible exchange rate system. This analysis is based on the IS curve, which shows the various combinations of interest rates and national incomes at which the real goods market is in equilibrium, LM curve, which shows equilibrium in the money market and BP curve, which shows the various combinations of real interest rates and national incomes at which the nation's balance of payments is in equilibrium at a given exchange rate. Under this model, the larger budget deficit is associated with a larger capital inflow and a current account deficit than originally, establishing a direct link between the budget deficit and the current account deficit. Based on these arguments, it is evident that the dynamic progression from budget deficits to higher interest rates, to appreciation of the domestic currency and, finally, to current account deficits are based on sound theoretical analysis (Salvatore, 2006). This is in line with the Keynesian preposition, which leads to testable hypotheses of twin deficits. However, as mentioned in the introduction, counter views, for example, REH argues that there is no impact of budget deficits on current accounts. Based on the empirical context, these contending hypotheses are discussed in the following section.

3 However, although real interest rate is the key linkage between domestic activity and merchandise trade, the connection between interest rates and exchange rates remains controversial and subject to heterogenic empirical evidence (Abell, 1990).

3. Literature Review

This section elaborates on relevant empirical literature, which contends to four testable hypotheses of twin deficits.

The first hypothesis is based on the Keynesian (or conventional) proposition and according to this view, an increase in budget deficit will cause a similar increase in current account deficit. However, due to the differences of countries and the developments of respective economies, the size of effects could be differing. A number of empirical studies support this view.

For example, Harko (2009) estimates the causal link between twin deficits and other macroeconomic variables by using multivariate time series data for Pakistan. The estimates of vector autoregressive (VAR) model demonstrate that causality link of deficits is flowing from budget deficit to prices to interest rate to capital flows to exchange rates and to trade deficit. Evidence also suggests that a reduction in the budget deficits might help to control the level of prices. Chowdhury and Saleh (2008) investigate the twin deficits relationship for Sri Lanka. Their empirical results support the Keynesian view to claim that there is a strong, positive link between the current account deficit, saving-investment balance and budget deficit during the period of 1970–2005. They find that a 1 per cent increase in the saving and investment gap will lead to 0.67 increases in current account deficit, while a 1 per cent increase in budget deficit will increase current account deficit by 0.20 per cent. Beetsma, Giuliodori and Klaassen (2008) explore the effects of public spending shocks for trade balances and budget balances in 14 European Union countries employing an annual panel VAR with exports and imports as separate variables. Their results are consistent with the TDH. Also, a split of their sample into relatively closed and opened economies shows that a public spending shock has a larger effect on output of the former group, while for the latter group, the trade balance exhibits a stronger deterioration. Salvatore (2006) finds strong empirical evidence on a direct relationship between the budget and current account deficits for United States, Japan, Germany, United Kingdom, France, Italy, and Canada. Saleh *et al*. (2005) examine the relationship between budget deficit and current account deficit in Sri Lanka, using the autoregressive distributed lag (ARDL) model and the bounds test for cointegration. They support the Keynesian view and find a strong linkage between the budget deficit and the current account deficit during the period 1970–2003. The empirical analysis shows that the direction of causality is uni-directional running from budget deficit to current account deficit.

The second hypothesis refers to the REH. According to this view, an inter-temporal shift between taxes and budget deficits does not matter for the real interest rate, the quantity of investment or the current account balance. Using monthly data and the bounds testing approach to co-integration, Ratha (2009) finds that the twin-deficits theory holds for India in the short-run. However, it appears that there is no such relation in the long-run and hence, supports the REH. Therefore, it is concluded that the Keynesian view prevails in the short-run, and the neo-classical theory prevails in the long-run. Rahman and Mishra (2001) find that budget and current account deficits have no possibility of reverting to a long run equilibrium relationship in United States during the period 1946–1988. Kustepeli (2001) examines TDH in Turkey for the period 1975–1995 and suggests that there is no evidence for twin deficit relationship. Kaufmann, Scharler and Georg (1999) investigate the twin deficits relationship in Austria using quarterly data. Looking at the impulse responses of the current account to various shocks, they conclude that the reaction can be explained by a reallocation of expenditures over time due to changes in current and expected income and productivity as emphasised in the models in which REH holds. Enders and Lee (1990) investigate the REH for US economy using quarterly data and show some patterns in the recent US data, which appear to be inconsistent with the REH. Rigorous testing of the model, however, does not allow rejecting the independence of the federal government budget and current account deficits. In a study for G7 countries, Godley and Cripps (1983) also find no short run statistical relationship between the two deficits.

The third view is based on the unidirectional causality that runs from current account deficit to budget deficit. Based on this premise, Alkswani (2002) examines the relationship between twin deficits in the Saudi Arabian economy employing annual data and argues that in oil economy, neither the REH nor the Keynesian proposition is valid. The application of the error correction models (ECM) and Johansen co-integration confirms short and long-run relationships among the deficits, but Granger causality test asserts that trade deficit causes budget deficit. Alkswani argues that export revenue impacts government revenue, expenditure and the exports of goods and services and concludes that the two deficits are positively linked, but the direction of causality is from trade deficit to budget deficit. Bartlett (1999) investigates the secular relationship between the twin deficits in the United States and concludes that the relationship between the twin deficits is not consistent overtime. The evidence presented by Bartlett suggests that during the 1980s, the budget deficit and the current account deficit moved together. However, the direction of the relationship between two deficits has changed during the 1990s. Anoruo and Ramchander (1998) investigate the twin deficits relationship for five developing Southeast Asian economies (India, Indonesia, Korea, Malaysia and Philippines) and find trade deficits to cause budget deficits not vice versa. A study by

Biswas, Tribedy and Saunders (1992) reveals a unidirectional causal relation running from structural budget deficits to net exports. However, their findings indicate a bi-directional causal relation between actual budget deficits and net exports. Using quarterly data for eight countries during the period of flexible exchange rates, Kearney and Monadjemi (1990) report that a temporary relationship between the two deficits may be indicated. They also find substantial evidence on reverse causation between the stance of fiscal policy and the current account balance.

The final set of evidence is based on the bi-directional causality between budget deficit and current account deficit. While budget deficit may cause current account deficit, the existence of significant feedback may cause causality between the two variables to run in both directions. Lau and Tang (2009) find that there is a bi-directional causality between budget deficit and current account deficit in Cambodia. Pahlavani and Saleh (2009) investigate the TDH for Philippines and Mukhtar, Zakaria and Ahmde (2007) for Pakistan. Both studies find that there is a bi-directional causality between budget deficit and current account deficit in both economies. Lau and Baharumshah (2006) argue that interest rates, exchange rates and budget deficit play an important role in explaining the current account balance. In a panel data investigation for a set of SEACEN countries, they find a two-way causal relationship between budget and current account deficit and that there exist two channels in which budget deficit affects the current account: directly budget deficits to current account deficits and indirectly via its impact on interest rates, exchange rate and current account deficits. Meanwhile, empirical results of a study by Islam (1998) suggest the presence of bilateral causality between trade deficits and budget deficits. Similarly, Darrat (1988) reports evidence to support the bi-directional causality between the twin deficits with additional variables of monetary base, real output, inflation, labour cost, exchange rate, short- and long-term interest rates and foreign real income. Darrat concludes that there is evidence for budget to trade deficit causality and a stronger evidence for trade to budget deficit causality in the US economy.

In addition to above, some empirical research provides mixed evidence. Grier and Ye (2009) investigate the relationship between the current account balance and government budget balance in the United States and conclude that there is no long-run relationship between the twin deficits. They also estimate a vector auto regression – generalised auto regressive conditional heteroscedasticity (VAR-GARCH) (1,1) model with demeaned current account balance and government budget balance, which allows examining their short-run connection in the presence of conditional heteroscedasticity. Based on both generalised impulse response functions as well as variance decompositions, they find a significantly positive and persistent short-run effect of budget shocks on the current account balance. Hashemzadeh and Wilson (2006) investigate the relationship

between twin deficits for Egypt, Iran, Jordan, Kuwait, Syria and Turkey applying causality test and VAR models. Their findings suggest that the correlation between two deficits is complex and ambiguous and it is subject to change depending on the underlying tax system, trade patterns and barriers, the exchange rate, *etc*. Baharumshah *et al*. (2006) examine the TDH for Indonesia, Malaysia, the Philippines and Thailand and find that the Keynesian reasoning fits well for Thailand since a unidirectional relationship exists that runs from budget deficit to current account deficit. For Indonesia, the reverse causation (current account targeting) is detected while the empirical results indicate that a bi-directional pattern of causality exists for Malaysia and the Philippines. The results of the variance decompositions and impulse response functions suggest that the consequences of large budget and current account deficits become noticeable only overthe long-run. Fidrmuc (2002) examines the twin deficits relationship for a set of OECD, emerging and transition economies in Central and Eastern Europe and finds that the countries which pursue sustainable fiscal policies (*e.g*. Korea, Germany, Estonia, and the Czech Republic) display a high flexibility of the current account. This study shows that twin deficits emerged in the 1980s, however less evidence for twin deficits in the 1990s.Using Granger non-causality approach, Kouassi *et al*. (2002) find evidence for causality (either uni-directional or bi-directional) between twin deficits for some developing countries, but not for many developed countries. Kulkarni and Erickson (2001) investigate the twin deficits relationship in Mexico, India and Pakistan for the period of 1969 – 1997. In the case of Mexico, there is no evidence of twin deficit relationship and causality running in either direction. For India, there is strong evidence for twin deficits. They find that twin deficits exist in Pakistan, but causality runs in an exactly opposite direction. With three country cases showing different evidences, the TDH is not strongly supported. Khalid and Guan (1999) examine the long-term relationship and causality between budget deficit and current account deficit for five developed countries (United States, United Kingdom, France, Canada and Australia) and five developing countries (India, Indonesia, Pakistan, Egypt and Mexico). Their empirical results show that such secular relationship exists in four developing countries, while no developed country exhibits such a relationship. The results on the direction of causality are mixed for developing countries with evidence supporting that the current account deficits cause budget deficits for Indonesia and Pakistan while the reverse is true for Egypt and Mexico. The data does not support any causal relationship for the United Kingdom and Australia and some week evidence of bi-directional causality for Canada and India. In the context of the US, Miller and Russek (1989) find no long-run equilibrium relationship between the twin deficits despite the existence of some causal relationship.

4. Overview of the Developments in Twin Deficits in Sri Lanka

During last five decades, the budget deficit continued to be quite high in Sri Lanka with an average of 8 per cent of GDP. Budget deficit in Sri Lanka peaked at 19.2 per cent of GDP in 1980, and continued to remain above 6 per cent during the subsequent period. Budget deficits and the accompanying current account deficits in 1960s resulted in a rapid depletion of external reserves causing serious foreign exchange problems, which lasted till the introduction of economic reforms in the late 1970s. However, since then, budget deficits continued to exert pressures on the external payments position. After economic reforms in 1977, government's involvement in heavy capital expenditure projects, such as Accelerated Mahaweli Development Programme, power generation and ports development projects impacted to increase the capital expenditure leading to expansions in budget deficits. After completion of these projects, budget deficit declined to around 7.9 per cent of GDP during 1990s (CBSL, 1998). Budget deficit has narrowed down commencing 2002 indicating a favourable trend towards the fiscal consolidation. However, it increased again in 2009 recording 9.9 per cent of GDP, reflecting a reversal of the declining trend. The significant shortfall in the government revenue, overrun in the recurrent expenditure and the increase in public investment over and above the expected level during the year were the main reasons for this increase (CBSL, 2009). However, it dropped again to 7.9 per cent in 2010.

Table 1

Selected Macroeconomic Indicators of Sri Lanka (1960 - 2009)

Averages for Decades

	1960 - 1969	1970 - 1979	1980 – 1989	1990 - 1999	2000 - 2009
Budget Balance (% of GDP)	-6.0	-7.1	-11.3	-7.9	-8.1
Current Account Balance (% of GDP)	-2.8	-2.0	-7.7	-4.8	-3.5
Interest Rate, 91-day Treasury bill Rate (%)	3.1	6.2	13.6	15.9	12.4
Exchange Rate (US dollar/Rupee)	5.0	8.6	25.8	52.3	99.7
GDP Growth (%)	4.7	3.9	4.2	5.2	5.0
Inflation, based on Colombo Consumers' Price Index (%)	2.2	6.9	12.8	11.3	10.8

Source : CBSL

Sri Lankan economy has experienced current account deficits since 1960s and it peaked at 16.4 per cent of GDP in 1980. At the same time, current account surpluses were recorded only in 1965 and 1977 (0.7 per cent and 3.5 per cent of GDP, respectively).

During the 1960s and early 1970s, trade account was continuously in deficit as its exports which concentrated on only three primary agricultural exports and vulnerable to commodity price fluctuations were kept sufficient to meet its import requirement and heavy dependence on essential consumer imports. This coupled with the net outflows on services and transfers, led to continuous deficits in the current account (CBSL, 1998). The current account deficit widened during the open economy phase after 1977. During 1978 – 1985, current account deficit widened to 8.2 per cent of GDP reflecting the increased imports due to high demand with expanding economic activity and funded large infrastructure development projects and export processing zones. Hence, it is noteworthy that a part of the current account deficits in the post-liberalised period was also an outcome of the country's attempt to absorb foreign capital. However, with the expansion of exports and improvements in both the services and transfers accounts as well as completion of large donor funded development projects, the current account deficit declined significantly from high levels of the early 1980s and had remained at single digit levels since then. In recent years, increased worker remittances helped to contain the widening current account deficit and cushion the adverse impact of higher international commodity prices on the current account and exchange rates (CBSL, 2009). By end 2010, current account deficit remained at 2.9 per cent of GDP.

National savings stood at 12 per cent of GDP during 1960s and increased slightly in 1970s except 1974 and 1975. By 2009, national savings stood at 23.7 per cent of GDP.

5. Data and Methodology

5.1 Data

As already mentioned, this study attempts to explore the TDH for Sri Lanka using annual and quarterly data. We use annual data for the period 1960 to 2009, however quarterly data series only spans for the period 1990:Q1 to 2009:Q4 due to limited data availability. Data were obtained from annual reports and other various publications of the Central Bank of Sri Lanka (CBSL). [Due to the difficulty of obtaining a long series of data, quarterly budget deficit data used in this study was constructed using the treasury format

(accounting classification) instead of economic classification, which is used by the CBSL for its analytical purposes].[4]

Variables used in the empirical analysis, are defined in the following manner.

- CA = Current account deficit defined as net exports of goods and services plus net factor income
- BD = Budget deficit defined as the difference between government revenue and government expenditure
- EXR = Exchange rate expressed in terms of Sri Lankan rupees per US dollar
- INR = Interest rate represented by 91-days Treasury bill rate

Budget deficit and current account deficit are measured as a percentage of GDP and exchanges rate was in period average.[5]

Descriptive statistics of data are given in Table 2. It clearly indicates persistently high budget and current account deficits throughout the post-independent economic history of Sri Lanka.

Table 2
Descriptive Statistics

	Annual Data (1960 - 2009)				Quarterly Data (1990:Q1 - 2009:Q4)			
	CA	**BD**	**EXR**	**INR**	**CA**	**BD**	**EXR**	**INR**
Mean	-4.2	-8.1	38.3	10.2	-3.7	-8.2	76.0	13.8
Median	-3.5	-7.2	26.3	10.0	-3.7	-8.2	72.3	13.2
Maximum	3.5	-3.3	114.9	21.3	8.6	0.0	116.4	21.3
Minimum	-16.4	-19.2	4.8	2.6	-14.7	-18.2	40.0	7.0
Std. Dev.	3.4	2.8	36.0	5.7	3.9	3.1	26.0	3.9
No. of observations	50	50	50	50	80	80	80	80

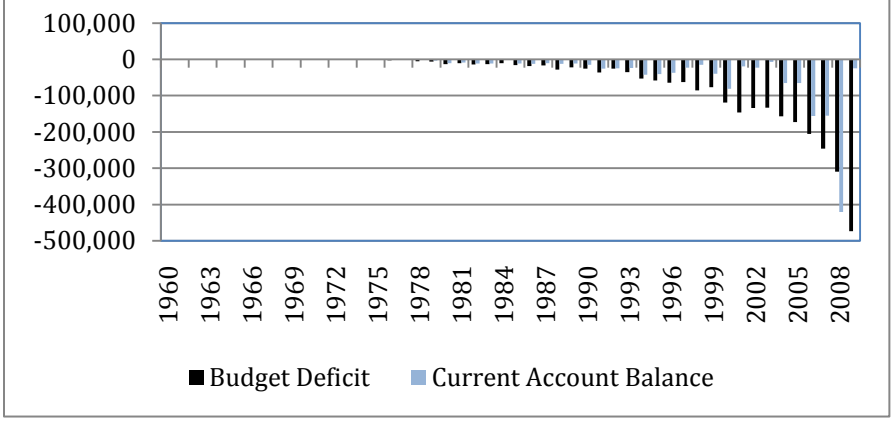
Prior to conducting the formal econometric analysis, we present the graphical presentation of two key variables in our analysis, *i.e.* budget deficit (BD) and current account balance (CA). Based on annual data, Figure 1 and 2 indicate that both BD and

4 Figures in the accounting classification (treasury format) are on gross basis while figures in the economic classification are on net basis. When calculating the budget deficit in according to the treasury format, total receipts of the government and total outlays (including debt repayments) are considered. However, according to the economic classification, only net receipt of the government is considered and debt repayments are not included in expenditure.

5 Salvatore (2006) suggests concentrating on the ratio of deficits to GDP, rather than on the absolute levels.

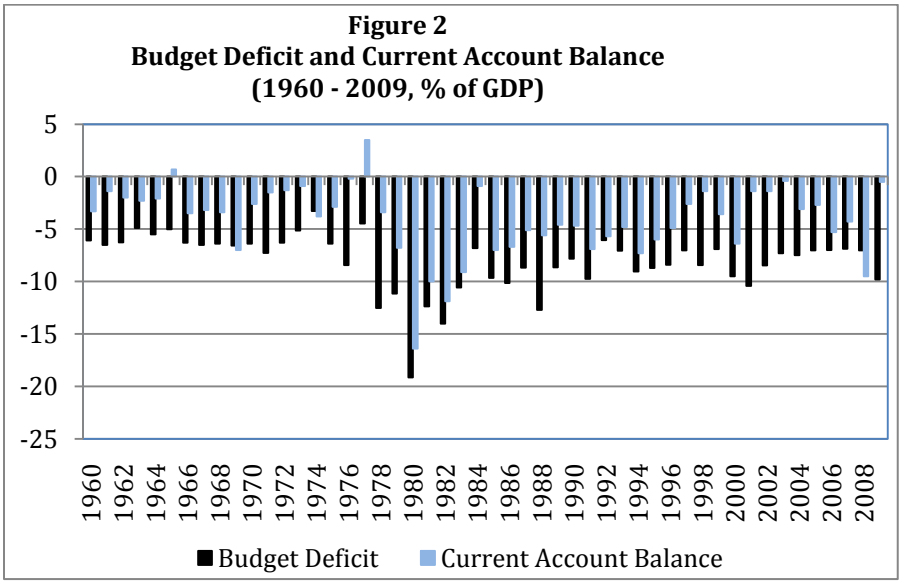
CA exhibit a co-movement over the sample period. For example, in Figure 2, when budget deficit peaks in 1980, current account also follows the similar trend.

Figure 1
Budget Deficit and Current Account Balance
(1960 - 2009, Rs. Mn)



Source: CBSL

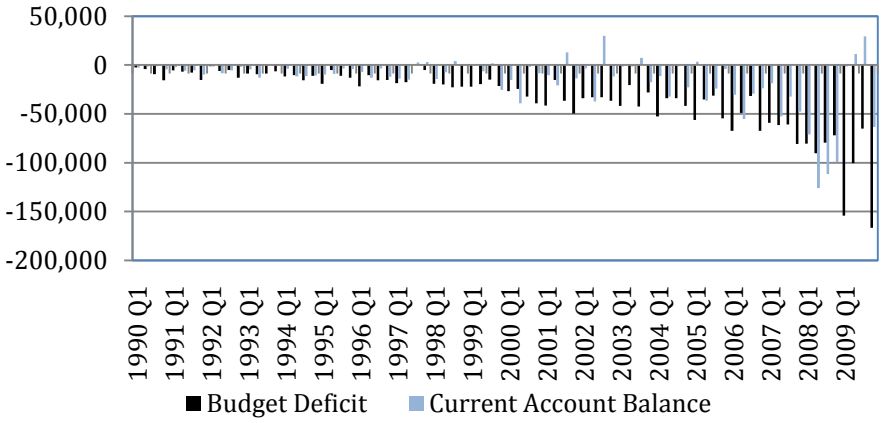
Figure 2
Budget Deficit and Current Account Balance
(1960 - 2009, % of GDP)



Source: CBSL

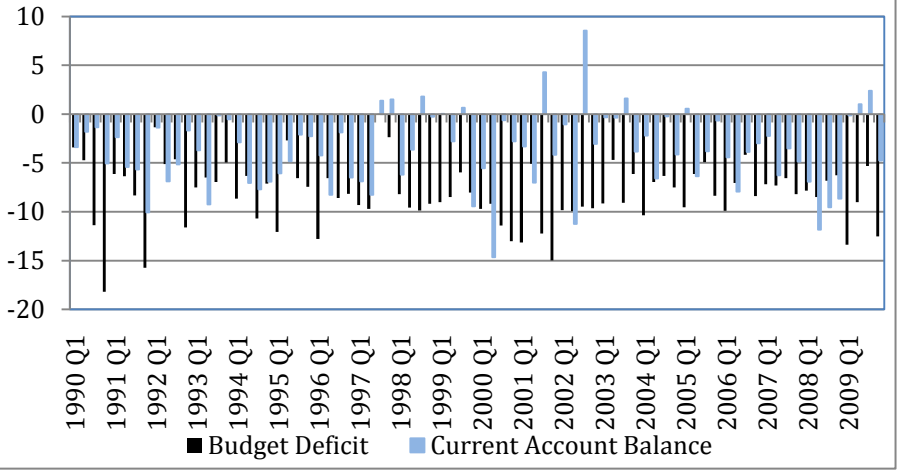
Similarly, based on quarterly data, Figure 3 and 4 indicate that both *BD* and *CA* share a common trend indicating a possible long-run relationship between two deficits.

Figure 3
Budget Deficit and Current Account Balance
(1990:Q1- 2009:Q4, Rs. Mn)



Source: CBSL

Figure 4
Budget Deficit and Current Account Balance
(1990:Q1- 2009:Q4, % of GDP)



Source: CBSL

In addition to these simple graphical illustrations, correlation analysis is often introduced either to support or against the relationship between budget and the current account balances (Salvatore, 2006).

Table 3 shows simple correlations between the current account and the budget account balances (both expressed as a percentage of GDP), un-lagged and lagged by 1–3 years, as well as leading by 1–3 years the current account.

Table 3
Correlation between Budget and Current Account Deficits

Period	Annual Data	Quarterly Data
t-3	0.70	0.06
t-2	0.43	-0.10
t-1	0.29	-0.04
t	0.05	0.05
t+1	0.48	0.04
t+2	0.49	-0.08
t+3	0.35	-0.11

The correlations based on annual data in Table 3 strongly support the theory that budget balances are directly related to current account balances, *i.e.*, budget deficits are positively related and lead current account deficits, and budget surpluses are associated with and lead current account surpluses. Although, the relationship is not strong for quarterly data, there still remains a positive correlation between budget deficits and current account deficits for the periods *t*-3, *t* and *t*+1. Hence, the general conclusion that can be reached by these simple correlations is that the theory that budget deficits lead to current account deficits seem to hold.

In order to confirm or reject the TDH for Sri Lankan context, it is required to pursue a formal empirical investigation based on time series econometric techniques, which involve several diagnostic tests and modelling approaches.

5.2 Methodology

By following the previous empirical literature (for example: Miller and Russek, 1989; Rahman and Mishra, 2001; Leachman and Francis, 2002; Baharumshah and Lau, 2007 and Harko, 2009 among others), we mainly employ the co-integration method to examine twin deficits in Sri Lanka. The main advantage of this test method is that it performs well even when the time series are non-stationary, and hence, in line with state of the art methodology. If a pair of time series is co-integrated, then there must be Granger causality at least one direction reflecting the direction of influence between two series (Granger, 1969 and 1981). Hence, in addition to co-integration analysis, by following Abell (1990); Normandin (1999); Hatemi-J and Shukur (2002); Mukhtar *et al*. (2007), *etc*., we employ Granger causality tests to further examine the direction of influence between budget deficits and current account deficits.

The following section briefly explains the methodology.[6]

a. Testing for Stationarity

The examination of stationarity property in a time series is closely related to testing for unit roots. Generally, most of the economic time series are non-stationary (mean and variance are not constants) and integrated. If a non-stationary time series (X) needs to be differenced (d) times until reaching stationarity, then the time series is said to be integrated of order (d) denoted by $X_t \sim I(d)$. Hence, to avoid the problem of spurious regression and the failure to account for the appropriate dynamic specification, this study, first, performs unit roots tests on the variables. In this study, we use the Augmented Dickey – Fuller (ADF) to test for the stationary proeperty of the time series.

b. Testing for Long Run Relationships

The finding that the time series may contain a unit root guides us to use the non-stationary time series analysis. Engle and Granger (1987) pointed out that a linear combination of two or more non-stationary series may be stationary. If such a stationary linear combination exists, the non-stationary time series are said to be

6 Different econometric techniques used in this study are extensively used in contemporary empirical discourse. Hence, we do not intend to provide detailed mathematical explanations on such techniques in order to preserve space. However, required references are given as and when necessary for the benefit of researchers who would like to explore them extensively.

co-integrated. The stationary linear combination is called the co-integrating equation and may be interpreted as a long-run equilibrium relationship among the variables. In summary, if two or more series are themselves non-stationary, but a linear combination of them is stationary, then the series are said to be co-integrated.

In this study, we use two approaches, *i.e.*, residual based method and Johansen's method, which are widely used methods for modeling cointegrated relationships.

i. Engle-Granger Co-integration

The Engle-Granger (1987) residual-based tests for cointegration is simply unit root tests applied to the residuals obtained from static ordinary least squares (SOLS) estimation of the follwoing equation:

$$Y_t = X_t'\beta + D_t'\gamma_1 + u_{1t} \tag{14}$$

Under the assumption that the series are not cointegrated, all linear combinations of (Y_t , X_t'), including the residuals from SOLS, are unit root nonstationary. Therefore, a testof the null hypothesis of no cointegration against the alternative of cointegration corresponds to a unit root test of the null of nonstationarity against the alternative of stationarity. The Engle-Granger test uses a parametric, ADF approach. We consider the two standard ADF test statistics, one based on the t-statistic for testing the null hypothesis of nonstationarity ($\rho = 1$) and the other based directly on the normalised autocorrelation coefficient ($\hat{\rho} = 1$).

ii. Johansen Method for Co-integration:

The maximum likelihood procedure (Johansen's test), suggested by Johansen (1988 and 1991) and Johansen and Juselius (1990), is particularly preferable when the number of variables in the model exceeds two due to the possibility of existence of multiple co-integrating vectors.

To determine the number of co-intergrating vectors, Johansen (1988 and 1991) and Johansen and Juselius (1990) suggest two statistic tests. The first one is the trace test (λ_{trace}). It tests the null hypothesis, which says that the number of distinct co-integrating vectors is less than or equal to (q), against a general unrestricted alternative ($q = r$). The trace statistic tests the null hypothesis of r co-integrating relations against the alternative of k cointegrating relations, where k is the number of endogenous variables, for $r = 0,1,...k–1$. The alternative k of cointegrating

relations corresponds to the case where none of the series has a unit root and a stationary VAR maybe specified in terms of the levels of all of the series. This statistic is specified as follows:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{p} ln(1-\lambda_i) \quad (14)$$

where $\lambda_{r+1} \ldots . \lambda_n$ are the smallest value eigenvectors (p-r).

The second statistical test is the maximal eigenvalue test (λ_{max}) that is calculated according the following formula:

$$\lambda_{max}(r, r+1) = -T\, ln(1+\lambda_{r+1}) \quad (15)$$

This concerns a test of the null hypothesis of r cointegrating relations against the alternative of $r + 1$ cointegrating relations.

c. Testing for Directions of Causality:

In the case of time series data, tests on the causality of variables and their directions have become important and meaningful exercises. Granger (1969) and Sims (1972) developed an operational framework of systematic testing and determination of causal direction. The approach is based on the axiom that the past and present may cause the future but the future cannot cause the past (Granger, 1980).

Accordingly, Granger causality test examines whether the contemporary movements of a variable Y can be merely explained by the past values of Y, or adding lagged values of another variable X, that can improve the explanation of Y. Hence, Y is said to be Granger-caused by X, if X helps in predicting Y, or equivalently, if coefficients on lagged X's are statistically significant.

Granger causality between X and Y are said to be:

$$Y_t = \sum_{i=1}^{n} \alpha_i X_{t-i} + \sum_{j=1}^{n} \beta_j Y_{t-j} + u_{1t} \quad (16)$$

$$X_t = \sum_{i=1}^{n} \lambda_i X_{t-i} + \sum_{j=1}^{n} \delta_j Y_{t-j} + u_{2t} \quad (17)$$

Where u_{1t} and u_{2t} are serially uncorrelated random disturbances with zero mean. If X Granger causes Y ;

$H_0 : \alpha_1 = \alpha_2 = \alpha_3 = \cdots \alpha_m = 0$ is rejected against the alternative, H_1: not H_0.

Similarly, If Y Granger causes X ;

$H_0^* : \delta_1 = \delta_2 = \delta_3 = \cdots \delta_m = 0$ is rejected against the alternative, H_1^*: not H_0^*.

6. Empirical Results and Discussion

Prior to the empirical analysis, we examine stationary properties of both annual and quarterly data by conducting unit root tests.

Table 4 presents t values obtained from ADF tests for both levels and first differences. The calculated t values pertaining to levels are greater than 5 per cent critical value; hence do not reject the null hypothesis of non-stationarity. In other words, variables in the system are non-stationary. Results however prove that the hypotheses of unit roots can be rejected, when the variables are in first differences. In other words, since the t values of first differenced data variables are less than 5 per cent critical value, we reject the null hypothesis of non-stationarity or say that variables in their first differences are stationary time series. Therefore, variables in the system for TDH are integrated of order (I).

Table 4
Augmented Dickey-Fuller Test on the Levels and First Differences of Variables (Annual and Quarterly Data)

Variable	Level	First Difference	Critical Values for Rejection of Hypothesis of a Unit Root at 5%	Decision	Order of Integration
Annual Data					
Current Account Deficit (CA)	-1.1997	-5.4717	-2.9238	Stationary at First Difference	I(1)
Budget Deficit (BD)	-2.3217	-5.5812	-2.9238	Stationary at First Difference	I(1)
Exchange Rate (EXR)	2.8423	-2.9845	-2.9238	Stationary at First Difference	I(1)
Interest Rate (INR)	-2.2465	-4.9264	-2.9238	Stationary at First Difference	I(1)
Quarterly Data					
Current Account Deficit (CA)	-0.2126	-11.2712	-2.8991	Stationary at First Difference	I(1)
Budget Deficit (BD)	-2.6125	-10.1019	-2.8991	Stationary at First Difference	I(1)
Exchange Rate (EXR)	-0.2083	-5.6891	-2.8991	Stationary at First Difference	I(1)
Interest Rate (INR)	-2.2413	-6.0477	-2.8991	Stationary at First Difference	I(1)

The observation that variables have the same order of integratedness implies that variables move together overtime and hence, there exists a long-run relationship known as co-integration. Next, we test co-integration between variables, which would help to identify any equilibrium relationship between variables in the system. Based on the Engle-Granger method, results of regression equation and ADF test for residuals are summarised in Table 5 and 6, respectively, for both annual and quarterly data (estimate outputs obtained using the Eviews 7.0 software are given in Annexure 1).

Table 5
Engle-Granger Cointegration Test (Annual and Quarterly Data)

Statistic	Value	Probability
Annual Data		
Engle-Granger tau-statistic	-5.892293	0.0033
Engle-Granger z-statistic	-41.83803	0.0021
Quarterly Data		
Engle-Granger tau-statistic	-10.93685	0.0000
Engle-Granger z-statistic	-95.7525	0.0000

Source: Model Estimates

As to the tests themselves, the Engle-Granger tau-statistic (t-statistic) and normalised autocorrelation coefficient (z-statistic) both reject the null hypothesis of no co-integration (unit root in the residuals) at the 5 per cent level. In addition, the tau-statistic rejects at a 5 per cent significance level. On balance, the evidence clearly suggests that variables in the system are co-integrated.

Table 6
ADF Test for Residuals (Annual and Quarterly Data)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Annual Data				
RESID(-1)	-0.853837	0.144907	-5.892293	0.00000
Quarterly Data				
RESID(-1)	-1.212057	0.110823	-10.93685	0.00000

Source: Model Estimates

The bottom section of the output of the Engle-Granger test results depicts the results for the actual ADF test equation and are summarised in Table 6. It confirms that

the residual of the system is stationary at levels that are integrated of order zero. This validates our proposition that variables in the system are co-integrated indicating long-run relationship between them.

Next, we test for long run co-movement of the variables in the system using the Johansen procedure. Tests results for the system based on annual data are summarised in Table 7 (Detailed model outputs for Johansen tests are given in Annex II).

Table 7
Johansen Cointegration Test (Annual Data: BD, CA, INR, EXR)

Unrestricted Cointegration Rank Test (Trace)		
Hypothesized No. of Cointegrated Equations	**Trace Statistic**	**Critical Value (5%)**
r=0	52.99382	47.85613
r<=1	25.53198	29.79707
r<=2	10.28424	15.49471
r<=3	0.753067	3.841466
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)		
Hypothesized No. of Cointegrated Equations	**Max-Eigen Statistic**	**Critical Value (5%)**
r=0	27.46183	27.58434
r<=1	15.24774	21.13162
r<=2	9.531174	14.26460
r<=3	0.753067	3.841466

Source: Model Estimates

The determination of the number of co-integrating vector is based on the use of two likelihood ratio (*LR*) test statistics: the trace test and maximum eigenvalue test. As for Table 7, based on annual data for *BD, CA, INR* and *EXR*, trace test indicates 1 co-integrating equation at the 0.05 level. However, max eigenvalue test indicates no co-integration at the 0.05 level. This indicates that there is no significant long run co-movement between all four variables in the system.

Given the possibility of interest rates and exchange rates having a significant impact for this outcome, we re-estimate the model only for *BD* and *CA*, and summarised results are presented in Table 8.[7]

Table 8
Johansen Cointegration Test (Annual Data: BD, CA)

Unrestricted Cointegration Rank Test (Trace)		
Hypothesized No. of Cointegrated Equations	**Trace Statistic**	**Critical Value (5%)**
r = 0	24.95177	15.49471
r <= 1	6.045954	3.841466
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)		
Hypothesized No. of Cointegrated Equations	**Max-Eigen Statistic**	**Critical Value (5%)**
r = 0	18.90581	14.26460
r <= 1	6.045954	3.841466

Source: Model Estimates

According to Table 8, both trace statistic and max eigenvalue tests confirm that the system includes co-integrating equations since the hypothesis of no co-integrating vector ($r = 0$) is soundly rejected at 5 per cent level, however when including only budget deficit and current account balance. This indicates that financial variables, *i.e.*, interest rates and exchange rates are not significant in explaining TDH for Sri Lanka when using annual data.

In order to affirm the existence of the TDH, we estimate the model for quarterly data using the Johansen procedure. Tests results based on quarterly data are summarised in Table 9.

7 We examined co-integration between pairs of variables. Although a failed co-integration was detected for budget deficits and interest rates, significant co-integrating relationships were observed among other variables.

Table 9
Johansen Cointegration Test (Quarterly Data: BD, CA, INR, EXR)

Unrestricted Cointegration Rank Test (Trace)		
Hypothesized No. of Cointegrated Equations	**Trace Statistic**	**Critical Value (5%)**
r = 0	95.08632	63.87610
r <= 1	49.98470	42.91525
r <= 2	11.72829	25.87211
r <= 3	4.123906	12.51798
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)		
Hypothesized No. of Cointegrated Equations	**Max-Eigen Statistic**	**Critical Value (5%)**
r = 0	45.10162	32.11832
r <= 1	38.25641	25.82321
r <= 2	7.604380	19.38704
r <= 3	4.123906	12.51798

Source: Model Estimates

According to Table 9, both trace and max eigenvalue test statistics are higher than the critical value. Accordingly, the LR statistics confirm that all four variables in the system are co-integrated indicting long run co-movements between them supporting the prevalence of TDH for Sri Lanka. With compared to annual data, high frequency quarterly data, which captures dynamics in the economy, strongly suggest that there is a long-run relationship between budget and current account deficits. Also, simultaneous inclusion of both interest rate and exchange rate, *i.e.*, financial variables confirm that they are significant variables in explaining TDH for Sri Lanka, however, with regard to quarterly data.

It is argued that transmission of twin deficits vary across exchange rate regimes (Leachman and Francis 2002). For example, Miller and Russek (1989) observe that twin deficits have no long-run relationship under flexible exchange rates. Similarly, Leachman and Francis (2002) find evidence to argue that in a floating exchange rate regime, neither of twin deficits is co-integrated or multi co-integrated. Therefore, although results are not reported, we estimated separate models using sub-sampled quarterly data for different regimes of exchanges rates (two samples for 1990-2001 and 2001-2009) in order to isolate the impact of exchange rate regimes on twin deficits. However, we detect

significant co-integrating relationships between budget deficits and twin deficits irrespective the exchange rate system.[8]

Although cointegration methods confirm the existence of a long-run equilibrium relationship between budget deficit and current account deficit, such methods do not explain which of the two deficits cause the other. Granger causality test provides evidence to determine the direction of causality between the two deficits.

Table 10 presents results for hypotheses whether budget deficit Granger causes current account deficit, current account deficit Granger causes budget deficit, causality runs in both directions or both are independent (Detailed outputs are given in Annex III).

Table 10
Granger Causality Test (Annual and Quarterly Data)

Null Hypothesis	F-Statistic	Probability	Decision
Annual Data			
No causality from budget deficits to current account deficits	4.13706	0.02270	Rejected
No causality from current account deficits to budget deficits	1.36973	0.26500	Not Rejected
Quarterly Data			
No causality from budget deficits to current account deficits	0.37879	0.03600	Rejected
No causality from current account deficits to budget deficits	0.42041	0.65840	Not Rejected

Source: Model Estimates

Granger causality results show that the hypothesis that budget deficit does not Granger cause current account deficit is rejected supporting the conventional hypothesis of *TDH*. Hence, results in Table 10 indicate that in the short run, budget deficit is causing the current account deficit. At the same time, we do not observe any reverse causation that can be used to support the Ricardian view. Moreover, based on annual data, we do not observe any causality running from budget deficits to interest rates, interest rates to exchange and exchange rates to current account deficits. However, Granger causality tests for quarterly data confirm that exchange rates have a significant unidirectional impact on current account deficits providing evidence for the channel of twin deficits and also strengthening the argument for holding the twin deficits in Sri Lanka.

8 Results for sub-sample analysis are available from the authors upon request.

Overall, it is observed that there exists a long-run relationship between budget deficits and current account deficits and hence, such relationship confirms that current account balance in Sri Lanka is highly dependent on budget deficit. Hence, it can be concluded that *TDH* holds for Sri Lanka.

7. Conclusion

Fiscal imbalances are frequently associated with economic disruptions, and hence, the discussion on fiscal issues deserves more attention. Given the specific importance of discussing the issues in regards to fiscal deficits, the purpose of this study is to examine twin deficits, particularly in the context of emerging country setting. As such, in this study, main objectives were to summarise theoretical arguments of twin deficits, review the existing literature, and examine the twin deficit phenomenon based on empirical evidence using data for Sri Lankan economy.

To achieve our objective, we estimate empirical models based on time series data for budget deficits, current account deficits, interest rates and exchange rates. The study also focuses investigating the direction of causality between the budget deficits and the current account deficits. Empirical analysis confirms that time series were integrated of order one and co-integrated indicating long-run equilibrium relationships between these two deficits. It also affirms the direction of causality running from budget deficits to current account deficits. This study also reveals that these deficits are co-integrated with key financial variables suggesting that there exists an underlying equilibrium relationship binding these key macroeconomic variables. In this context, our study supports the existence of twin deficit relationship in Sri Lanka. Hence, it is implied that budget cuts, or in other words, fiscal tightening, would tend to correct the current account deficits. As Khalid and Teo (1999) argue, many economists have argued that the way to reduce chronic current account deficits is to raise national saving by reducing the budget deficit and increasing the rate of private saving. The unidirectional causal relation running from the budget deficit to current account deficit suggests that there is a possibility of relying on curtailing budget deficits in an attempt to trim down current account deficits. To that end, one may argue that fiscal deficit may be treated as a fully controlled policy variable (Biswas *et al*., 1992).

On the policy front, these results draw several implications. First, as there exists a unidirectional impact from budget deficit to the current account balance, which causes pressures on the stability of exchange rates, Sri Lankan authorities would require

pursuing policies towards fiscal consolidation in order to reduce high budget deficits on a sustainable basis. In particular, increasing budget deficits does not allow to exchange rate to depreciate to maintain the competitive power. To that end, as Abell (1990) argues, to reduce the pressure on current account deficits, authorities would need to reduce budget deficits on a sustainable basis. However, more caution needs to be examined in this regards. As Biswas *et al*. (1992) argue if productivity growth is not improved, cutting fiscal deficits to improve current account balance would tend to deteriorate current account balance due to the loss in competitive power and hence, aggravate the contractionary effect of a budget cut.

Being an emerging economy where the growth trajectory heavily depends on increased spending on capital investment while incurring essential recurrent expenditure, Sri Lanka would need to gear the fiscal discipline focusing to increase revenues. At the same time, it is also required to focus on external financing in accumulating Sri Lanka's capital stock. Second, it is also required to create conducive environment to attract foreign remittances and also foreign investment which would help to generate healthy external balances. As the stability in exchange rates are of paramount important to Sri Lanka, particularly in promoting the exports sector, minimising external imbalances through creating surpluses in current account is critical. Third, as a whole, Sri Lankan authorities would need to pursue policies for further reforms in external, fiscal and financial sectors, which would enable such sectors to perform without creating adverse imbalances.

We are aware that findings reported in the previous literature as well as empirical evidence in this study are not conclusive as the relationship between twin deficits is complex and ambiguous. Particularly, we emphasise that the relationships between the two deficits is subject to evolve depending on dynamics of the economy and due to the impact of various macroeconomic developments. To that end, use of alternative specifications and methods such as use of vector auto regressive models and impulse response functions (for example: Abell, 1990; Anoruo and Ramchandar, 1998), incorporating structural breaks (for example: Hatemi-J and Shukur, 2002; Baharumshah and Lau, 2007), estimating Granger non-causality tests (for example: Kouassi *et al*., 2004; Pahlavani and Saleh, 2009), multi-integration models (Leachman and Francis, 2002) and co-integration models with regime shifts (for example: Daly and Siddiki, 2009) would help to deepen our understanding of twin deficits and hence, to formulate appropriate macroeconomic policies in Sri Lanka. Such complex specifications as well as general equilibrium model based research is left for future discourse.

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Annex I: Engle Granger Cointegration Tests

Annual Data

Cointegration Test - Engle-Granger
Date: 02/20/11 Time: 15:46
Equation: EQ01
Specification: CA BD INR EXR C @TREND
Cointegrating equation deterministics: C @TREND
Null hypothesis: Series are not cointegrated
Automatic lag specification (lag=0 based on Schwarz Info Criterion, maxlag=10)

	Value	Prob.*
Engle-Granger tau-statistic	-5.892293	0.0033
Engle-Granger z-statistic	-41.83803	0.0021

*MacKinnon (1996) p-values.

Intermediate Results:	
Rho - 1	-0.853837
Rho S.E.	0.144907
Residual variance	5.000960
Long-run residual variance	5.000960
Number of lags	0
Number of observations	49
Number of stochastic trends**	4

**Number of stochastic trends in asymptotic distribution.

Engle-Granger Test Equation:
Dependent Variable: D(RESID)
Method: Least Squares
Date: 02/20/11 Time: 15:46
Sample (adjusted): 1961 2009
Included observations: 49 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-0.853837	0.144907	-5.892293	0.0000

R-squared	0.419452	Mean dependent var	0.062805
Adjusted R-squared	0.419452	S.D. dependent var	2.934996
S.E. of regression	2.236283	Akaike info criterion	4.467704
Sum squared resid	240.0461	Schwarz criterion	4.506313
Log likelihood	-108.4587	Hannan-Quinn criter.	4.482352
Durbin-Watson stat	1.909815		

Quarterly Data

Cointegration Test - Engle-Granger
Date: 02/20/11 Time: 17:03
Equation: EQ02
Specification: CA_Q BD_Q INR_Q EXR_Q C @TREND
Cointegrating equation deterministics: C @TREND
Null hypothesis: Series are not cointegrated
Automatic lag specification (lag=0 based on Schwarz Info Criterion, maxlag=11)

	Value	Prob.*
Engle-Granger tau-statistic	-10.93685	0.0000
Engle-Granger z-statistic	-95.75250	0.0000

*MacKinnon (1996) p-values.

Intermediate Results:	
Rho - 1	-1.212057
Rho S.E.	0.110823
Residual variance	30.11791
Long-run residual variance	30.11791
Number of lags	0
Number of observations	79
Number of stochastic trends**	4

**Number of stochastic trends in asymptotic distribution.

Engle-Granger Test Equation:
Dependent Variable: D(RESID)
Method: Least Squares
Date: 02/20/11 Time: 17:03
Sample (adjusted): 1990Q2 2009Q4
Included observations: 79 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-1.212057	0.110823	-10.93685	0.0000

R-squared	0.605282	Mean dependent var	-0.045256
Adjusted R-squared	0.605282	S.D. dependent var	8.735118
S.E. of regression	5.487979	Akaike info criterion	6.255575
Sum squared resid	2349.197	Schwarz criterion	6.285568
Log likelihood	-246.0952	Hannan-Quinn criter.	6.267591
Durbin-Watson stat	2.056695		

Annex II: Johansen Cointegration Tests

Annual Data: Budget Deficit, Current Account Balance, Interest Rate and Exchange Rate

Date: 02/20/11 Time: 16:19
Sample (adjusted): 1962 2009
Included observations: 48 after adjustments
Trend assumption: Linear deterministic trend
Series: CA BD INR EXR
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.435673	52.99382	47.85613	0.0152
At most 1	0.272151	25.53198	29.79707	0.1433
At most 2	0.180094	10.28424	15.49471	0.2595
At most 3	0.015566	0.753067	3.841466	0.3855

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.435673	27.46183	27.58434	0.0518
At most 1	0.272151	15.24774	21.13162	0.2719
At most 2	0.180094	9.531174	14.26460	0.2446
At most 3	0.015566	0.753067	3.841466	0.3855

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

CA	BD	INR	EXR
-0.628444	0.520852	-0.112119	0.001163
-0.016876	-0.004876	-0.169473	-0.013955
0.019784	0.472302	0.145281	-0.017453
0.067575	-0.113818	0.164980	-0.034622

Unrestricted Adjustment Coefficients (alpha):

D(CA)	1.717564	-0.780717	-0.458259	-0.005200
D(BD)	0.472634	-0.055740	-0.794445	0.132384
D(INR)	-0.219085	0.997144	-0.491044	-0.252216
D(EXR)	-0.275657	-1.162204	-0.127891	-0.161811

1 Cointegrating Equation(s): Log likelihood -436.1457

Normalized cointegrating coefficients (standard error in parentheses)

CA	BD	INR	EXR
1.000000	-0.828796	0.178407	-0.001850
	(0.13759)	(0.07423)	(0.01143)

Adjustment coefficients (standard error in parentheses)

D(CA)	-1.079392
	(0.26072)
D(BD)	-0.297024
	(0.21534)
D(INR)	0.137682
	(0.29318)
D(EXR)	0.173235
	(0.25351)

2 Cointegrating Equation(s): Log likelihood -428.5218

Normalized cointegrating coefficients (standard error in parentheses)

CA	BD	INR	EXR
1.000000	0.000000	7.492411	0.612692
		(2.57677)	(0.43153)
0.000000	1.000000	8.824850	0.741488
		(3.10953)	(0.52075)

Adjustment coefficients (standard error in parentheses)

D(CA)	-1.066216	0.898403
	(0.24957)	(0.20678)
D(BD)	-0.296083	0.246444
	(0.21535)	(0.17842)
D(INR)	0.120854	-0.118973
	(0.27688)	(0.22940)
D(EXR)	0.192849	-0.137910
	(0.22716)	(0.18821)

3 Cointegrating Equation(s): Log likelihood -423.7562

Normalized cointegrating coefficients (standard error in parentheses)

CA	BD	INR	EXR
1.000000	0.000000	0.000000	-0.069521
			(0.03295)
0.000000	1.000000	0.000000	-0.062049
			(0.02955)
0.000000	0.000000	1.000000	0.091054
			(0.05576)

Adjustment coefficients (standard error in parentheses)

D(CA)	-1.075283	0.681966	-0.126837
	(0.24570)	(0.27467)	(0.09758)
D(BD)	-0.311800	-0.128775	-0.158963
	(0.20118)	(0.22490)	(0.07990)
D(INR)	0.111139	-0.350894	-0.215765
	(0.27289)	(0.30505)	(0.10838)
D(EXR)	0.190318	-0.198313	0.209288
	(0.22693)	(0.25368)	(0.09013)

Annual Data: Budget Deficit and Current Account Balance (excluding interest rate and exchange rates)

Date: 02/20/11 Time: 16:18
Sample (adjusted): 1962 2009
Included observations: 48 after adjustments
Trend assumption: Linear deterministic trend
Series: CA BD
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.325559	24.95177	15.49471	0.0014
At most 1 *	0.118348	6.045954	3.841466	0.0139

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.325559	18.90581	14.26460	0.0086
At most 1 *	0.118348	6.045954	3.841466	0.0139

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

CA	BD
-0.531195	0.474040
-0.032419	0.441781

Unrestricted Adjustment Coefficients (alpha):

D(CA)	1.806563	-0.338051
D(BD)	0.331139	-0.759969

1 Cointegrating Equation(s): Log likelihood -216.0484

Normalized cointegrating coefficients (standard error in parentheses)

CA	BD
1.000000	-0.892404
	(0.16833)

Adjustment coefficients (standard error in parentheses)

D(CA)	-0.959637
	(0.22260)
D(BD)	-0.175899
	(0.18098)

Quarterly Data: Budget Deficit, Current Account Balance, Interest Rate and Exchange Rate

Date: 02/20/11 Time: 17:04
Sample (adjusted): 1990Q4 2009Q4
Included observations: 77 after adjustments
Trend assumption: Linear deterministic trend (restricted)
Series: CA_Q BD_Q INR_Q EXR_Q
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.443304	95.08632	63.87610	0.0000
At most 1 *	0.391548	49.98470	42.91525	0.0085
At most 2	0.094038	11.72829	25.87211	0.8304
At most 3	0.052148	4.123906	12.51798	0.7241

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.443304	45.10162	32.11832	0.0008
At most 1 *	0.391548	38.25641	25.82321	0.0007
At most 2	0.094038	7.604380	19.38704	0.8554
At most 3	0.052148	4.123906	12.51798	0.7241

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

CA_Q	BD_Q	INR_Q	EXR_Q	@TREND(90Q2)
-0.265828	-0.458955	-0.035978	-0.045150	0.062067
-0.309462	0.451756	0.078743	0.088224	-0.077713
0.002534	0.055198	-0.301769	-0.081916	0.070062
0.022726	0.013489	-0.077448	0.215907	-0.253031

Unrestricted Adjustment Coefficients (alpha):

D(CA_Q)	2.749607	3.006112	-0.446280	-0.263968
D(BD_Q)	1.812144	-1.055679	-0.087413	0.306680
D(INR_Q)	0.360915	-0.004453	0.579561	0.091358
D(EXR_Q)	0.135543	-0.326072	0.101399	-0.276368

1 Cointegrating Equation(s): Log likelihood -730.7884

Normalized cointegrating coefficients (standard error in parentheses)

CA_Q	BD_Q	INR_Q	EXR_Q	@TREND(90Q2)
1.000000	1.726513	0.135343	0.169847	-0.233487
	(0.33225)	(0.16517)	(0.12945)	(0.14477)

Adjustment coefficients (standard error in parentheses)

D(CA_Q)	-0.730922
	(0.19493)
D(BD_Q)	-0.481718
	(0.09664)
D(INR_Q)	-0.095941
	(0.06410)
D(EXR_Q)	-0.036031
	(0.04439)

2 Cointegrating Equation(s): Log likelihood -711.6602

Normalized cointegrating coefficients (standard error in parentheses)

CA_Q	BD_Q	INR_Q	EXR_Q	@TREND(90Q2)
1.000000	0.000000	-0.075868	-0.076661	0.029100
		(0.11276)	(0.08364)	(0.09385)
0.000000	1.000000	0.122334	0.142778	-0.152091
		(0.07080)	(0.05252)	(0.05893)

Adjustment coefficients (standard error in parentheses)

D(CA_Q)	-1.661199	0.096082	
	(0.25893)	(0.40874)	
D(BD_Q)	-0.155025	-1.308602	
	(0.13866)	(0.21889)	
D(INR_Q)	-0.094563	-0.167655	
	(0.09837)	(0.15528)	
D(EXR_Q)	0.064876	-0.209513	
	(0.06616)	(0.10444)	

3 Cointegrating Equation(s): Log likelihood -707.8580

Normalized cointegrating coefficients (standard error in parentheses)

CA_Q	BD_Q	INR_Q	EXR_Q	@TREND(90Q2)
1.000000	0.000000	0.000000	-0.054613	0.009813
			(0.08559)	(0.09688)
0.000000	1.000000	0.000000	0.107227	-0.120991
			(0.06170)	(0.06984)
0.000000	0.000000	1.000000	0.290608	-0.254219
			(0.28605)	(0.32377)

Adjustment coefficients (standard error in parentheses)

D(CA_Q)	-1.662330	0.071448	0.272460
	(0.25798)	(0.40873)	(0.19852)
D(BD_Q)	-0.155247	-1.313427	-0.121946
	(0.13860)	(0.21958)	(0.10666)
D(INR_Q)	-0.093094	-0.135664	-0.188229
	(0.09404)	(0.14898)	(0.07236)
D(EXR_Q)	0.065133	-0.203916	-0.061152
	(0.06597)	(0.10452)	(0.05077)

Annex III: Granger Causality Tests

Annual Data

Pairwise Granger Causality Tests
Date: 02/20/11 Time: 16:21
Sample: 1960 2009
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
BD does not Granger Cause CA	48	4.13706	0.0227
CA does not Granger Cause BD		1.36973	0.2650
INR does not Granger Cause CA	48	1.90753	0.1608
CA does not Granger Cause INR		0.09888	0.9061
EXR does not Granger Cause CA	48	0.36402	0.6970
CA does not Granger Cause EXR		0.35904	0.7004
INR does not Granger Cause BD	48	0.22798	0.7971
BD does not Granger Cause INR		0.89836	0.4147
EXR does not Granger Cause BD	48	0.09791	0.9069
BD does not Granger Cause EXR		0.54508	0.5837
EXR does not Granger Cause INR	48	0.10401	0.9014
INR does not Granger Cause EXR		1.80087	0.1774

Quarterly Data

Pairwise Granger Causality Tests
Date: 02/21/11 Time: 15:50
Sample: 1990Q1 2009Q4
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
BD_Q does not Granger Cause CA_Q	78	0.37879	0.0360
CA_Q does not Granger Cause BD_Q		0.42041	0.6584
EXR_Q does not Granger Cause CA_Q	78	3.74480	0.0283
CA_Q does not Granger Cause EXR_Q		0.45063	0.6390
INR_Q does not Granger Cause CA_Q	78	1.38235	0.2575
CA_Q does not Granger Cause INR_Q		1.93382	0.1519
EXR_Q does not Granger Cause BD_Q	78	0.02640	0.9740
BD_Q does not Granger Cause EXR_Q		0.70395	0.4980
INR_Q does not Granger Cause BD_Q	78	1.06949	0.3485
BD_Q does not Granger Cause INR_Q		1.35999	0.2631
INR_Q does not Granger Cause EXR_Q	78	1.27806	0.2847
EXR_Q does not Granger Cause INR_Q		1.26706	0.2878

Economic Impact of Foreign Direct Investment in Sri Lanka

B. H. P. K. Thilakaweera*

Abstract

This paper investigates the long-run relationship and causality between real per capita GDP, foreign direct investment (FDI) and the level of the infrastructure in Sri Lanka over the period 1980 to 2011. Level of the infrastructure has been measured by using a summary measure based on principal component analysis. Analysis shows that there is a long-run relationship between real per capita GDP, foreign direct investment (FDI) and the level of the infrastructure. The empirical results further confirm the unidirectional causality from level of the infrastructure to FDI.

I. Introduction

Foreign Direct Investment (FDI) as a growth stimulus tool has received great attention from developing countries in recent decades. In a closed economy without access to foreign saving, investment is financed from domestic savings. However, in an open economy, investment may be financed through both domestic savings and foreign capital flows, including FDI. Therefore FDI enables host countries to achieve investment levels beyond their capacity to save. Over the last couple of decades, FDI flows have increased significantly and remain the largest form of capital flows into developing countries, far

* *The author would like to thank Dr. D.S Wijesinghe and Dr. M.Z.M. Aazim for their guidance and comments.*

surpassing portfolio investment, foreign loans and other forms of financial assistance[1]. FDI now accounts for more than half of the private capital flows between countries in the world. Therefore the contribution of FDI to economic growth has been studied quite extensively in the recent literature of studies focused on FDI. A preponderance of studies shows that FDI encourages the economic development of a country through both direct and indirect channels (Borensztein et al. 1998, Asafu-Adjaye, 2000, Fan and Dickie 2000).

The positive role of infrastructure in the economic development of a country also has been emphasized in both the theoretical literature and empirical studies (Rioja 2004, Ramiraz and Nazmi 2003, Wang 2002, Kessides 1993, Ford and Poret 1991). Infrastructure facilities contribute to economic development by improving productivity and by providing amenities that enhance the living standards of the society. Therefore, infrastructure is generally believed to be one of the essential factors for economic development, especially roads, telecommunications services, electricity, water supply *etc*.

More recently, a number of studies have suggested a potential role for advanced infrastructure, in particular, in attracting FDI (Reynolds et al. 2004, Yol and Teng 2009). A country's capacity for absorbing FDI depends highly on the infrastructure facilities in terms of physical and regulatory framework available in the economy for foreign investments. Therefore, countries with advanced infrastructure absorb more FDIs than do countries with a relatively low-level infrastructure facilities. According to the World Investment Report 2011, despite the slow recovery from the economic downturn of 2008-09 and uncertainties in developed economies particularly in euro zone, developed countries accounted for 52 per cent of FDI flows in 2011.Although the World Investment Report 2011 highlights the increased participation of MNCs(Multi National Companies) in the infrastructure sector of developing countries, development in regulatory infrastructure and reforms are not inline with those FDI inflows.

Within this global investment environment, the relationships between FDI, infrastructure and economic growth are a subject of debate in this era. Sri Lanka introduced an open market economy with trade and FDI liberalisation in 1977 and became the most open economy in South Asia. Most of the other South Asian countries introduced FDI liberalisation policies after the mid-1980s; therefore, South Asia was not

[1] *www.unedforum.org/policy/economic/fdi.pdf*
www.undp.org/content/dam/undp/library/Poverty Reduction/Inclusive development/Towards Human Resilience/Towards_SustainingMDGProgress_Ch3.pdf

generally a large recipient of FDI. In the 1980s with early liberalisation, Sri Lanka attracted an annual average of US$ 40 million in FDI flows, while large South Asian economies recorded lower FDI flows with respect to the size of their GDP. During this period, the average annual flow of FDI was around US$ 2 million per annum for Bangladesh, US$ 100 million for India and around US$ 90 million for Pakistan (UNCTADstat 2012). The past three decades have witnessed a dramatic increase in foreign capital flows into Sri Lanka. The inflows of FDI increased from US$ 47 million in 1979 to US$ 752 million in 2008[2]. Sri Lanka is trying to offer relatively better infrastructure facilities to foreign investors compared with most of the other South Asian nations, with high public investment in infrastructure sector. Thus, the empirical investigation of the dynamic interactions between FDI, infrastructure and economic growth is important for researchers and policy makers both in Sri Lanka and in other developing countries in order to examine the effectiveness of liberalisation policies on FDI and infrastructure development in enhancing economic prosperity.

The development of a number of theories to explain FDI was led by the growing interest in FDI as a stimulus tool for rapid economic development. These theories explain the reasons for an investor's preferences for some locations, selection of different entry modes or reasons for inward FDI or outward FDI, *etc*. Although most of the FDI theories are focused on determinants of the FDI, impact of FDI on the host economy or infrastructure has been highlighted in some of them. In neoclassical theory, Heckscher–Ohlin (HO) model introduced by the Samualson in 1941 explains the mobility of investment from countries with low marginal productivity of capital to the countries with high marginal productivity of capital (Leamer 1995). Since the underlying assumptions of HO model are based on perfect competition, balanced trade, constant return to scale and full employment, it is inadequate to explain real world phenomena such as FDI flows in imperfect market competition along with the risk and uncertainties. Therefore HO model failed to explain the FDI flows among developed countries and to make distinction between FDI and other investment. Eclectic theory of FDI developed by Dunning (1977) poses two questions: (*i*) Why the local demand is not met by local firms? (*ii*) When a firm wants to expand production, why does it choose FDI? He argued that for investing in a foreign country, three conditions should be satisfied by the firm that invite FDI; first, the firm should have a comparative advantage such as brand named technology, *etc*., second, it should be beneficial to invest rather than sell the rights and third, it should be profitable to use these advantages. Kojima's hypothesis presented in 1973 explains FDI as transferring modes of technology, managerial skills and technology. It classifies FDI into

[2] *http://www.fdi.net/index.cfm?infocntry=179 viewed 02 October 2009*

two types, as trade oriented and anti-trade oriented. The trade-oriented FDI is based on comparative advantages. These FDIs encourage trade in both host and home country while improving welfare, but the second type does not improve trade.

Many researchers have attempted to quantify the impact of FDI inflows on the economic growth of the host country. Most of these highlight the positive impact of FDI on economic growth while more recent studies also prove the same positive impact of FDI on economic growth while emphasising the necessity of the threshold level of other factors, such as infrastructure and institutional frameworks (Borensztein et al. 1998, Jyun-Yi and Chih-Chiang 2008, Alfaro et al. 2001).

Early theoretical works on FDI also include the influence of infrastructure on FDI. Hymer (1970) developed a model highlighting the importance of infrastructure for attracting FDI and ultimately, for the level of economic development. Meanwhile, the impact of infrastructure on economic growth has been investigated by many researchers. Interest in the impact of infrastructure on economic growth was first triggered by a series of papers published by Aschauer (1989). Later, Ford and Poret (1991), Wang (2002) and Kessides (1993) also tested the interaction between infrastructure and economic growth.

Despite the fact that FDI flows have focused on the infrastructure development and the economic development of emerging economies, most empirical studies examine the impact of FDI on the economic growth rather than investigating the interaction between FDI, infrastructure and per capita GDP. Comprehensive analysis should analyse, how FDI impacts on GDP, the impact of the infrastructure on economic growth and the type of relationship that exists between FDI and infrastructure. Therefore this paper is an attempt to combine these three branches of research to fill the lacuna in empirical literature and test the relationship among these 3 variables within a multidimensional framework.

Economists and policy makers have analysed the contribution of FDI and infrastructure separately in accelerating the process of economic growth in developing countries. However, most studies make implicit assumptions that causality runs from FDI and infrastructure to economic growth. Such an assumption precludes the possibilities of reverse causation or a simultaneous relationship between the variables. Therefore, the foremost objective of this study is to investigate the possible links between FDI inflow, economic growth and infrastructure based on a systematic approach such as vector autoregression (VAR), rather than merely operating with a production function equation which explains that growth is driven by the factors such a labour, capital, FDI

etc.(Unidirectional causality). The study seeks to examine whether a stationary long-run relationship exists among FDI inflow, economic growth and infrastructure and causality between those three variables along with the direction of the dynamic interaction between them.

Trends in FDI

During the British Colonial Period from 1815–1948, the UK was the major source of FDI in Sri Lanka. British FDIs focused on the development of infrastructure facilities that were required for their investment in the plantation sector of the country. After achieving independence in 1948, Sri Lanka followed different strategies with changes in government until 1977. FDI flows were negligible as a percentage of GDCF (Gross Domestic Capital Formation) until the late 1970s. The annual average inflow of FDI during the 1970–1977 was only US$ 0.5 million and it was around only 0.2% of GDCF. With the economic policy reforms introduced in 1977, the FDI flows rapidly increased continuously until 1983. The annual average FDI inflows, as a percentage of GDCF, increased to 4.2% in the period 1978–1982.

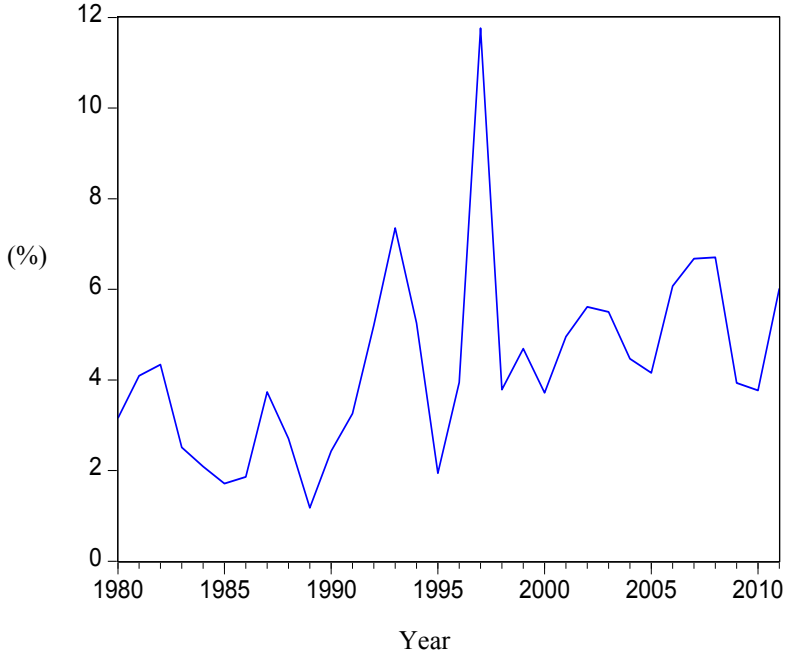
However, the impressive upward trend in FDI flow was disrupted by the escalation of ethnic problems into a civil war in 1983. Sri Lanka lost its investment potential due to the uncertainty created by the civil war. As an example, two electronic manufacturing giants, namely Motorola and the Harris Corporation which obtained BOI approval to establish plants inside the Katunayaka free trade zone in 1982; withdrew their investment projects from Sri Lanka with the uncertainty created by the war(Kelegama 2006).

In addition, the Japanese yen appreciated in value in the mid-1980s and Sri Lanka may have had an opportunity to attract Japanese investment, as had other East Asian economies, if there had been a peaceful environment in the country. Even with the civil war, Sri Lanka was able to maintain the average FDI flow of 3.2% as a percentage of GDCF until the Marxist-armed insurrection started in the southern part of the country in 1988. Due to the conflict in both the northern and southern parts of the country, FDI flows significantly dropped in 1988 and 1989. However, in late 1989 the government managed to crush the rebels in the southern part of the country and armed struggle was again limited to the Northern and Eastern Provinces.

With the second wave of trade and FDI liberalisation in the early 1990s, Sri Lanka attracted significant FDI flows. Privatisation of state-owned enterprises also contributed to attracting significant amounts of FDI between 1990 and 2001. More than

two-thirds of the state-owned enterprises were acquired by foreign investors in 1990s (CBSL 2002). In the 1990s, the largest 20 foreign investors went into telecommunications, power generation, port and other infrastructure development and industrial sectors. More than one-third of the FDI flows in the 1990s came through the privatisation of state-owned enterprises (Athukorala and Jayasuriya 2004).

Figure 1
FDI as a Percentage of GDCF



However in the second half of the 1990s, FDI inflows recorded somewhat of a deceleration due to the external shocks and the political environment in Sri Lanka. The sector was affected by the escalation of violence in the Northern and Eastern Provinces of the country and the consequences of the East Asian currency crisis. Before the recovery from the set-back in the late 1990s, the adverse impact of the 9/11 attack in 2001 was felt in FDI flows. In addition, the LTTE attacked Sri Lanka's only international airport in the same year, and this also badly affected to the FDI flows. Again, a somewhat conducive economic environment was visible in the country after 2002, with the signing of a peace agreement with the LTTE Tamil rebel group. Although the LTTE withdrew

from negotiations and the government decided to crush the rebels in 2005, FDI flows into the sector have shown a steady growth over 2003-2010. In year 2011 country attracted significant inflow of FDI consequent to achieving sustainable peace after the government forces crushed the LTTE rebels in May 2009.

Following this introduction, section II provides Literature Review on Economic Growth and FDI. Further, section III focuses on the model specification, data and methodology used to assess these relationships and the statistical tests applied in this methodological framework. The empirical analysis is presented in section IV and section V concludes the research with the conclusion, policy recommendations and limitations of the study.

II. Literature Review on Economic Growth and FDI

Empirical research in this area falls roughly into two groups. First, there is a plethora of empirical studies that examine the impact of FDI flows on economic growth based on cross-sectional or panel data from groups of countries. Some of the studies have examined other factors, such as domestic investment, trade, financial sector development, *etc*., while assessing the impact of FDI on economic growth. Only the studies focused on finding the determinant of FDI in this category have addressed the relationship between infrastructure and economic growth. Those have incorporated proxy variables, such as telecommunications and road developments to represent infrastructure developments. Second, the relationship between FDI and economic growth has been investigated by many researches focused on one country using time series data. Most of those studies are focused on GDP-FDI nexus, and the role played by the some other variables such as financial sector development and infrastructure development have been taken into consideration.

When considering the econometric methodologies used, previous studies in this area made use of regression models and causality analysis. The neo-classical growth theory defines aggregate growth as a sum of the total factor productivity growth and the weighted sum of the growth rate of factor inputs while incorporating the Hicks-neutral technological change. Therefore, some studies investigate the impact of FDI and infrastructure on economic growth using these aggregate production function models based on both cross-sectional data and time series data. This method implicitly assumes that the selected economic variables (explanatory) cause the growth without formal testing of the direction.

The issue of causality between FDI and some other macro economic variables has been empirically examined in a number of more recent studies. Two approaches based upon bivarite and multivariate models have been used. The general tests for causality within the bivariate models are the Granger test, Sims test and Geweke test. On the other hand, multivariate models of correlation are characterised by examining the variance decompositions functions and impulse response functions.

Among the recent cross sectional studies, Borensztein et al. (1998) examined the effect of FDI on economic growth using seemingly unrelated regressions technique (SUR) in production function framework for 69 developing countries over the period 1970–1989. The results suggested that FDI contribute more to economic growth than domestic investment in the developing countries studied. Further, the transfer of technology is the vehicle for developing the economy through FDI inflows. However, Borensztein et al. mentioned that the contribution of the FDI to the host country's economic growth is highly dependent on the absorptive capability available in the economy to attract new technology into the country. This absorptive capacity is highly correlated with human capital, which was estimated using average educational attainment of the labour force in each country. Although the theoretical models imply that FDI promotes economic growth in the host country, Alfaro et al..(2001) revealed that the efficiency and development of the local financial market in the host country is crucial for a positive impact of FDI on growth. Alfaro et al used OLS and instrumental variable regression to analyse three samples of cross-country data (39-41 countries). The study emphasised that the spillover effects of the FDI are increased with financial infrastructure. The findings of the research team's calibration exercise are: (*i*) the impact of FDI with developed financial infrastructure is twice the impact of FDI when there is poor financial infrastructure, (*ii*) productivity of foreign firms further increases with sound financial infrastructure and (*iii*) other host country conditions such as market structure and human capital levels are also important and have a positive impact on FDI. The causal relationship between foreign direct investments (FDI) and economic growth in developing countries was examined by Zhang (2001a) using data from 11 economies in East Asia and Latin America from 1970 to 1995. A stationarity test and co-integration techniques were used to assess the relationship between FDI and growth. The study found that FDI improved growth in five of the eleven countries. Of these eleven countries, four were Asian. The study indicated that the impact of FDI on growth varied with the economic environment of the host country. When the host country encouraged export-oriented FDI with pro-free trade and pro-education policies, the impact tended to be positive on growth. Besides the study by Borensztein et al. (1998), Jyun-Yi and Chih-Chiang (2008) examined whether the impact of FDI on GDP growth is dependent on

other factors, namely initial GDP, human capital and volume of trade, by using a sample based on 62 countries covering the years 1975 through to 2000. The technique used for the study is the threshold regression technique developed by Caner and Hansen (2004). Initial GDP, human capital and volume of trade are assigned as threshold variables. They found that the impact of FDI on economic growth is positive and significant when the host country has improved human capital and high level of initial GDP. These results are consistent with those of Borensztein et al. (1998). Some researchers have found that the state of infrastructure plays a significant role in attracting FDIs into a country. Some highlight infrastructure facilities such as telecommunications as a determinant of the FDI. For example, Reynolds et al. (2004) examined the empirical relationship between FDI flows and the level of telecommunications infrastructure using data from 212 countries for 1960–1998. While proving the positive relationship between FDI and telecommunications infrastructure, the study revealed that privatisation increases the number of phones per 100 by 1.2, the amount of FDI by 0.52 cents per dollar of GDP. Carkovic and Levine (2005) assessed the relationship between FDI flows and economic development in 72 countries from 1960–1995 using a dynamic panel approach of OLS estimating method into panel data. The results show that the FDI flow is positively related to economic growth, and from the sensitivity analysis it was found that the relationship between FDI and TFP (total factor productivity) is not significant. Further study revealed there is no positive impact on economic growth from portfolio investment.

While Borensztein et al. (1998) highlighted human development levels and Alfaro et al. (2001) emphasised the importance of financial markets, Busse and Groizard (2008) argued that good government regulation is required for FDI to have a positive impact on economic growth of the country. Busse and Groizard studied 89 countries, using the standard growth regression model and instrumental variable regression models. The data were for 1994–2003. The study showed that the tax holidays offered by the host countries are not effective if there is a poor regulatory system in the country. Some recent studies have also suggested that the institutional framework and fewer labour and business regulations are essential to stimulate growth through international trade of host countries (Bolaky and Freund 2004).

Atiken and Harrison (1999) examined the effect of FDI on domestic firms in Venezuela by using a weighted least-square regression model. The study focused on spillover effects of FDI based on data from 4,000 Venezuelan manufacturing plants between 1976 and 1989. The study revealed that foreign participation increased the productivity of firms with less than 50 employees. Although previous research generally revealed the positive impact of FDI on productivity, this study found that the impact on

productivity of the domestic firms was negative. Therefore the net positive impact of the FDI is quite small for the country. However, the results of the study may be biased since foreign firms acquired most of the productive plants and invested in the more productive sectors of the Venezuelan economy. Asafu-Adjaye (2000) investigated the effect of foreign direct investment on Indonesian economic growth by using time-series data for 1970–1996. He used the error-correction regression model along with the Johansen co-integration test. The results suggested that the FDI, gross domestic savings, other private capital flows and human capital jointly influenced economic growth and the impact of FDI is significant. In addition, the education level of the labour force, which was used as a proxy for human capital, and gross domestic saving also contributed to the rate of Indonesian economic growth separately. Fan and Dickie Ruane (2000) studied the contribution of FDI to the growth and stability of Indonesia, Singapore, Thailand, Malaysia and the Philippines during 1987–1997. They used the Cobb-Douglas growth accounting regression models to evaluate the effect of FDI on economic growth. The results of the study showed that FDI has made significant contributions to the economic growth of these five ASEAN economies. The contribution of FDI was estimated at between 4–20% of GDP growth. Further study highlighted that FDI played an important role in averting external shock during the period of financial crisis. Besides the FDI impact of growth on East Asian and Latin American countries, Zhang (2001b) assessed the direct and indirect affect of FDI on the Chinese economy using provincial data for 1992–2004. A panel data set was used to evaluate the impact of FDI. The study indicated that FDI contributed to Chinese economic development directly by promoting exports and improving productivity, and indirectly with spillovers. An important conclusion was that the estimated marginal product of the foreign capital is higher than local capital with higher levels of productivity in foreign firms in China. The dynamics of the relationship between FDI, economic growth and domestic investment were examined by Kim and Seo (2003) by applying VAR models to South Korea. The results revealed that FDI has some positive effect on economic growth; however, its effect seems to be not significant. On the other hand, the economic growth of South Korea was found to have had a statistically significant effect on the FDI flows in to the country. Athukorala and Karunaratne (2004) examined the impact of FDI on the economic development of Sri Lanka using co-integration and a ECM models over the period 1959–2002. The study was based on the FDI-led growth hypothesis. He found that the direction of causality was not towards FDI to GDP growth. Further, the impact of domestic investment and trade liberalisation was found to have a positive effect on GDP growth. Wijeweera and Mounter (2008) examined the causality relationship among five macroeconomic variables, namely wage rate, exchange rate, GDP per capita, external trade, FDI and interest rate for Sri Lanka. The study used VAR techniques. The findings indicate wage rate – as the variables

studied – is the most important determinant of FDI. Despite this, the study emphasised that the other four variables should also be considered for policy formulation.

III. Model Specification and Data Sources

Following framework model is employed to investigate the relationship between real per capita GDP, FDI and the level of the infrastructure.

$$Y\ (GDP) = f\ (INFR,\ FDI)$$

In this analysis, three variables were considered to investigate the relationships among them. The system consists of real per capita GDP of Sri Lanka (GDP), real FDI, and level of infrastructure (INFR). FDI in rupee terms is deflated by GDP deflator to derive real FDI. In some of the time series studies, only one variable is used to measure the financial or physical infrastructure due to limitations in accommodating more variables into the analysis of a small data set. However, this study has used logarithms of total number of fixed telephone lines, no. of Bank Branches, electricity generation and total length of A&B class roads in the country to develop a summary measure by using principal component analysis[3] to quantify the level of infrastructure. This summary measure avoids the problems of multi-collinearity and over-parameterisation as an index of infrastructure level of the country. The sample period uses annual time series data over the period from 1980 to 2011. These annual data were obtained from the UNCTAD database, various issues of Economic and Social Statistics of Sri Lanka and Annual reports published by the Central Bank of Sri Lanka .

Cointegration Relationship

Investigation of the stationarity properties of variables allows researchers to avoid spurious regressions. Therefore it is essential to test the stationary properties of the selected variables. Unit root tests are conducted to test the stationarity properties of the selected variables. The first step in applying the unit root test is to determine the stationary properties of the levels of the time series. If the variable is non-stationary, then it is preferable to carry out the same test including a trend and/or a constant term. However, most of the financial and economic data series are non-stationary at levels and differenced series should be checked as the second step. If the variable achieves the stationary properties when it is differenced once, the variable is termed as integrated of

[3] *Pls.see the Appendix A for calculation of principal components*

order one or I(1). Most financial and economic data series are I(1) and this would imply the presence of stochastic trend in those series. But the higher order differencing is not recommended for empirical analysis due to the loss of information and difficulties in interpretation. The typical unit root tests employed in econometric studies are the Dickey and Fuller test (DF), the Augmented Dickey-Fuller Test (ADF) and the Phillips-Perron (PP) test. The ADF test can be considered as an improved version of the DF test. The ADF test is used to check the stationary properties of the variables considered in this study.

Granger (1981) first introduced the concept of cointegration, referring to the long-run "equilibrium" relationships in economics. Later this concept was supported by Nelson and Plosser (1982) who argued that taking differences of the series until stationarity is achieved, as remedial measure to spurious regression may lead to a loss of information regarding long-run properties. The precise definition of cointegration can be derived from its statistical concepts. The long-run equilibrium relationship between two variables could be presented as follows in the case of a bivariate model:

$$y_t = \gamma_1 + \gamma_2 x_t + \varepsilon_t \text{ ---------- (1)}$$

If y_t and x_t are at equilibrium, then the disequilibrium term $\varepsilon_t = y_t - \gamma_1 - \gamma_2 x_t$ is equal to zero. However, there are many instances when Y is not in its equilibrium relative to X such that the disequilibrium terms will be non-zero. To have real meaning for the equilibrium relationship, the disequilibrium errors observed over time should tend to fluctuate at about zero (Eagle and Granger, 1987). If the equilibrium relationship such as model (1) exists, it would imply that the disequilibrium ε_t is I(0) - *i.e.* and the linear combination of two variables must also be I(0). Therefore, conditions for the existence of a long-run relationship is that the error term or linear combination of two variables is I(0).

Error correction models

One way of solving the spurious problem is to get the difference series of I(1) variables and run a regression model as follows:

$$\Delta y_t = \gamma_1 + \gamma_2 \Delta x_t + \varepsilon_t$$

This model gives us correct estimates of γ_1 and γ_2 parameters and solves the problem of spurious regression. However, the model does not hold true in the long run. In order to solve this problem, error correction models (ECM) are useful:

$$\Delta y_t = a_0 + b_1 \Delta x_t - \pi \hat{\varepsilon}_{t-1} + u_t$$

This ECM model includes both short-run and long-run information. The b_1 is the impact of the changes in x_t on y_t in the short-run. On the other hand, π is the adjustment affect, which shows how much of the disequilibrium has been corrected (Asteriou and Hall 2007).

Johansen's Full information Maximum Likelihood (FIML) approach

Although there are three approaches for testing cointegration, this study uses one approach, namely Johansen's Full Information Maximum Likelihood (FIML) approach. When more than two variables are to be considered, there is a possibility of having more than one cointegration vector. In this situation, the variables in the model might form several equilibrium relationships governing the joint evaluation of all the variables. Therefore Johansen's FIML approach is the best approach relative to other two approaches.The FIML approach provides a good framework for estimating the cointegration relationships in the context of Vector Auto Regressive (VAR) error correction models (Johansen 1988, Johansen and Juselius 1990). There are two methods for determining the number of cointegration vectors and both involve estimation of the matrix π . The tests are based on the rank of the matrix as r and eigenvalues. Johansen and Juselius (1990) provided the critical values for both test statistics.

Causality test for ECM

One good feature of the VAR model is that it allows us to test for directional causality. The causality tests give an indicator about the ability of one variable to predict the other variable. If there are two variables, x_t and y_t, each affect the other with distributed lag, the relationship between these two variables can be captured by using the VAR model. Four possible relationships can be identified in this model; (*a*) x_t causes y_t (*b*) y_t causes x_t (*c*) there is a bidirectional causality, and (*d*) two variables are independent. Granger (1969), as cited in (Asteriou and Hall 2007), developed a test to examine the causality. The test defines causality as follows: a variable y_t is said to be granger cause x_t, if x_t can be predicted with greater accuracy by using past values of the y_t variable rather than by not using such past values, all other terms remain unchanged:

Granger causality test

$$y_t = a_1 + \sum_{i=1}^{n} \beta_i x_{t-i} + \sum_{j=1}^{m} \gamma_j y_{t-j} + \varepsilon_{xt} \text{ ----------(2)}$$

$$x_t = a_2 + \sum_{i=1}^{n} \theta_i x_{t-i} + \sum_{j=1}^{m} \delta_j y_{t-j} + \varepsilon_{yt} \text{ ----------(3)}$$

where it is assumed that both ε_{yt} and ε_{xt} are uncorrelated white-noise error terms.

The steps in the Granger causality test are as follows:

Step 1

Regress y_t on lagged y terms as in equation (4):

$$y_t = a_1 + \sum_{j=1}^{m} \gamma_j y_{t-j} + \varepsilon_{xt} \text{ ---------- (4)}$$

Find the regression sum of square (RSS) and label it as RSS_R.

Step 2

Regress y_t on lagged y terms plus lagged x terms as in equation (5):

$$y_t = a_1 + \sum_{i=1}^{n} \beta_i x_{t-i} + \sum_{j=1}^{m} \gamma_j y_{t-j} + \varepsilon_{xt} \text{ ---------- (5)}$$

Find the regression sum of square (RSS) and label it as RSS_u.

Step 3

Define the null and alternative hypothesis as follows:

$H_0 : \sum_{i=1}^{n} \beta_i = 0$ or x_t does not cause y_t

$H_1 : \sum_{i=1}^{n} \beta_i \neq 0$ or x_t does cause y_t

Step 4

Calculate the test statistics *F* for coefficient restrictions using the standard Wald test as follows:

$$F = \frac{(RSS_R - RSS_U)/m}{RSS_U/(n-k)}$$

Test statistics *F* follows the F^m_{n-k} distribution and $k = m + n + 1$

If the test statistics (F) exceeds the F-critical value corresponding to F-Distribution, reject the null hypothesis and conclude that x_t does cause y_t.

To check the causality in cointegrated variables, the following ECM form of equation can be used:

$$\Delta y_t = a_1 + \alpha_{1i}\sum_{i}^{m}\Delta x_{t-i} + \alpha_{2k}\sum_{k}^{n}\Delta y_{t-k} + \alpha_3 v_{t-1} + \varepsilon_t$$

where $v_{t-1} = y_{t-1} - \alpha x_{t-1} - \alpha_2 z_{t-1}$ is the residual of cointegration equation. The null hypothesis for *x* does not Granger-cause *y*, given *z*, is $H_o : \alpha_1 = \alpha_3 = 0$. This shows that there are two sources of causation for *y*, either through lag terms Δx or through lagged cointegration vector. The hypothesis is tested using the standard F test. As cited in Asteriou and Hall (2007), Granger and Lin (1995) argue that the conventional causality test is not valid for cointegrated variables. Therefore this study used VECM to measure the causality in empirical analysis.

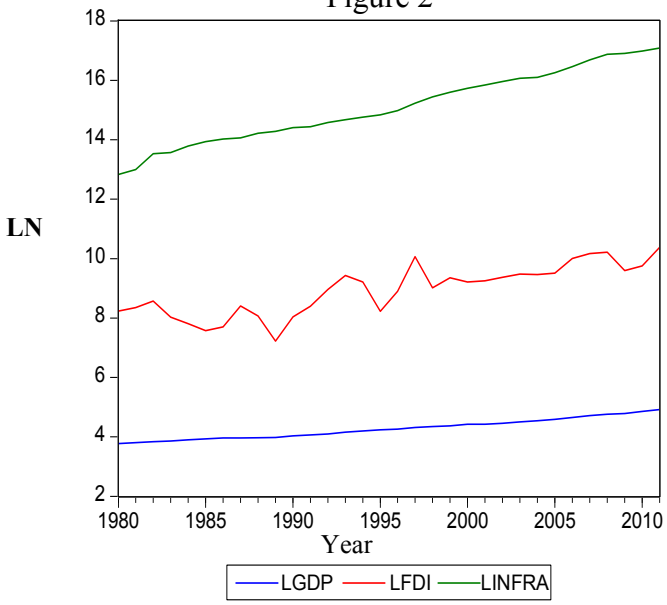
IV. Empirical analysis and findings

The aim of this section is to provide statistical validation of the existence of long-run relationships and causality among the following selected variables, namely FDI, Real GDP per capita and level of infrastructure in Sri Lanka.

The first step involves investigating the stationarity properties of the three variables, FDI, real GDP per capita and level of infrastructure, so as to ensure the variables are I(1) series, which enables the use of cointegration techniques to assess the long-run relationship. Plotting the variable against the year can be considered to be a

preliminary indicator used in analysis of trends in time series data. The plot of logarithms of the three variables in Figure 1 shows that all data series demonstrate an upward trend.

Figure 2



Univariate analysis of each variable was carried out to investigate the stationary properties of the data series. It is required to have I(1) data series for the cointegration test, which can be used to find existence of a cointegration relationship. In order to find the presence of the unit root in each series, this study uses ADF test and the results of the ADF test are given in Table 2 and Table 3.

Table 1: ADF test for unit root on the level series

Variables	*No Constant & No Trend*	*Constant & No Trend*	*Constant & Trend*
LGDP	12.25429	3.080602	-0.111291
LINFRA	7.647764	-1.223449	-3.481143
LFDI	0.978890	-1.404797	-4.248370*

Table 2: ADF test for unit root on the first differenced series

Variables	*No Constant & No Trend*	*Constant & No Trend*	*Constant & Trend*
LGDP	-0.206335	-3.775239**	-4.925005**
LINFRA	-2.436660*	-5.238118**	-2.836852
LFDI	-6.113743**	-6.202526**	-6.170224**

Significant at 5% level* * Significant at 1% level*

Unit root tests for stationarity are performed on both levels and the first difference of the selected variables. The typical three types of models with varying deterministic components have been considered while performing the ADF tests. The results indicate that all three series are stationary in differences. Therefore, we can conclude that the three time series are all integrated of order 1, I(1). Therefore the cointegration test can be performed on this three data series to check the long-run relationship among the variables.

Testing for Cointegration of variables

Selection of appropriate lag length is very important in examining cointegration using Johansen's FIML approach. After inspecting the values of Akaike Information Criteria (AIC) and Schwarz's Bayesian criteria (SBC), as well, as diagnostics concerning autocorrelation, heteroskedasticity, possible ARCH effects and normality in residuals, 4 lags were selected as the optimal lag length for the existence of the cointegration relationship.

Table 3 presents the results of the Johansen's FIML test for the model. According to both the Trace test and Eigenvalue test there is one cointegration relationship existing among the three variables. Both tests do not reject the null hypothesis of number of cointegration relationships (r) = 0 at 5% significant level.

Table 3: Results of Johansen's test for multiple cointegrating vectors

Hypothesised cointegrating H_0	No. of relationships H_1	Test statistics		Critical values (95%)	
		Max. eigenvalue	Trace	Max. eigenvalue	Trace
r=0	r>0	32.95222*	41.02500*	21.13162	29.79707
r=1	r>1	7.588251	8.072776	14.26460	15.49471
r=2	r>2	0.484525	0.484525	3.841466	3.841466

Note: *r indicates the number of cointegrating relationships. The optimal lag structure of the VAR was selected by minimising the AIC criterion. Critical values are taken from Johansen and Juselius (1990).*

** indicates rejection at the 95% critical values.*

Error correction model (ECM) of the following VAR system is used to examine the relationship between variables.

$$\Delta LGDP_t = \alpha_1 + \alpha_{gdp}\hat{\varepsilon}_{t-1} + \sum_{i=1}^{m}\phi_{11}\Delta LGDP_{t-i} + \sum_{i=1}^{m}\phi_{12}\Delta LFDI_{t-i} + \sum_{i=1}^{m}\phi_{13}\Delta LINFRA_{t-i} + u_1$$

$$\Delta LFDI_t = \alpha_2 + \alpha_{fdi}\hat{\varepsilon}_{t-1} + \sum_{i=1}^{m}\phi_{21}\Delta LGDP_{t-i} + \sum_{i=1}^{m}\phi_{22}\Delta LFDI_{t-i} + \sum_{i=1}^{m}\phi_{23}\Delta LINFRA_{t-i} + u_2$$

$$\Delta LINFRA_t = \alpha_3 + \alpha_{Infra}\hat{\varepsilon}_{t-1} + \sum_{i=1}^{m}\phi_{31}\Delta LGDP_{t-i} + \sum_{i=1}^{m}\phi_{32}\Delta LFDI_{t-i} + \sum_{i=1}^{m}\phi_{33}\Delta LINFRA_{t-i} + u_3$$

i = Number of lags

ε_{t-1} = Error Correction terms

u_1, u_2, u_3 = White noise disturbance terms

Since the Trace test and Eignvalue test confirm the existence of a cointegration relationship among variables, the cointegration equation is written in the following form using values of cointegration matrix generated by the E-views.

Cointegration Equation

$LGDP = 0.392944 - 0.013480\ LFDI + 0.264194\ LINFRA$

T-Stat : [0.80774 -24.7217]

According to this cointegration equation, there is a long-run relationship between GDP per capita, FDI inflows and level of infrastructure. Level of infrastructure positively impact on GDP in log-run and impact is significant at 1% level. However the impact of the FDI on GDP per capita is negative but not significant. The diagnostic tests also show the relevancy of normality assumption and absence of significant autocorrelation in the residual.

In the context of development strategy, there is intense interest in the causal connections among the selected variables. According to Engle and Granger (1987), if non-stationary variables are cointegrated then a vector autoregression (VAR) in the first difference is specified incorrectly. Since a cointegration relationships are found between GDP per capita, FDI and infrastructure, an error correction model (ECM) is used to test for causality among these variables. The results in Table 4 provide evidence of a causal relationship between some variables.

Table 4: Causality results based on vector error correction model (VECM)

Dependent variable	Exogeneity Wald Tests X^2-statistics		
	$\Delta LGDP$	$\Delta LFDI$	$\Delta LINFRA$
$\Delta LGDP$		6.043380	0.726763
$\Delta LFDI$	4.030914		10.79784*
$\Delta LINFRA$	6.980598	3.230782	

**Significant at 5% level*
Note: Causality running from columns to rows.

The results revealed a significant impact of level of infrastructure on FDI. Impact of FDI on GDP is also to be expected according to economic theories, but findings do not support the existence of that type of causality. However the analysis shows that the increased in FDI with the improvement in infrastructure. Therefore study

proved the validity of argument that infrastructure impact on the attraction of FDI into host country. Further, causality test results revealed the absence of other causality among three variables selected for this study.

V. Conclusion and Policy Recommendations

The objective of this study was to identify possible long-run relationships and direction of causalities among per capita GDP, FDI inflows and level of infrastructure in Sri Lanka. The study has used inferential analysis based on ECM models to evaluate the relationship between the variables in multidimensional space while considering all the possible dynamic interactions between them.

When the long-run relationship is considered, level of infrastructure has a stronger relationship with GDP per capita since the coefficient of level of infrastructure is statistically significant. According to growth theory, investment plays a key role in the production process of a country and infrastructure which is a part of investment is also an important factor that stimulates economic growth through various channels. Many empirical studies have investigated the long-run relationship between level of infrastructure and GDP and proved the existence of a positive long-run relationship between two variables. On the other hand, study does not show the existence of positive long-run relationship between GDP and FDI based on the data for the same reference period over 1980–2011 as the estimated coefficient is not significant with a negative sign. Sri Lanka liberalised the economy in 1977 and subsequently FDI inflows increased significantly up to 1982. However, the impressive upward trend in FDI flow was disrupted by the escalation of civil unrest in 1983. Sri Lanka lost its investment potential due to the uncertainty created by the civil war. Therefore the lack of a relationship between GDP per capita and FDI may be due to the substantial fluctuation in FDI after year 1982.

The findings with respect to causality indicate that the level of infrastructure of the country plays a key role in attracting FDI into Sri Lanka. Level of infrastructure is a determinant of FDI for MNCs to invest in developing countries. Therefore, causality running from level of infrastructure to FDI is justifiable, particularly in developing countries like Sri Lanka. Since level of infrastructure causes FDI, more attention should be paid to infrastructure development as poor infrastructure would be an impediment to future growth in FDI inflows.

According to the findings, strategies to enhance level of infrastructure of the country should be developed by the policy makers to enhance the economic growth of Sri Lanka. MNCs seeking to invest in infrastructure development also consider the income level of the host country and structure of the income distribution in order to assess the expected return on their investments. The income elasticity of services changes with the improvements in income level. Therefore, improvement in income level of the country in recent years would positively affect to attract the FDI, particularly for infrastructure developments.

In addition, institutional reforms and legislative changes are also included in broad definition of the infrastructure of the country to pave the way for sustainable economic growth. Therefore, it is essential that policies are focused on creating a holistic enabling environment to achieve overall economic growth.

Limitations of the Study

This study uses a composite index derived from four (4) variables of infrastructure namely total length of A&B class roads (ROAD), No. of Bank Branches (BANKB), total number of fixed telephone lines (TELECOM) and installed electricity generation capacity (ELECT) of the country as proxies to measure the level of infrastructure facilities of the country. However some other infrastructure such as water supply, payment systems, government services, mobile phone lines, internet lines, port expansion *etc*., were not taken into consideration due to the unavailability of time series data. Therefore composite index derived from four (4) variables may not be a good proxy for level of infrastructure of Sri Lanka.

Although the variables used to measure the level of infrastructure indicate the availability of facility, the decisions of investors may also be based on quality factors and the available technology, which is not reflected in variables relating to infrastructure. This may account for the fact that India is attracting high-tech IT related foreign investment with lower teledensity than Sri Lanka. Therefore, the lack of a representation of quality factor in the proxy variables for the infrastructure is a limitation of this study.

FDI and infrastructure developments have been dampened by the unfavorable economic environment within the country due to the civil war, which originated from poverty and the loss of confidence and understanding among communities and political parties. The civil war has had different phases from 1976 to 2009, ranging from guerrilla tactics to intensified conventional fighting between the two forces. The confidence of

investors and other development activities may depend on the intensity of the war. A proxy variable that reflects the impact of civil war which may have varied with its intensity was not included in the study due to the unavailability of such an indicator.

Sri Lanka introduced reforms on trade, FDI and the services relating to infrastructure during reference period of this study from 1980 to 2011, and different regimes can be identified with respect to the liberalisation of each sector. To capture these changes, econometricians have adapted dummy variables for analysis. However, the application of those types of structural brakes to this study was prevented by the small sample size.

In evaluating the interactions between per capita GDP, FDI and level of infrastructure, the study was handicapped by the lack of empirical studies. Few studies have focused on evaluating the direct impact of FDI on the industrial sector and economy as a whole. The spillover effect of FDI was hardly captured by those studies. Research papers based on comprehensive studies of the economic impact of the infrastructure are not available for Sri Lanka. Therefore, historical descriptive data or studies based on other countries have been used as references for the study.

Appendix A

Logarithms of total length of A&B class roads (ROAD), No. of Bank Branches (BANKB), total number of fixed telephone lines and installed electricity generation capacity (ELECT) of the country were used to develop a summary measure by using principal component analysis to quantify the level of infrastructure. The results derived from principle component analysis are presented in Table A.

Table A: Principle component analysis summary Results

Principal Component	PC 1	PC 2	PC 3	PC 4
Eigenvalues	3.694892	0.143066	0.122715	0.039327
% of variance	0.9237	0.0358	0.0307	0.0098
Cumulative %	0.92370	0.95950	0.99020	1.00000

Loading Eigen Vector				
Variable	PC 1	PC 2	PC 3	PC 4
ROAD	0.493736	0.762045	0.333855	0.253087
BANKB	0.502146	-0.227456	-0.634312	0.541997
TELECOM	0.493492	-0.602323	0.626982	0.023792
ELECT	0.510430	0.068979	-0.305094	-0.801012

According to the principle component analysis 92% of the standard variance of the selected four (4) variables are explained by the first principle component. Therefore the first principle components which explain 92% of the variation of the data is the best combination of variables. The first principle component was calculated using the weights of the respective loading vector for this analysis.

Appendix B

VEC Granger Causality/Block Exogeneity Wald Tests

Sample: 1980 2011
Included observations: 27

Dependent variable: D(GDP)

Excluded	Chi-sq	df	Prob.
D(FDI)	6.043380	4	0.1959
D(INFRA)	0.726763	4	0.9480
All	6.447600	8	0.5972

Dependent variable: D(FDI)

Excluded	Chi-sq	df	Prob.
D(GDP)	4.030914	4	0.4018
D(INFRA)	10.79784	4	0.0289
All	11.99809	8	0.1513

Dependent variable: D(INFRA)

Excluded	Chi-sq	df	Prob.
D(GDP)	6.980598	4	0.1369
D(FDI)	3.230782	4	0.5200
All	8.309980	8	0.4038

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