

Reforming International Monetary System¹

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The global economy is faced with unprecedented imbalances where huge reserves mostly denominated in US\$ have been accumulated in non-reserve currency countries and United States is faced with chronic current account deficit and increasing foreign debt. The income velocity of the global reserves is decreasing with random-walk as global demand is not been increasing at desired pace to absorb such reserves. There are several reasons for accumulating foreign exchange reserves which include precautionary measure to unused trade surpluses. Such imbalances are also being cited as one of the plausible causes of the recent financial crises in the United States besides its fragile monetary system and prudential regulations. In fact debate has intensified towards need for reforming the entire international monetary system to obtain a more sustainable framework. In this paper global data with respect to world economy and the United States have been analysed in Vector Error Correction and Unconstrained Vector Auto Regression frameworks to understand the changing dynamics of economic relationship between United States and other nations through Granger Causality and impulse responses. In particular, the economic relationships between United States and groups of other economies of the World has been examined with respect to real GDP, domestic money market rates, and international interest rates respectively to demonstrate the prevailing dichotomy in international economic structure. The dynamics of analysis indicates that the United States does not cause growth in real GDP of other countries (taken in groups of high income, upper middle, lower middle and low income countries) but it continues to affect the money market of major economies. Such possibility is argued to be plausible only because of the dual use of US\$, which is both the national currency of the United States and major currency of international transaction. A dichotomy of this kind is inherently unsustainable as it creates distortions in conducting monetary and fiscal policies of all nations including the United States. We also estimate a simple model of consumer price inflation in the United States and demonstrate the prevailing rigidity and supply side dominance. It is then argued in particular how the inflation targeting regime in the United States has been misplaced, volatile and destabilising for the entire global economy through linkages provided by dual use currency system while preferred policy regime should be characterised by low level low volatility interest rate. Finally, the paper argues for a more inclusive neutral currency based international monetary system which would be in the interest of global economy including United States and lead to higher global demand.

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1. INTRODUCTION

Development of a credible International Monetary System (IMS) is evolutionary process. However, every improvement is subjected to severe scrutiny whenever a new economic crisis is encountered. Each crisis leaves its own imprint, unravels a new vista of problems and makes economists busy in search of new explanations. Yet, fewer lessons are learnt and the search for a long term solution is lost in complex processes and negotiations for short-term gains. Not long ago, the East Asian crisis was marked as an outcome of institutional failure and inadequacies of governance. It was felt essential to strengthen emerging market banking system and financial institutions with bench mark systems prevalent in developed countries. But, when the most developed system such as one prevalent in the United States itself proved fragile, a crisis of confidence emerges, which exposes both analytical and political sincerity of purpose. The voices of protectionism, command, control, and regulation have never been shriller in market economies than they are today.

The fragility is demonstrated in critical areas such as credibility of credit rating agencies, underwriting standards, quality assessment of mortgaged backed securities and risk weighted capital adequacy of the banks.² However, this is only one side of the coin; the broader framework of international monetary system, the other side is equally strained, and its sustainability questioned. Contradictions of political/corporate interest and technical correctness abound with dual-use currency and increasing sophistication of monetary instruments. In the era of increasing influence of information technology, the volatility in international currency and the interest rate have become more detrimental than ever for success of innovative financial instruments and the international monetary architecture in general. The key question is that, how a system working for hundreds of years proves so fragile, misgoverned and unsustainable? How, established businesses can be their own enemies? Was it not an outcome of bad policy and if so, what did we learn? In a more globalised world, the policy actions of dual currency country quickly transmit to the rest of the world causing cascading effects of instability. Thus, there is need of reality check about the changing dynamics of relationship between world economies and the United States as it provides anchor currency for financial transactions. During recent periods, global economy has experienced unprecedented transformation which

² See for example Gorton, G. B. (2008). The Subprime Panic. [NBR Working Paper 14398](#), National Bureau of Economic Research, Cambridge, MA.

calls for comprehensive reforms in extant international monetary system. Some of these transformations are summarised below.

(1) Several economies, thus far considered to be immaterial to the world economy have emerged as new drivers of global demand, while United States considered earlier as the driver of world economy has become self serving. The share of U.S. export in total World export has gone down from 17.06 per cent in 1960 to just about 10.04 per cent in 2005, while import share has gone up marginally from 14.25 per cent to 15.65 per cent. During the same period the share in World GDP has gone down from 38.57 per cent to 27.16 per cent (Figures 1). Thus, the commanding position held by the United States during 1960, which made it natural leader in all the economic parameters, now appears to be converging to average State.

Figures 1 about here

(2) The economic dominance of the United States thus far has been obtained through its leadership in technological innovations and factor productivity growth. However, the comparative advantage of strategic innovations and efficiency in production is now under challenge as reflected in downwards shift in share of global high-tech exports, which has gone down from 25.08 per cent in 1990 to 12.83 per cent in 2006 (Figure 2). In an influential article, Paul A. Samuelson analyses the situation of reversal of specialisation and situations where autarky real wages of America becomes better than gains of trade (Samuelson 2004). The information age has made the diffusion of knowledge much easier and the competition has forced shifting of research and development centres from high cost areas to low cost areas, which is likely to breach the barriers to technology transfers. This has the potential of protective reactions from the United States and other developed countries. In such a situation, the International Monetary System tied to US\$ will face another crisis in much complex style. Although, such fears of protectionism are dispelled outright by yet another influential set of economists led by Jagdish Bhagwati (Bhagwati 2007). Nevertheless, the precautionary measure requires discontinuance of dual use currency so as to reduce the direct transmission of policy actions of one country to the other.

Figure 2 about here

(3) The divergence in national interest eludes consensus exchange rate regime and as a result both flexible and fixed exchange rate systems keep coexisting (Dooley, Folkerts-Landau et al. 2009). The problem is further complicated due to diversification in monetary regimes between reserve currency country and non-reserve currency countries in terms of choice of objective functions of the central banks, the intermediate targets and the instruments. While maintaining macroeconomic stability in terms of prices/ inflation is politically essential, the sovereign sustainability requires discipline in fiscal exuberance and balance of payments. In the process of striking this balance, the central banks and the governments tend to use several interventions (monetary as well as fiscal) simultaneously with pervasive effects. Interventions in exchange rate market, open market operations in treasury bills, selective controls on trade flows, taxation and financing of populist programs with little multiplier effects often lead to outcomes that cannot be explained by consistent theory. It is also in this context that the international reserve system needs to be robust to minimise if not wade off completely the effects of such diversities.

(4) Considering the fact that free capital movement has proved costly in many economies, often management of exchange rate is associated with large accumulation of international reserves of the order that is decided more by thumb rules rather than any theoretical foundation. Further, the sources of accretion of international reserves vary across countries, which make it difficult to set a norm for its optimal size. Therefore, the challenge is to design a system that minimises the holding of international reserves; and facilitates sharing of reserves held by member countries with other countries facing crisis. However, reforms in international monetary system to allow such arrangements ought to have long term perspective and constitutional commitments for its sustainability (Frenkel and Goldstein 1988) (Frankel 1987).

(5) The monetary policy in the United States as provider of international currency has become more volatile during recent periods. Such volatility is not compatible with decreasing margins in business and transaction, a direct outcome of growing influence of information technology on business. Under the current age of information technology the competition is scaling new heights and it has started breeding evils such as unrealistic bonus system, extreme inequalities in salary structure of corporations and motivations for decisions with potential short term gains overlooking disastrous long-term consequences. Clearly, the risk taking behaviour of key decision makers cannot be justified in absence of large positive difference between short-term

gains and the long-term losses. Therefore there is need to design the system that discourages the possibility of windfall gains from arbitrage and the evils at the corporate level do not result in to collapse of the entire system. In other words, the system needs to be designed for an imperfect World rather than an ideal World where gaming on arbitrage is minimised.

Thus, it is time to think of sustainable international reserve system which has potential to 'Evolve' and which can absorb 'Innovations', 'Newer Economic Realities' and is more 'Democratic'. Such system cannot be tied to one economy or a selected group of economies instead; it must look beyond in a more neutral sense. In the short run a multi-currency options including regional currency arrangements as discussed by several analysts in this volume and elsewhere can be third best solution, while expanded SDR with current method of valuation could be the second best solution. However, neither of these would completely solve the problems associated with the dual use of currency. The multi-currency system does not ensure level playing field for all economies, where some countries would have the advantage of borrowing at zero cost but at the same time they may have to run a current account deficit. And, overall the deflationary bias may still continue.

We consider that the current financial crises has given a great opportunity to make it a defining period in the history of international Monetary System, and therefore it is important to nurture the short term actions in a framework of long term objectives. The stakes are very high as the gains of dual use of US\$ are enormous, while at the same time the holders of US\$ are nervous in absence of alternatives. Continuing with this situation will keep breeding financial crises. Further, we argue in this paper that the economic conditions which led US\$ to become the international currency of exchange and the resulting International Monetary System have undergone substantial change and a fresh look is required to develop a system, which is more neutral and more encompassing, and is likely to face lesser constraints to evolution, particularly in supporting the expansion of world trade and financial development. We argue for (1) a neutral currency, and a low interest rate as the regime target for the international monetary system; (2) an international monetary authority with a role of banker of the last resort³ and facilitator of parking and loaning of capital between surplus and deficit nations at a reasonable cost; (3) transparency on external and internal balances and financial innovations; and all this with (4) full

³ Somewhat in the sense discussed in Sachs, J. D. (1999). "The International Lender of Last Resort: What are the Alternatives." Retrieved 15.07.2009, from <http://www.bos.frb.org/economic/conf/conf43/181p.pdf>.

autonomy of monetary policy making for the individual economies consistent with flexible or managed exchange rate.

The rest of the paper is organised in the following sequence. The following section deals with the methodology followed in this paper to bring out arguments in support of reforming the current international monetary system designed around domestic currency of the United States as the dominant medium of exchange. In Section three we bring out the fundamental problems faced by the global economy. Section four presents crises of confidence arising out of dual use currency system. In Section five we summarise the need for reform in the long terms perspective. Section six examines approach to reforming International Monetary System including some of the aspects of institutional arrangements and finally Section seven concludes.

2. METHODOLOGY FOR ANALYSIS

In order to formalise the international changes leading to dichotomy as mentioned in the foregoing discussion ex-post data of the world economies and the United States are analysed in Vector Error Correction and Unconstrained Vector Auto Regression framework to understand the changing dynamics of relationship between United States and other nations through granger causality and impulse responses. Four key analyses have been carried out; (1) relationship between real gross domestic product (GDP) of selected groups of world economies (namely High Income Countries less United States (HIC1), Upper Middle Income Countries (UMC), Lower Middle Income Countries (LMC), and Low Income Countries (LIC)) and United States; (2) relationship between money market rates (MMR) in the United states and the World economies; (3) relationship between international rate proxied by three-month London Interbank Offer Rate (LIBOR3) and the Overnight Federal Fund rate (FFO); and (4) the Inflation- Output gap nexus in the United States and its implications to monetary stance in the United States and therefore, its impact on rest of the world. The variables used in the analysis are presented in Appendix Table A1.

Drawing on the time series literature, the statistical properties, in particular the stationarity of the chosen variables are examined. In recent years several competing methods of testing unit root have been developed as an improvement over the conventional Augmented Dickey-Fuller (ADF) test (Dickey and Fuller 1979) and Phillips- Perron (PP) tests (Phillips and Perron 1988). These include methods developed by Phillips Denis Kwiatkowski, C. B. Peter, Peter Schmidt, and Yongcheol Shin (hence forth KPSS) (Kwiatkowski, Phillips et al. 1992); Graham Elliott,

Thomas J. Rothenberg and James H. Stock (hence forth ERS) (Elliott, Rothenberg et al. 1996); Serena NG and Pierre Perron (hence forth NP) (NG and Perron 2001). However, the test results of the new methods also are sensitive to the way they are implemented. We therefore, test the variables using several of these methods and present the test results in Appendix Table A2. It may be noted that except Output Gap (GAP_IIP), World Oil Price Inflation (INF_WOP), and Consumer Price Index Inflation (INF_CPI) all other variables are integrated of order one (I-1). This allows us to exploit concept of cointegration in a consistent way. It may be noted that even if there are at least two I (1) variables, cointegration can be exploited (see for example discussion in (Pagan and Wickens 1989). If variables were cointegrated, then causal relationship in at least one direction is automatically established (Granger 1988) even if short-term causation is absent. In the literature Granger Causality has been usefully exploited in vector autoregressive (VAR) framework to analyse the precedence among variables. If variables are cointegrated then causal analysis and impulse responses could be more meaningful in a vector error correction framework (VECM). Alternatively, Causal relationship can also be studied in simple unrestricted VAR framework. We exploit both methods with particular preference to the former.

We therefore, start our analysis by first examining the possibility of cointegration and appropriate vector error correction model (VECM) representation and then analyze the causal relationship between selected variables and the impulse responses to one standard error shock to the selected equations to examine the short-run dynamics. The VECM framework draws on Hamilton (1994), (Johansen 1995), and (Pesaran and Shin 1998).

3. THE FUNDAMENTAL PROBLEMS OF THE EXISTING INTERNATIONAL MONETARY SYSTEM

Three important characteristics of international monetary system include adequate but not excess liquidity in terms of international reserve currency, least cost adjustment of imbalances in balance of payments and confidence that the system is credible and sound with respect to the first two. All the three aspects are under challenge. Besides, there is another challenge of selecting a consistent monetary regime for each country while maintaining its sovereignty in terms of objectives, intermediate targets, and instruments.

3.1 Instability in income velocity of International Reserves

Consider the first requirement, adequacy in liquidity. One way to look at it could be the output or income velocity of total international reserves (World GDP to World Reserve ratio). A lower value means higher liquidity. This has its implications not only in terms of international transactions but also credit creation, financial intermediation that is required to finance the growth of individual economies. The data on velocity is presented in Figure 3 for the period 1960-06.

Figure 3 about here

The income velocity rose secularly up to 1969 (when the Bretton Woods System started showing fissures) to a level of about 34 and then fell back in 1971 to about 20. The velocity appears to be stationary between 1972 and 1987. However, since 1987 till 2006 the velocity is highly unstable, with secular falling trend reaching a low of about 10 in 2006. However, the unit root tests presented in Appendix table 2 indicate non-stationarity for the entire period. This implies too much of reserves chasing income aimlessly. Some of the reasons and implications can be summarised as follows:

- (1) That there is underlying fear of instability across non-reserve currency countries leading to precautionary accumulation of foreign currency reserve
- (2) The global trade and transactions are increasing much faster than World gross domestic product (world GDP) and there is shift of trade surplus from reserve currency countries to non-reserve currency countries. Such trade surpluses could be achieved on account of comparative advantage and/or import restrictions and domestic monetary/ fiscal policies. Examples of both are available in plenty.
- (3) There is chronic current account deficits and hence fiscal deficit in some of the economies with freely available currencies particularly the United States. This may be a direct outcome of Triffin Paradox as also the deterioration of comparative advantage in export market of goods and services. Whatever, be the dominant reason, this situation cannot continue forever as accumulating debt and deficit lead to global crises of confidence as reflected in recent meltdown.

- (4) That the global demand (or output) is not growing fast enough due to distortions in factor costs across countries and inefficient allocation of global resources.

All the four issues are detrimental to international financial stability and pose challenge to the design of new financial architecture. At the national level technical innovations, application of information technology and use of plastic money is already destabilising the income velocity of broad money, which is further destabilised with unstable movements in international reserves.

The current crises in the United States has triggered printing of international currency in quantities measured in trillions and more than half of it could end up in accretion of international reserves. Certainly, cost of this excess liquidity would be transferred globally, which could have been avoided in presence of neutral currency for international reserves.

3.2 Instability in the reference currency and rising international reserve

The international reserve currency has witnessed wide fluctuations with respect to global benchmark currency of SDR during the recent years and it has depreciated significantly (Figure 4). With such fluctuation in reserve currency no country can claim to have fixed peg and those which have chosen to peg their exchange rate with the US\$ are actually not stable with respect to international demand and supply. This complicates the management of the pegged currencies, the expected outcome and the resulting capital flow.

However, despite depreciation of Dollar, the United States has not been able to keep pace with the export performance of several other countries. Such export intensive countries face currency appreciation and need to buy more of US\$ to maintain trade competitiveness, which increases the demand for US\$ further. The accumulated reserve is then ploughed back into United States as investment at almost zero cost. The dual currency reserve also yields seigniorage gains for the reserve currency countries. Thus, there are motivating reasons to follow such policies by the O-1⁴ countries in general. Therefore, it can be argued that the domestic policies followed in the United States are equally responsible for the growth of international reserves.

⁴ A freely usable currency means a member's currency that the Fund determines (i) is, in fact, widely used to make payments for international transactions, and (ii) is widely traded in the principal exchange markets.

Figure 4 about here

3.3 Dichotomy arising out of changing dynamics of Real Economy and Monetary Indicators across world economies and the United States

During the last two decades, several under developed countries have experienced high growth rate in real GDP and their size is increasing fast enough to take centre stage in world economic order. The People's Republic of China (PRC), Brazil, Russia and India are among the leading countries ready to take position in top slots of largest economies of the world. With large size coupled with faster growth, these countries have achieved potential to even drive the economic growth of other countries. We examine the dynamics of change in relationships between world economies with respect to real GDP growth and financial markets respectively in subsequent part of this section. There is no doubt that United States would remain leading country in terms of size of the economy but its potential to drive growth in other economies appears to be diminishing. On the other hand the dual use currency system allows the monetary and fiscal policies of the United States to be transmitted to the rest of the world with pervasive effects and distortions.

3.3.1 DYNAMICS OF REAL ECONOMY

More concrete evidence that the United States has lost the position of driver of global economy comes out from the results of Granger Causality/Block Exogeneity Wald Tests presented in Table 1 and impulse responses presented in Figures 5-9 with VAR variable of Y_USA, Y_HIC1, Y_UMC, Y_LMC, Y_LIC. As discussed earlier, the causality is analysed for two periods of adequate length in vector error correction framework. The cointegration tests are presented in Appendix Table A2 and the long term relationships are presented in Table 2. The results clearly show the following:

- (1) During 1962-1990, growth in the United States preceded the growth of at least the lower middle income countries (LMC) and low income countries (LIC) with positive long term effect on LMC and insignificant long term effect on LIC.
- (2) When we analyse the data for the period of 1980-2006 using same methodology the causality is completely reversed. The hypothesis that the long term error correction term and the short term growth terms of the United States are jointly insignificant in equations for other groups is accepted, while the corresponding hypothesis that the long term error

correction term and the short term growth terms of other groups (taken one by one) in the equation for United States are rejected for all. This means that the United State does not cause (or precede) growth of any of the above stated groups although there is positive long term relationship with upper and lower middle income countries. On the other hand all the economic groups HIC1, UMC, LMC, and LIC affect the economic growth of the United States in one direction or the other.

- (3) Importantly, the Low Income Countries are being driven by UMC and LMC, which supports rationale for South-South cooperation.
- (4) There is significant negative relationship between GDP of United states and that of other high income countries, while long term relationship between GDP of the United States and LIC is insignificant.
- (5) The generalized impulse response for the period of 1980-2006 presented in Figures 5-9 reveal the short term dynamics of one standard error shock to the equation of a particular economy on other economies.
- (6) In the short run an increase in GDP of United States increases the GDP in HIC1 and UMC but reduces the GDP in LMC and LIC (Figure 5). An increase in HIC1 increase the GDP of USA, UMC and LIC but it reduces the GDP of LMC (Figure 6).
- (7) In the short run, an Increase in GDP of UMC increases the GDP of all other groups including United States but the quantum of increase is much higher for LIC (Figure 7).
- (8) The impulse response to the shocks in Y_LMC and Y_LIC are interesting in the sense that both produce negative effect on GDP of the United States and positive effect on other groups. However, an increase in GDP of LMC produces much bigger effects on GDP of UMC and LIC but small effects on HIC1 and USA.

Table 1-2 about here
Figures 5- 9

3.3.2 DYNAMICS OF MONETARY INDICATORS

The financial markets are getting integrated on real time basis and US\$ being dual use currency, any development in the money market of the United States is expected to be transmitted quickly to the rest of the world with. Table 3 presents Granger Causality/Block Exogeneity Wald Tests between overnight money market rate in the United States (MMR_USA) and a Rest of the World money market rate (MMR_ROW) obtained from principal component

analysis of 29 countries. This test is implemented in Vector error Correction framework for the period of 1976M4-2009M10 and unconstrained VAR framework for 1991M1-2009M10 and 2000M1-2009M10 because test of cointegration indicates that the two variables are not cointegrated during the recent periods. Therefore, the causality is examined in first difference of the two variables and the residuals are tested against unit root for consistency. All the results are presented in Table 3. It may be noted that similar results are obtained when test is conducted in levels.

Results clearly show that money market rates in the United States causes variation in the ROW but this causality is unidirectional and the long term relationship indicates that one percentage point increase in money market in the United States causes 1.136 percentage point increase in money market rate in rest of the world (Table 4).

The impulse response based on model estimated for 1976M4-2009M10 is presented in Figures 10-11, which indicates the positive and large effect of a shock in equation for MMR_USA on the equation for MMR_ROW (Figure 11)

Table 3-4 about here

Figures 10-11 about here

3.3.3 DYNAMICS OF INTERNATIONAL INTEREST RATE AND FEDERAL FUND RATE

While the above causality indicates the effect of monetary policy of the United States on the domestic interest rate of other countries, it is interesting to examine the causality between monetary policies of the United States on international interest rate represented by the London Interbank Offer Rate. We select three month LIBOR rate (LIBOR3) and apply the Causality test between overnight Federal Fund Rate (FFO) and the LIBOR3 rate taking monthly and daily data. The result presented in Tables 5-6 show a clear bi-directional causality for all the three periods namely 1963M4-2009M11, 1991M1-2009M11, and 2000M1-2009M11. Clearly, the international financial market and the monetary policy in the United States are mutually dependent.

However, there is marked change in the long-term relationship. The response of LIBOR to one percentage point increase in FFO has reduced from 1.04 to 0.98 percentage point during recent years.

Table 5-6 about here
Figures 12-13

3.3.4 IMPLICATIONS OF NEW ECONOMIC ORDER AND NEED FOR REFORMING INTERNATIONAL INSTITUTIONS

There is no doubt that United States would remain leading country in terms of size of the economy but its potential to drive growth in other economies appears to be diminishing. On the other hand the dual use currency system allows the monetary and fiscal policies of the United States to be transmitted to the rest of the world with pervasive effects and distortions.

The results presented above and the foregoing discussion support the view, that the dominance of United States has its origin in the dual use currency system that is providing effective channel of policy transmission from the United States to the rest of the world without any direct effect on the real economy of other countries. Such dominance can produce global distortions in economic management. It is neither in the interest of the United States nor in the interest of the rest of the world to continue dual currency system for international reserve.

There are other implications of the new economic order. The emergence of newer economies as dominant players is also a sign of faster convergence to newer equilibrium. But, this convergence in the real economy requires equivalent voting rights in the international institutions through an automatic and self sustaining process. Denial of such participation will lead to regional grouping such as less formal pressure groups like G-20, BRIC/BRICS and more organised European Monetary Union which has its own common currency and Chiang Mai Initiative, which is progressing towards common regional currency and a regional fund. Even individual countries with sufficient economic power may resort to promoting trade transactions with some of their trading partners in their own currency.

However, such initiatives in bits and pieces may not be efficient and sufficient to solve the global problem. Comprehensive reform of the international monetary system is inevitable with increasing pressure to suspend the role of dominant country currency status of US\$. History has been cruel to international currencies, which have played dual role of being national as well as

international means of exchange. Sterling gave way to Dollar and now Dollar is losing grounds. Which currency might take over and when is not known but it is under process. Attention has been drawn towards, 'Renminbi' (Persaud 2004), while some others think it to be 'Euro'. Yet, there are others who do not want to believe that Dollar could ever be replaced by any other currency (Eichengreen 2005; Humpage 2009). More neutral substitute has been suggested as special drawing rights (SDR), which find wider support among others (Balladur 1999; Reisen 2009; Xiaochuan 2009). Therefore, sooner a neutral consensus currency is adopted and groomed to take the centre stage, better it would be.

4 CRISIS OF CONFIDENCE IN DUAL USE CURRENCY SYSTEM

The loss of confidence in dual-use currency system has its origin in the management of U.S. economy also. It is ironical that the richest country of the World is reeling under external debt in excess of its current GDP and such debt is being utilised for private consumption expenditure. The consumption expenditure of the United States increased from 62.4 per cent during early seventies to 69.6 per cent during 1999-2008, most of the increases being procured from outside World, while share of government expenditure and gross domestic investment have falling trends (Figure 14). Such lavish misuse of the international reserve currency status of domestic currency is clear case of concern. Any other country would have collapsed much earlier with this kind of imbalance in production and consumption.

Figure 14 about here

The loss of confidence in the economy of United States is also manifested by steady decline of the US\$ as the favourite currency of international reserves at least in emerging economies (Table 7). It has gone down from 71.9 per cent in 1995 to 60.3 per cent in 2008. With current financial crisis prolonging, the composition is likely to shift further southwards. Considering the fact that emerging economies are major holders of reserves, this shift is an outcome of several developments discussed earlier and the following sections.

Table 7 about here

4.1 Diverging Views on Financial Crises in the U.S. Economy

The crises of confidence also originate from the lack of knowledge about the economy of United States. Consider the current global financial crisis led by the United States. There is no consensus explanation: J. B. Taylor blames it on the loose monetary policy followed during 2001-05, because it does not confirm with the Taylor Rule (Taylor 2008). It may be noted while Taylor type Rules have better usefulness in analysing historical data, they have found less usefulness in conducting monetary policy with real time data. More importantly, such rules have high reaction to inflation but at the same time do not have anything to handle supply side shocks, even the output-gap the key variable is known only ex-post. The parameters of such rules are likely to change with inclusion of new data. If the recent data is included to estimate the Taylor's rule, possibly, the parameters of the Rule itself would change and the counterfactual might throw a different story. However, a similar view is expressed by Jeffrey Sachs "Today's financial crisis has its immediate roots in 2001, amid the end of the Internet boom and the shock of the September 11 terrorist attacks. It was at that point that the Fed turned on the monetary spigots to try to combat an economic slowdown. The Fed pumped money into the US economy and slashed its main interest rate – the Federal Funds rate – from 3.5% in August 2001 to a mere 1% by mid-2003. The Fed held this rate too low for too long" (Sachs 2008). Some would argue about missing the leading indicators such as run-up in U.S. equity and housing prices and the inverted v-shape curve for output growth (Reinhart and Rogoff 2008). Yet, others would argue about excess savings outside the United States, which pushed the U.S. interest rate down leading to banking crisis (Bosworth and Flaaen 2009). It may be noted that such a saving glut being absorbed by the United States was glorified as one that testified the U.S. financial system mature, developed, sustainable and robust (Bernanke 2005).

The very fact that there are diverging views about the cause of recent financial crisis of United States is a sign of complexity caused by the dual use currency and it would remain complex, translucent and suspicious until there is complete detachment between international currency and the domestic currency of any nation. The motivations of keeping dominant country currency as international currency are no more there.

4.2 Volatile Monetary Regime in the United States

Almost all the explanations of financial crisis in the United States discussed earlier miss the supply side factors and the desire of the Federal Reserve to move towards Inflation Targeting Framework (ITF). The idea behind ITF is to use all possible instruments to bring the actual path

of inflation closer to the forecasted path of inflation over a period of say 1-2 years. The success of ITF is measured by its durability in countries that opted for it and some of the inherent attributes like flexible exchange rate system which are quite in contrast to Bretton Woods system (Rose 2006). Many argue (and several others disagree) that the recent improvements in global inflationary conditions are due to successful adaptation of ITF by more and more countries. However there are two critical issues with ITF: (1) the inflation-unemployment trade off describing the macroeconomic factors as the basic premise of ITF is not empirically supported by several countries; and (2) the ITF is silent on the strategy to deal with supply driven inflation, which is missed by pure inflation targeting countries and they may end up over using the instrument. In such situations, if a country with dual use currency follows pure ITF, the consequences could be destabilising in terms of missing targets and goals.

Let us consider the case of monetary stance of United States during 2005-06 a period marked by high inflation in crude prices. The quest of Federal Reserve to keep inflation under the target zone forced it to overuse monetary policy during 2005-06 (overuse was caused because this episode of inflation was supply driven) (Figure 15) and tightening continued during 2007 also, even while the crude prices were moderating and leading the decrease in CPI inflation. Again, 2008 CPI inflation and 2009 deflation are directly in correlation with the movements in crude prices but thanks to financial crisis, this time the Federal bench mark rate was not increased further. We argue, had Fed identified the inflation of 2005-06 as supply driven and restrained itself from overusing the monetary policy to keep CPI inflation in target zone, crisis would have been averted. The role of monetary tightening in reducing CPI inflation during the crude price build up can be disputed. The gains in controlling inflation were minimal while the loss incurred due to movement of the economy from a prolonged low interest rate regime to high interest rate regime have been enormous. It can also be argued that having a low interest rate regime was in fact a good decision, which was conducive to the innovative financial instruments. However, such innovations could not be sustained with shift of the economy from low interest regime to high interest rate regime leading to accelerated mortgage defaults.

Figure 15 about here

ECONOMETRIC EVIDENCE OF SUPPLY SIDE PROBLEM IN THE UNITED STATES

In order to bring home the above point, we model CPI inflation (INFCPI) for the United States using monthly data on output gap (GAP_IIPUSA) in VAR framework with world oil price inflation (INFWOP) taken as exogenous variable. The gap is measured by taking out trend component from index of industrial production, where trend is obtained using HP Filter. The model is estimated for three periods 1958M1 to 2009M6, 1991M1-2006M6, and 2000M1-2006M6 and the results are presented in Table 9. Following conclusions are clear:

- (1) The inflationary process in the United States is highly persistent in nature with sum of the lagged coefficients of CPI inflation varying from 0.98 (for 1958M1-1990m12 to 0.84 for 2000M1-2009M6)
- (2) That the world oil price inflation also plays an important role in setting inflation in the United states across all periods (see the test of variable deletion reported at the bottom of the Table 8)
- (3) However, the output gap has not been significant variable during the recent periods in explaining CPI inflation.
- (4) Table 8 also reports the block exogeneity tests for all the three periods. Clearly, hypothesis of excluding GAP_IIPUSA is accepted for 1991M1-2009M6 and 2000M1-2009M6, while it is rejected for the period 1958M1-1990m12

Table 8 about here

Thus, the demand side argument of monetary tightening is not supported by the history of the economy. In fact, the volatility created by the United States in the money market due to monetary tightening was much more than its own historical volatility as well as the volatility obtained in the Inflation targeting countries. In Figure 16 and Table 9, we present the mean and coefficient of variation of money market rates for several countries including those following Inflation Targeting framework for different periods. Following points are obvious:

- (1) All countries have moved to low interest rate regimes and at the same time they have reduced the volatility in the money market (Figure 16 and Table 9).

- (2) The United States also moved to lower interest rate regime but increased the volatility much beyond the limit of sustainability leading to crises.
- (3) With respect to selected countries it can be said that the United States has moved in more unstable zone of interest rate volatility (Figure 16)

Figure 16 about here

Table 9 about here

4.3 Rationale for 'low rate-low volatile' interest rate regime

A low interest rate regime brings relative stability even with larger fluctuations in the interest rate, while high interest rate regime is highly disruptive when it starts rising. This is due to the non-linearity between interest rate and the payment required (either in terms equated monthly instalment (EMI) with variable number of instalments or in terms of fixed period variable mortgage values) as demonstrated in Figure 17 through an example with EMIs. Consider a loan of one million units with equated monthly instalment (EMI) of 10000 units to be paid in 104 instalments at one per cent interest rate. Now consider a 100 per cent increase in the interest rate from one per cent to two per cent (low interest rate regime). This would result in an increase of number of EMI from 104 to 109, just about 4.8 per cent increase. Next, assume a high interest rate regime with initial interest rate of 5 per cent and EMI being 130. In this case an increase in interest rate by just one percentage point to 6 per cent would lead to an increase in number of EMIs by 6.92 per cent. If interest rate goes up by 100 per cent to achieve a level of 10 per cent the number of EMIs would jumps from 130 to 212, which is 63 per cent increase.⁵ Thus, countries with higher interest rate regime are required to be more careful in tightening the monetary policy. In fact, financial innovations and sophisticated instruments of financial intermediation can be more effective and less risky under a low interest rate regime.

Figure 17 about here

Therefore, it is important for the monetary authorities mandated with inflation control as the goal variable to differentiate between supply side inflation and demand driven inflation. In the case of

⁵ In case the payment periods are kept constant, the mortgage value would increase with similar non-linearity

supply driven inflation, overuse of instruments become so high that the economy moves from low regime to high regime quickly, causing heavy disruption as experienced in the case of recent sub-prime crises of the United States. Consequently, the entire financial structure is strained and all the well conceived instruments of intermediations become suspiciously unreliable.

However, the problem can be circumvented by reducing the volatility in the money market so that the disruption are low and the economic agents do not need to factor arbitrage into their decision making process. Figure 19 presents the desired quadrant of interest rate regime which can lead to more stable economic environment.

Figure 18 about here

5. SUMMARISING NEED FOR REFORM AND LONG TERM SOLUTION

In the foregoing discussion two issues have been clearly brought out with empirical evidence: (1) there is dichotomy in the global economic system. Small changes in financial sector of the United States has potential to destabilise the global economy but even big changes in the real economy of the United States do not make significant change in world economy; and (2) the monetary policy of the United States has become volatile, distorted and directionless, which we believe is more due to dual use of US\$. Under these contradictions the global stability cannot be achieved without making the international currency neutral. The economy of United States would also be better off with a neutral currency of international reserve, which decouples its current account deficits from the holding of international reserve of other countries. It would help her both in terms of conducting domestic policy and maintaining prudential discipline.

However, this requires greater political commitment and appreciation of a long-term solution. It may be worth recalling the post war circumstances in which John Maynard Keynes (representing the view from United Kingdom) Proposal of Bancor and International Clearing Union (ICU) succumbed to proposal of Harry Dexter White (representing the view of United States). There was at least one fundamental difference in basic approaches of the two economists with respect to Boncor type proposal. While Keyes wanted both deficit and surplus countries to share the adjustment cost, White wanted the deficit country to bear the adjustment cost. Now given the current state of economy of the United States (high current account deficit) a similar proposal may not be acceptable to the United States. Not surprisingly, some

proposals, (for example Greenwald and Stiglitz (2006)) want some means of disciplining surplus countries, which may not be acceptable. Clearly, it is pragmatic to look for long-term neutral solutions.

6. APPROACH TO REFORM

Several proposals have been floated to reform IMS. However, world appears to be divided in three very broad groups: (1) Replace the current dual use currency with an international currency, (2) Replace current dominant dual use currencies with a basket of currencies, and (3) Leave the current currency as it is but develop regional currencies to provide completion. We believe, in the long run only first option is sustainable because other option will lead to similar situation as the one being faced today. There is no guarantee that the multi currency System would remain flexible and competitive.

There are quite a number of proposals on the line of first option, which include idea of Bancor and International Currency Union (ICU) propounded by Keynes (Piffaretti 2009); Global Greenback system of Stiglitz (Stiglitz 2006); International Monetary Clearing Unit (IMCU) of Paul Davidson (Davidson 2003) to name a few. While these proposals are meritorious in their own rights they have attracted some criticism on account of lacking in either democratic spirit or complexities in implementing. We have attempted to address some of these issues in a modest proposal as under:

- (1) There should be a neutral currency say SDR-Money (SDRM) for international transaction, which can provide stable store of international value by virtue of expanded basket based valuation system. Such currency should be adequately supplied so that a low interest rate regime with low volatility can be ensured across countries. However, the new SDRM equivalent to the amount of international reserve would have to be credited to the members account in IMF in proportion to the initial allocations.
- (2) There should be a banker of last resort say IMF-Bank, where excess reserve can be deposited and lent at pre-decided benchmark rates just like any central bank but with a provision of transaction off the bench mark rate.
- (3) There should be arrangement of bilateral negotiations between depositor central bank and borrowing central bank to make a deal off the bench mark rate where discounted deposit of

surplus country can be transferred to borrower country in the mutual interest of trade. Such benefits can be provided by the surplus country to avoid tariff barriers from deficit countries which in a sense is supporting employment in exporting country.

- (4) The transition from US\$ based IMS to SDRM based system should be done in an agreed timeframe with a period of coexistence followed by complete transition to SDRM
- (5) With increasing share of other nations in world real economy, the demand for greater participation is legitimate and it would act as stabilising force. Therefore, more and more currencies need to be added to current SDR basket before adopting SDRM.

INSTITUTIONAL REFORM WITH REGIONAL PERSPECTIVE

As an aftermath of Asian Crises and loss of confidence in the IMF sponsored adjustment policy, prominent economists and the regional governments started propagating the idea of Asian Architecture under famous Chiang Mai Initiative with an ultimate goal to obtain an Asian Monetary Fund. Although the movement has not been a great success, it is an important indicator of need to reform the IMS. The idea favour bottom up approach of regional and global integration under a two tier system (see for example (Kawai 2009)). In the two-tier system there are Global Institutions namely IMF, WTO and WB with focus on Global public goods. It is argued that the issues of sub-regional public goods should be left to be solved by the Sub-regional Institutions as they know the problems better. However, when it comes to division of role and resources, such bottom up integration model faces several inadequacies and scepticism (see for example (Wyplosz 2010), (Woo 2010), and (Kawai 2010)) with respect to technology and resource. Therefore, we argue that all the energy should be used to reform the Global Institutions first with emphasis on decentralisation such that the regional interests are safeguarded by default. We propose a top down approach of institutional reform with clear division of responsibility for surveillance and management at the regional and global level. The monolithic monetary fund may be decentralised a an arrangement of central office and several autonomous regional offices looking after surveillance, monitoring, and advisory with respect to the member countries, and management and distribution of fund at the regional level. The regional offices could also be involved in looking after national compliance and vertical coordination. The central office could concentrate on currency management, Policy making, surveillance of regional offices and fund allocations to regions. Such a system as proposed here would not only bring more confidence among smaller countries but it would be more robust, knowledgeable and effective.

7. CONCLUDING REMARKS

The income velocity of international reserves has become highly unstable and unsustainable situation is being created due to chronic current account deficit and ever increasing debt accumulating in the United States. As a result the reference currency of international transaction (US\$) is unstable. The financial dominance of the United States continues while its dominance in real economy has diminished. This is likely to make global economic environment more strained and unsustainable. Therefore, changes in international monetary structure and currency of transaction are inevitable. The discussion favours a neutral currency, possibly SDR-money, which needs to be groomed as international currency. The design of new economic order must also ensure a low-level low volatile interest rate regime for the international monetary system with full autonomy of monetary policy making for the individual economies. For this purpose rules regarding valuation of SDR need to be modified to include more currencies and use of export as the determinant of weight. We have also argued that the role of United States may shrink further and it may be better to allow her to adopt a policy, which suites it the best without compulsions and prejudices just like any other country with single use of US\$. This would be beneficial to both United States as well as rest of the global economy.

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Figure 1: Shift in distribution of World GDP (current US\$), and export and Import of goods and services between 1960 & 2006 (WDI CDROM 2008 data)

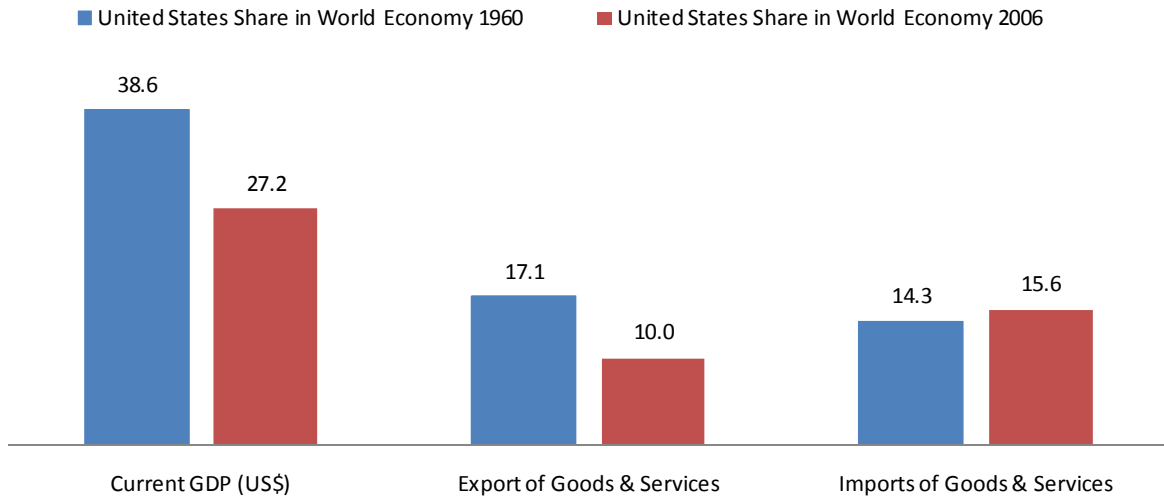
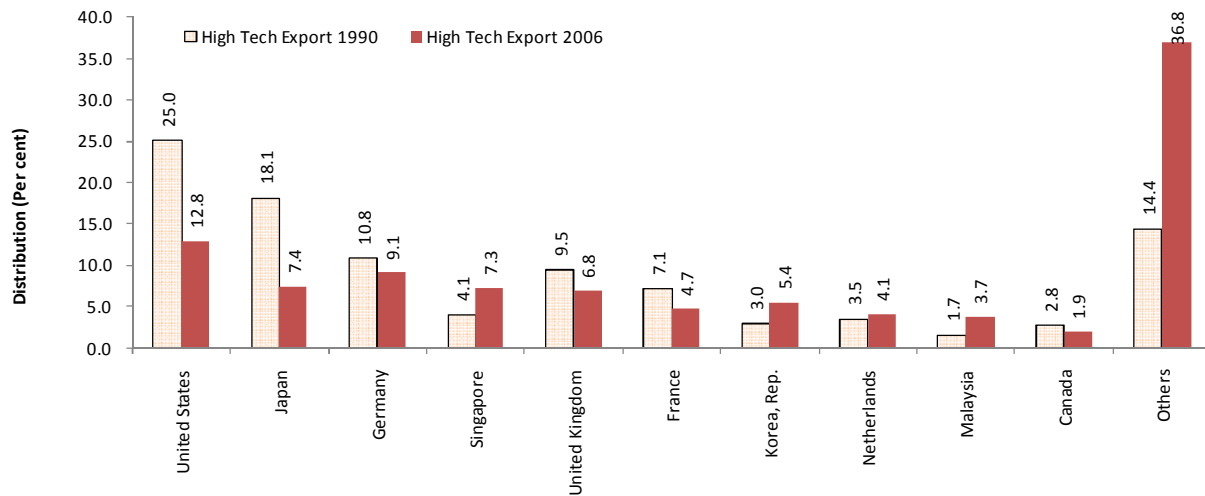
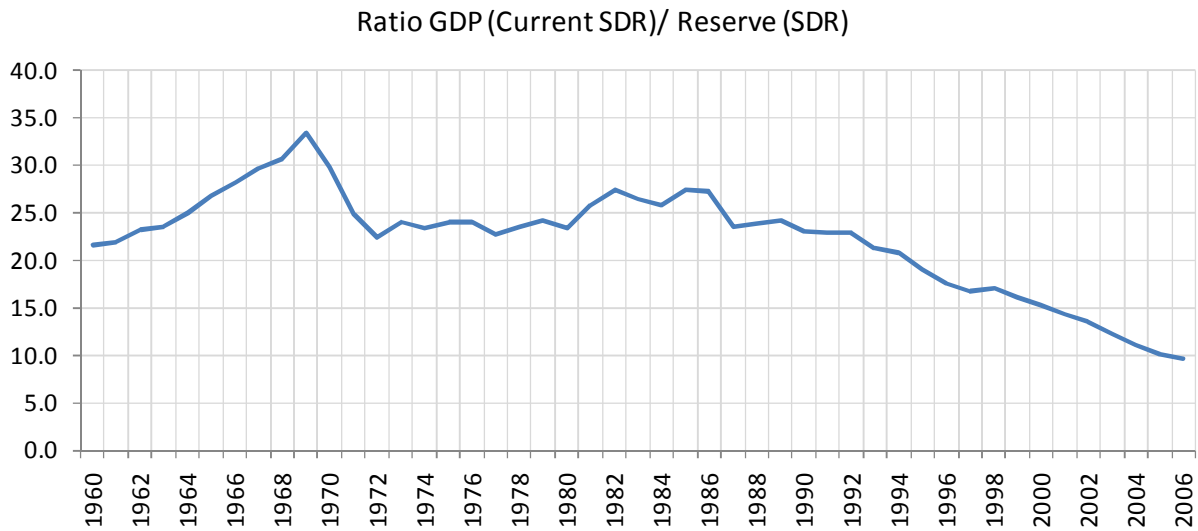


Figure 2: Shift in distribution of High-Technology exports over last 16 years



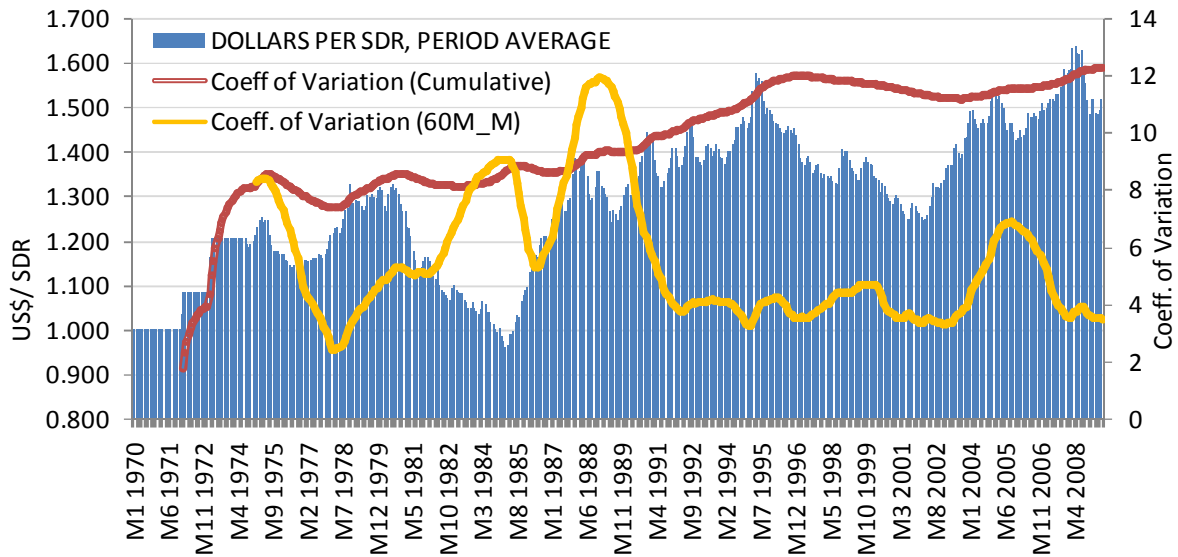
Basic data: WDI CDROM 2008

Figure 3: Income velocity of international reserves



Basic data: World GDP in current US\$ from WDI, US\$/SDR from IFS, and Total reserve from IFS (line 001.1L.SZF)

Figure 4: Movement of US\$ with respect to SDR, and cumulative and five year moving average of coefficient of variation



Basic data: IFS (line 111.SA.ZF)

Figure 5: Impulse Response A: Shock to Y_USA in System of Real GDP (1980-2006)

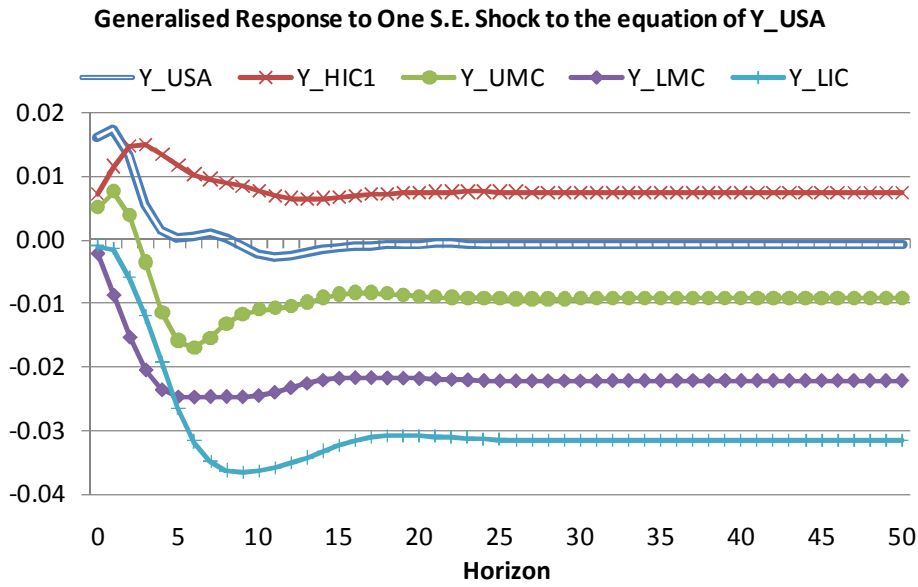


Figure 6: Impulse Response B: Shock to Y_HIC1 in System of Real GDP (1980-2006)

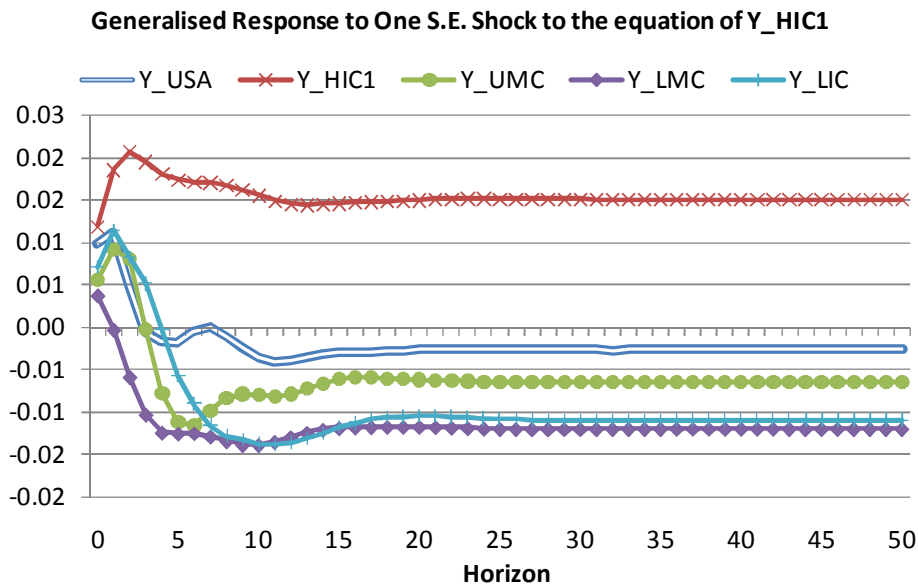


Figure 7: Impulse Response C: Shock to Y_UMC in System of Real GDP (1980-2006)

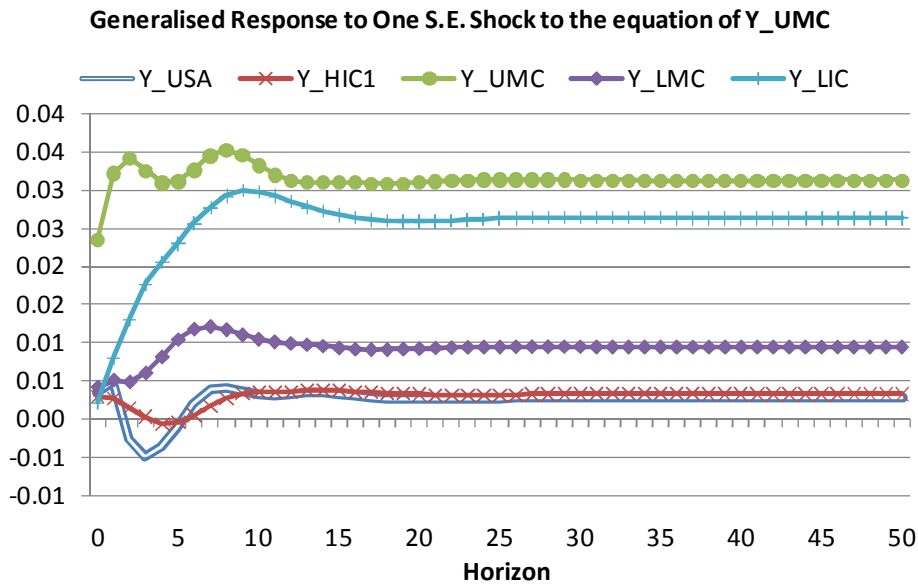


Figure 8: Impulse Response D: Shock to Y_LMC in System of Real GDP (1980-2006)

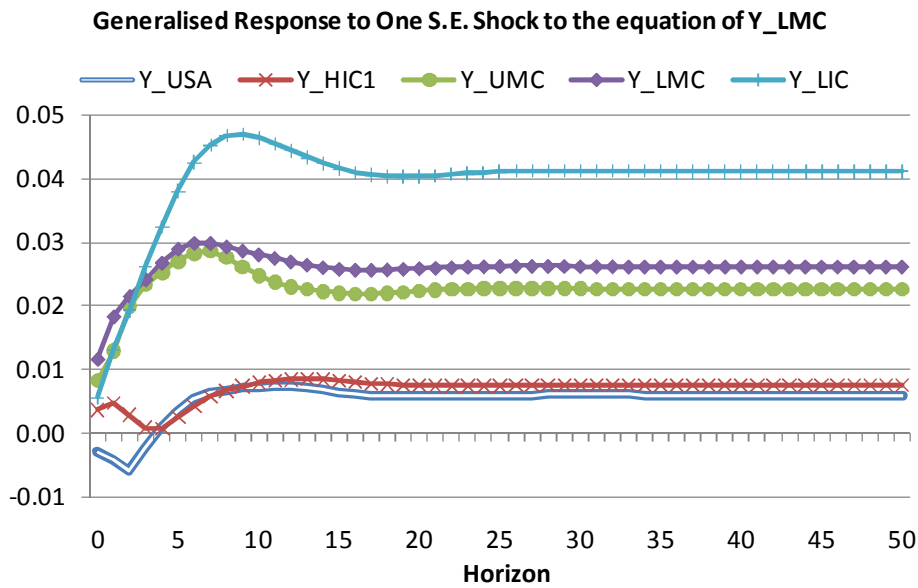


Figure 9: Impulse Response E: Shock to Y_LIC in System of Real GDP (1980-2006)

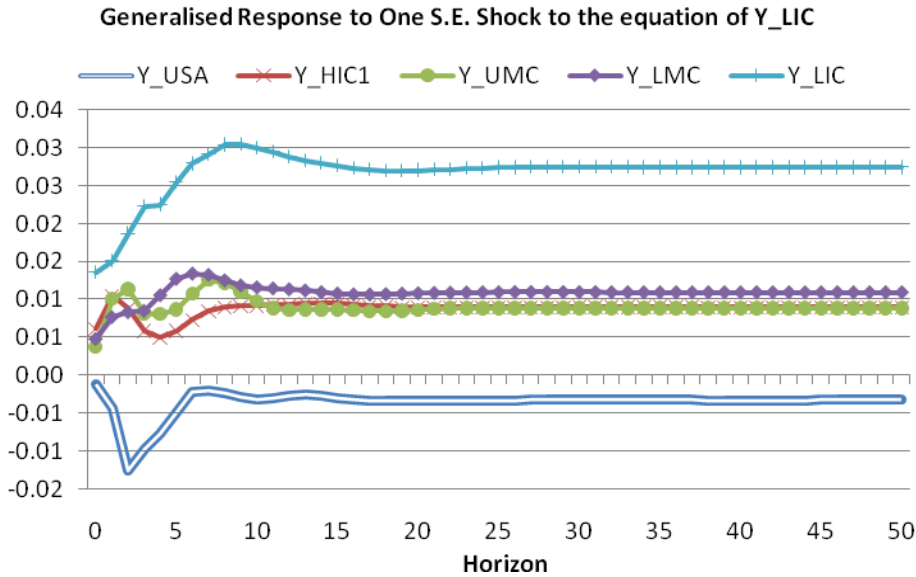


Figure 10: Impulse Response F: Shock to MMR_ROW in System of Money Market rates (1976M4-2009M10)

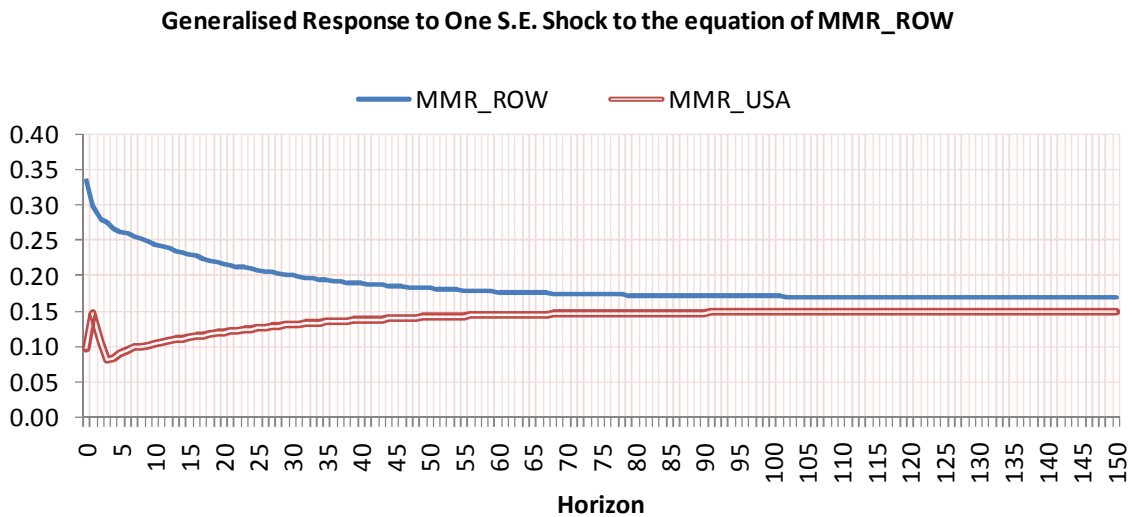


Figure 11: Impulse Response G: Shock to MMR_USA in System of Money Market rates (1976M4-2009M10)

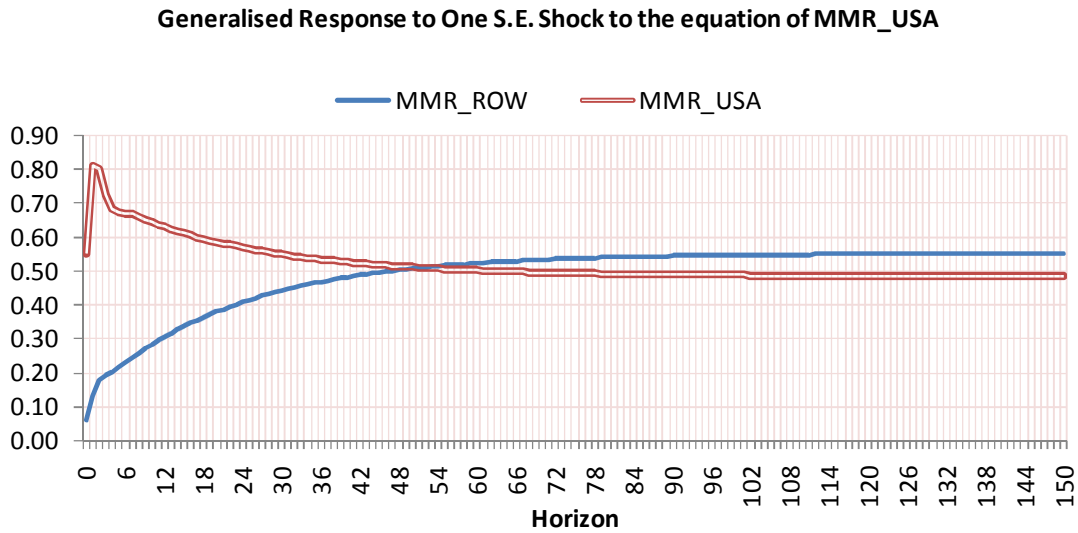


Figure 12: Impulse Response H: Shock to LIBOR3 in System of World Financial Market rates (1991M1-2009M11)

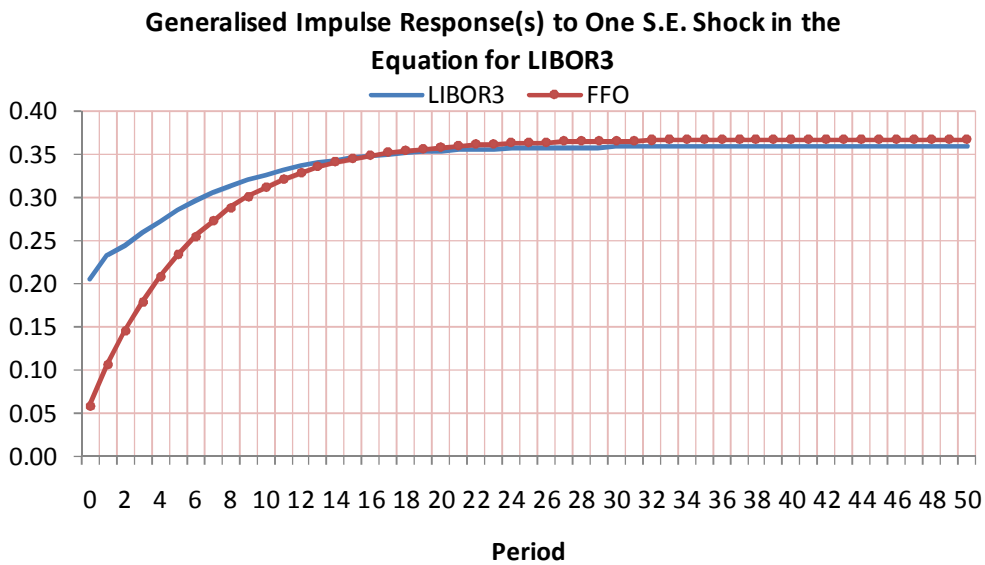


Figure 13: Impulse Response I: Shock to FFO in System of World Financial Market rates (1991M1-2009M11)

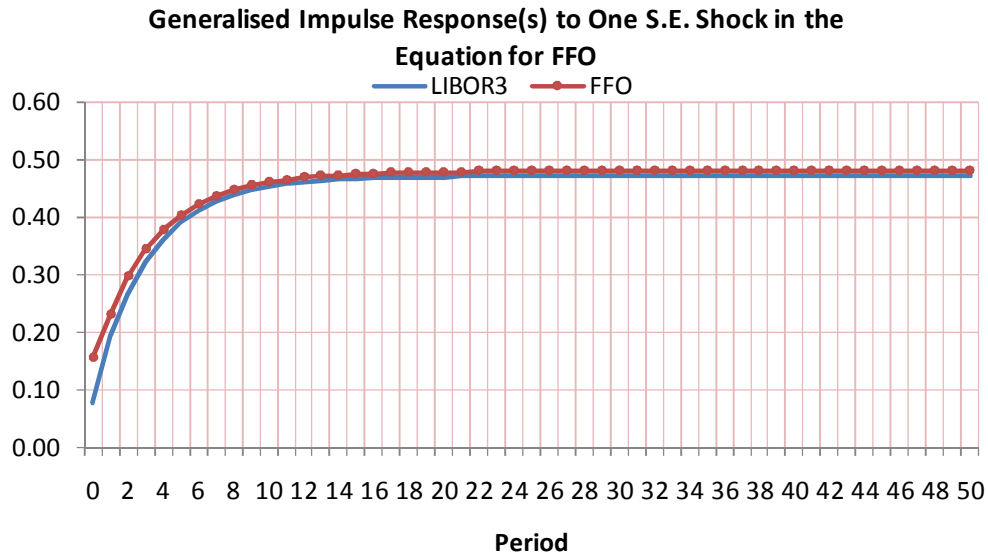
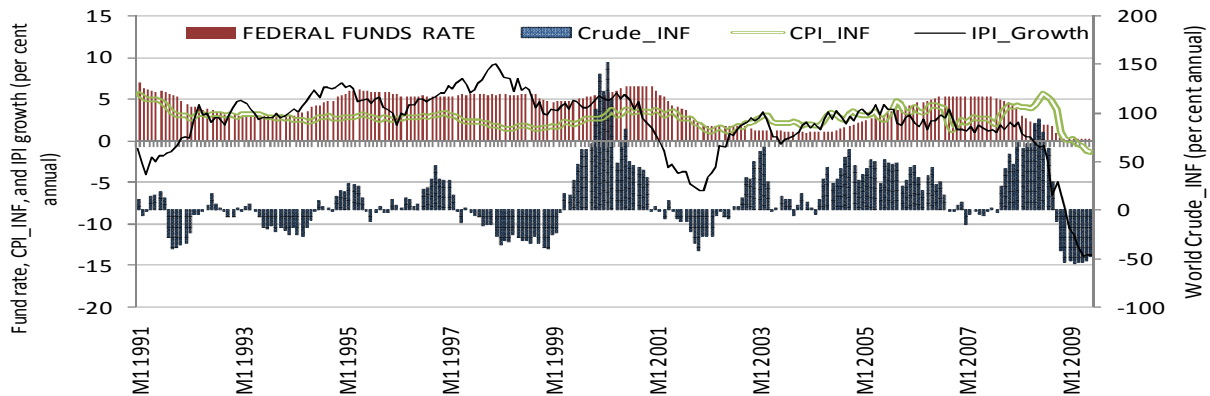


Figure 14: Shift in distribution of gross domestic product by expenditure



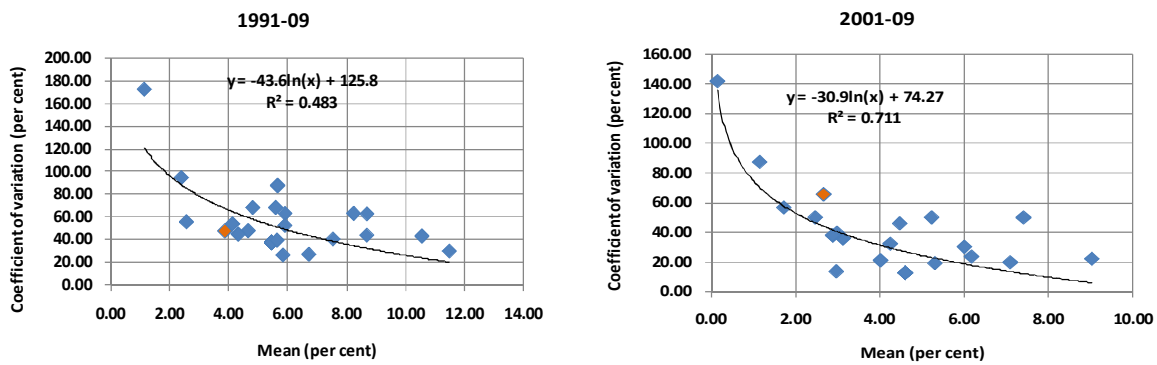
Basic data: Bureau of economic analysis (United States) website

Figure 15: World Oil price inflation and United States CPI inflation, IPI growth, and Federal Fund rate



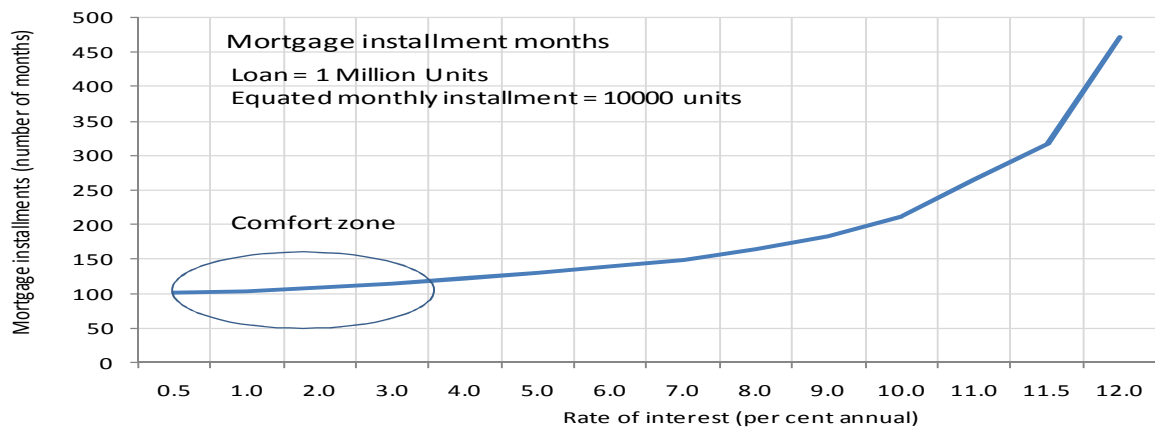
Basic data: IFS, IMF

Figure 16: Interest Rate Regimes in Selected countries: Overnight money market rates



Basic data: IFS

Figure 17: Non-linearity of number of mortgage instalments with changing interest rate regimes (low to high)



Data for figure 17

Interest Rate	Number of EMI	Percentage change in number of EMI
0.5	102	
1.0	104	1.96
2.0	109	4.81
3.0	115	5.50
4.0	122	6.09
5.0	130	6.56
6.0	139	6.92
7.0	150	7.91
8.0	165	10.00
9.0	184	11.52
10.0	212	15.22
11.0	265	25.00
11.5	316	19.25
12.0	470	48.73

Figure 18: Desired interest rate regime

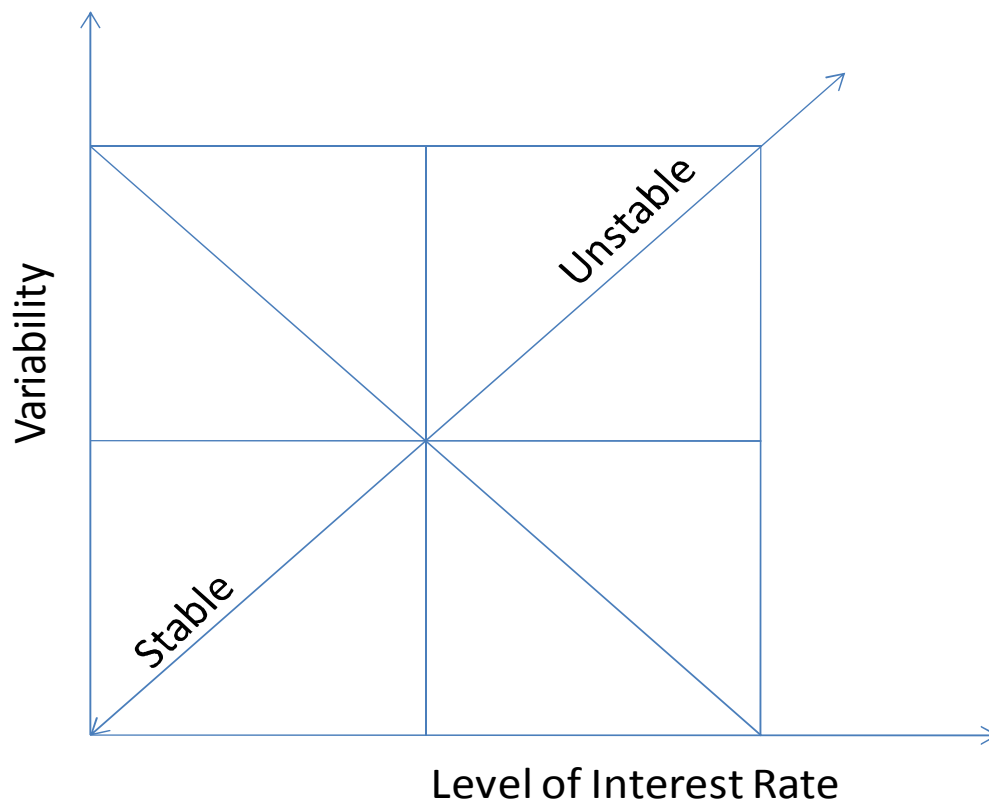


Table 1: Granger Causality between GDP of United States and GDP of Sub-Groups of World Economy

VEC System: Y_USA, Y_HIC1, Y_UMC, Y_LMC, Y_LIC				
Equation Dependent Variable	Excluded Variables	1962-90		1980-06
		P-Value		P-Value
dY_USA	ECM, dY_HIC1	0.467		0.010
	ECM, dY_UMC	0.339		0.001
	ECM, dY_LMC	0.335		0.017
	ECM, dY_LIC	0.556		0.002
	ECM, ALL	0.871		0.002
dY_HIC1	ECM, dY_USA	0.520		0.537
	ECM, dY_UMC	0.489		0.736
	ECM, dY_LMC	0.488		0.941
	ECM, dY_LIC	0.358		0.538
	ECM, ALL	0.770		0.783
dY-UMC	ECM, dY_USA	0.918		0.752
	ECM, dY_HIC1	0.557		0.724
	ECM, dY_LMC	0.709		0.495
	ECM, dY_LIC	0.835		0.688
	ECM, ALL	0.858		0.700
dY-LMC	ECM, dY_USA	0.044		0.812
	ECM, dY_HIC1	0.133		0.750
	ECM, dY_UMC	0.030		0.759
	ECM, dY_LIC	0.251		0.396
	ECM, ALL	0.000		0.325
dY-LIC	ECM, dY_USA	0.081		0.192
	ECM, dY_HIC1	0.144		0.160
	ECM, dY_UMC	0.654		0.069
	ECM, dY_LMC	0.060		0.024
	ECM, ALL	0.149		0.007

Data Source: World Development Indicator CDROM-2008. ECM: Error Correction Term of VEC, HIC1: High Income Countries less United States, UMC: Upper Middle Income Countries, LMC: Lower Middle Income Countries, LIC; Low Income Countries, d: first difference, Y: log of Real GDP.

Table 2: Long-Term Relationships Obtained through Cointegrating Vectors in Selected Models

Long-Term Relationships Obtained through Cointegrating Vectors in Selected Models having Cointegration						
GDP: 1962-2006						
List of variables included in the cointegrating vector: Y_USA, Y_HIC1, Y_UMC, Y_LMC, Y_LIC,						
Trend						
Imposed Restriction: a1=1						
	Y_USA	Y_HIC1	Y_UMC	Y_LMC	Y_LIC	Trend
Vector: a	1	-0.0704	-0.1077*	-0.6968**	0.2227	0.000
Std. Error	(NONE)	(0.1098)	(0.0651)	(0.2768)	(0.2784)	(NONE)
LR Test of additional restrictions (a7 = 0): CHSQ (1) = 2.897[.089]						
LL subject to exactly identified restrictions = 671.386 LL subject to over- identified restrictions = 669.9375						
GDP: 1962-1990						
List of variables included in the cointegrating vector: Y_USA, Y_HIC1, Y_UMC, Y_LMC, Y_LIC,						
Trend						
Imposed Restriction: a1=1						
	Y_USA	Y_HIC1	Y_UMC	Y_LMC	Y_LIC	Trend
Vector: a	1	0.1656**	-0.1305**	-0.719*	0.1725	0.000
Std. Error	(NONE)	(0.0786)	(0.0683)	(0.1583)	(0.2095)	(NONE)
LR Test of additional restrictions (a7 = 0): CHSQ (1) = 2.1922[.139]						
LL subject to exactly identified restrictions = 445.254 LL subject to over- identified restrictions = 444.1575						
GDP: 1980-2006						
List of variables included in the cointegrating vector: Y_USA, Y_HIC1, Y_UMC, Y_LMC, Y_LIC,						
Trend						
Imposed Restriction: a1=1						
	Y_USA	Y_HIC1	Y_UMC	Y_LMC	Y_LIC	Trend
Vector: a	1	-0.2148+	-0.3531***	0.9104*	-0.6662*	0.0000
Std. Error	(NONE)	(0.1444)	(0.2283)	(0.1067)	(0.2338)	(NONE)
LR Test of additional restrictions (a7 = 0): CHSQ (1) = 1.450[0.229]						
LL subject to exactly identified restrictions = 463.596 LL subject to over- identified restrictions = 462.871						

Table 3: VEC Granger Causality/Block Exogeneity Wald Tests for Money market rates of United states and rest of the World (ROW) represented by principal component for money markets rates in 29 countries

Granger Causality						
Framework	Equation Dependent Variable	Excluded Variable	Probability			
			1976M4-2009M10	1991M1-2009M10	2000M1-2009M10	
VEC (3)	dMMR_ROW	ECM, dMMR_USA	0.000	No Cointegration	No Cointegration	
	dMMR_USA	ECM, dMMR_ROW	0.310			
Unconstrained VAR (3)	dMMR_ROW	dMMR_USA	0.000	0.006	0.014	
	dMMR_USA	dMMR_ROW	0.480	0.178	0.23	
	Unit Root Tests for Residuals: Null: Unit root (assumes individual unit root process)					
	Method			Prob.	Prob.	Prob.
	Im, Pesaran and Shin W-stat			0.000	0.000	0.000

	ADF - Fisher Chi-square		0.000	0.000	0.000
	PP - Fisher Chi-square		0.000	0.000	0.000

Table 4: Long-Term Relationships between MMR_ROW and MMR_USA obtained through Cointegrating Vectors

Long-Term Relationships Obtained through Cointegrating Vectors in Selected Models having Cointegration		
<u>MMR 1976M4- 2009M10</u>		
List of variables included in the cointegrating vector: MMR_ROW, MMR_USA		
Imposed Restriction: a1=1		
	MMR_ROW	MMR_USA
Vector: a	1	-1.1362*
Std. Error	(NONE)	-0.1867
LL subject to exactly identified restrictions = 647.257		

Table 5: VEC Granger Causality/Block Exogeneity Wald Tests for international call money rates represented by LIBOR3 and Federal Fund option (FFO) (monthly data)

Granger Causality					
Framework	Equation Dependent Variable	Excluded Variable	Probability		
			1963M4-2009M11	1991M1-2009M11	2000M1-2009M10
VEC (3)	dLIBOR3	ECM, FFO_USA	0.000	0.000	No Cointegration
	dFFO_USA	ECM, dLIBOR3	0.000	0.036	
Unconstrained VAR (10)	dFFO_USA	dLIBOR3	0.000	0.000	0.000
	dLIBOR3	dFFO_USA	0.000	0.000	0.000
	Unit Root Tests for Residuals: Null: Unit root (assumes individual unit root process)				
	Method		Prob.	Prob.	Prob.
	Im, Pesaran and Shin W-stat		0.000	0.000	0.000
	ADF - Fisher Chi-square		0.000	0.000	0.000
	PP - Fisher Chi-square		0.000	0.000	0.000

Table 6:

Long-Term Relationships Obtained through Cointegrating Vectors in Selected Models having Cointegration
LIBOR3-FFO USA: 1963M4 - 2009M11

List of variables included in the cointegrating vector:

Imposed Restriction: a1=1

	LIBOR3	FFO_USA
Vector: a	1	-1.0371*
Std. Error	(NONE)	-0.0265

LL subject to exactly identified restrictions = 648.2526

LIBOR3-FFO USA: 1991M1 - 2009M11

List of variables included in the cointegrating vector:

Imposed Restriction: a1=1

	LIBOR3	FFO_USA
Vector: a	1	-0.9798*
Std. Error	(NONE)	-0.0339

LL subject to exactly identified restrictions = 167.674. LL subject to over identified restrictions = 2031.5

Table 7: Changing composition of international reserves

	Total				Advanced Economies		Emerging & Developing Economies	
	1973*	1987*	1995	2008	1995	2008	1995	2008
U.S. dollars	84.5		59.0	64.1	54.2	67.7	71.9	60.3
pounds sterling	5.9		2.1	4.1	2.1	2.8	2.1	5.3
Deutsche mark	6.7		15.8	-	16.1	-	14.8	-
French francs	1.2		2.4	-	2.3	-	2.5	-
Japanese yen		7.0	6.8	3.2	7.2	4.5	5.7	1.9
Swiss francs	1.4	1.5	0.3	0.1	0.2	0.2	0.7	0.1
Netherlands guilder			0.3	-	0.3	-	0.3	-
ECUs		5.7	8.5	-	11.7	-	0.1	-
Euros			0.0	26.5	-	22.6	-	30.6
other currencies		3.4	4.8	2.0	5.9	2.2	1.8	1.9
Allocated (known)			74.4	62.9	82.0	87.7	59.7	48.4
Unallocated			25.6	37.1	18.0	12.3	40.3	51.6

Basic data: COFER, IMF; * from Barry Eichengreen (2005)

Table 8: Equations from VAR estimates for CPI inflation in United States and Granger Causality between Inflation and Output Gap

Equations from VAR estimates for CPI inflation in United States: Dependent Variable INFCPI						
Variables included in VAR: INFCPI, GAP_IIPUSA; Exogenous Variables: constant (C), INF_WOP						
	1971M01 - 1990M12		1991M01 - 2009M06		2000M01 - 2009M06	
	Coefficient	T-Stat	Coefficient	T-Stat	Coefficient	T-Stat
INFCPI(-1)	1.1945	[18.32]	1.2288	[18.99]	1.1945	[11.96]
INFCPI(-2)	-0.1260	[-1.24]	-0.5355	[-5.54]	-0.5991	[-4.31]
INFCPI(-3)	-0.0908	[- 1.43]	0.2369	[4.23]	0.2437	[3.00]
GAP_IIPUSA(-1)	0.0102	[1.00]	0.0146	[1.27]	0.0155	[0.69]
GAP_IIPUSA(-2)	0.0081	[0.69]	0.0073	[0.64]	0.0225	[1.03]
GAP_IIPUSA(-3)	0.0057	[0.58]	0.0005	[0.04]	-0.0015	[-0.07]
C	0.0011	[2.30]	0.0015	[2.19]	0.0034	[2.18]
INFWOP	0.0066	[4.27]	0.0135	[7.72]	0.0194	[6.34]
INFWOP(-1)	0.0001	[0.02]	-0.0041	[-1.41]	-0.0084	[-1.62]
INFWOP(-2)	-0.0047	[-2.87]	-0.0060	[-2.88]	-0.0041	[-1.05]
R-squared	0.9904		0.9332		0.9398	
Adj. R-squared	0.9900		0.9303		0.9339	
Mean dependent	0.0607		0.0268		0.0259	
S.D. dependent	0.0301		0.0104		0.0129	
Unit Root Tests for Residuals: Null: Unit root (assumes individual unit root process)						
Method		Prob.		Prob.		Prob.
Im, Pesaran and Shin W-stat	-5.1940	0.0000	-3.5170	0.0000	-7.9130	0.0000
ADF - Fisher Chi-square	38.0530	0.0000	21.7300	0.0000	34.0680	0.0000

PP - Fisher Chi-square	239.2770	0.0000	228.2770	0.0000	65.1560	0.0000
Granger Causality/Block Exogeneity Wald Tests for Output Gap (GAP_IIPUSA)						
Excluded Variables		Prob.		Prob.		Prob.
GAP_IIPUSA		0.0480		0.3730		0.5760
INFCPI		0.0000		0.0000		0.0000
Variable deletion Test for Exogenous variable INF_WOP						
		Prob.		Prob.		Prob.
INF_WOP		0.0000		0.0000		0.0000

Table 9: Interest Rate Regimes in Selected countries: Overnight Money market rates

		76-09		1991-09		2001-09	
		Mean	CV	Mean	CV	Mean	CV
Japan	A	3.4	93.8	1.1	172.8	0.1	141.6
Germany	A	4.9	50.0	4.1	54.0	2.9	37.9
United States	A	6.2	59.2	3.9	47.0	2.7	65.5
Australia	IT	8.4	45.3	5.8	26.3	5.3	19.1
Korea, Republic of	IT	10.9	52.6	8.2	63.2	4.0	21.0
South Africa	IT	11.9	37.3	11.5	29.9	9.0	22.0
New Zealand	IT	9.3	65.0	6.7	27.0	6.2	23.5
Finland	IT	7.9	61.0	4.8	68.3	3.1	35.9
Spain	IT	9.5	66.9	5.6	68.4	2.9	37.5
Canada	IT	7.2	57.6	4.3	44.9	3.0	39.6
United Kingdom	IT	7.8	50.0	5.6	39.5	4.2	32.1
Malaysia	D	4.9	44.0	4.7	47.8	3.0	13.6
Thailand	D	8.2	64.5	5.7	87.9	2.5	49.9
Singapore	D	4.3	64.7	2.6	55.7	1.7	56.5
Philippines	D	12.3	46.4	10.5	43.1	7.1	19.6
Pakistan	D	8.5	35.7	8.7	43.9	7.4	49.8
India	D	9.1	48.4	8.7	62.7	6.0	30.1

Basic data: IFS

Appendix

Table A-1: Description of Regression Variables

Sl. No.	Symbol	Description	Data Sources
1	Y_USA	Real GDP at 2000 US\$ prices of the United States	WDI CDROM 2008
2	Y_HIC1	Real GDP at 2000 US\$ prices of the High Income Countries less that of the United States	WDI CDROM 2008
3	Y_UMC	Real GDP at 2000 US\$ prices of Upper Middle Income countries	WDI CDROM 2008
4	Y_LMC	Real GDP at 2000 US\$ prices of Lower Middle Income countries	WDI CDROM 2008
5	Y_LIC	Real GDP at 2000 US\$ prices of Low Income Countries	WDI CDROM 2008
6	ECM	Error Correction Term obtained from Co-integration	calculation
7	MMR_USA	Money Market Rates in United States	IFS
8	MMR_ROW	Money Market Rates in Rest of the World	Calculated as Principal Component from consistent data obtained from IFS for selected countries
9	LIBOR3	London Interbank Overnight Rates for 3-month maturity deposits of US\$	Monthly data from IFS-IMF and Daily Data from LBA
10	FFO	Overnight Federal Fund rates	Monthly data from IFS-IMF and Daily data from Fed Web site
11	INFCPI	Year to Year Inflation in Consumer Price Index of the United States	Calculated from Monthly data obtained from IFS-IMF
12	GAP_IIPUSA	Output Gap obtained by de-trending Index of Industrial Production in the United States using HP-Filter	Basic data on IIP for United States obtained from IFS-IMF
13	INFWOP	Inflation in World Oil Prices	IFS-IMF
14			

Table A2: Unit Root Test of variables used in the paper

Variables	ADF		ADF-GLS (ERS)		PP		KPS		ERS (Point Optimal)		NP (MZa)		Inference (based on majority)
	LEVEL	FIRST DIFFERENC E	LEVEL	FIRST DIFFERENC E	LEVEL	FIRST DIFFERENC E	LEVEL	FIRST DIFFERENC E	LEVEL	FIRST DIFFERENC E	LEVEL	FIRST DIFFERENC E	
MMR_USA	-1.64	-4.89	-1.64	-4.48	-1.52	12.51	1.47	0.12	4.78	0.25	-5.47	-98.44	I-1
MMA_ROW	-0.52	-20.52	-0.72	-19.43	0.56	-20.52	1.71	0.37	13.29	0.12	-1.56	-205.63	I-1
1% Critical Values	-3.45		-2.57		-3.45		0.74		1.99		-13.80		
5% Critical Values	-2.86		-1.94		-2.87		0.46		3.26		3.17		
LIBOR 3	-0.81	-26.24	0.68	-2.50	-0.70	-189.00	6.16	0.13	38.70	0.01	1.02	-1959.21	I-1
FFO	-0.49	-24.27	1.29	-0.39	-3.64	-153.42	6.24	0.04	5.46	0.12	-4.98	-235.41	I-1
1% Critical Values	-3.43		-2.57		-3.43		0.74		1.99		-13.80		
5% Critical Values	-2.86		-1.94		-2.86		0.46		3.26		-8.10		
INF_CPI	-1.98	-8.23	-1.96	-2.42	-2.08	-16.49	0.51	0.97	0.99	0.17	-10.25	-154.19	I-0
GAPIIP	-8.31	-10.29	-2.30	-0.64	-12.13	-38.10	0.01	0.01	0.30	0.33	-117.40	-76.10	I-0
INF_WOP	-4.33	-12.24	-4.35	-12.24	-5.34	-19.79	0.10	0.02	0.69	0.09	-57.86	-315.06	I-0
1% Critical Values	-3.44		-2.57		-3.44		0.74		1.99		-13.80		
5% Critical Values	-2.87		-1.94		-2.87		0.46		3.26		-8.10		
GDP_USA	-1.27	-5.17	0.73	-5.13	-1.83	-5.10	0.90	0.27	4248.76	2.71	1.97	-8.88	I-1
GDP_HIC1	-3.16	-2.99	0.34	-2.32	-6.08	-2.99	0.87	0.65	3615.79	4.54	1.53	-7.83	I-1
GDP_UMC	-1.83	-3.53	0.77	-3.04	-2.95	-3.54	0.85	0.44	1065.37	2.42	1.67	-11.92	I-1
GDP_LMC	0.05	-7.77	0.05	-0.29	1.56	-7.33	0.89	0.26	2095.27	39.69	2.25	-0.65	I-1
GDP_LIC	-2.87	-4.50	1.25	-4.40	3.57	-4.54	0.89	0.76	4504.24	1.96	2.63	-19.90	I-1
GDP_WLD1	-2.50	-3.03	0.60	-1.49	-4.46	-3.03	0.88	0.56	3520.24	2.91	1.73	-10.04	I-1
1% Critical Values	-3.58		-2.62		-3.58		0.74		1.87		-13.80		
5% Critical Values	-2.93		-1.94		-2.93		0.46		2.97		-8.10		
FFO_M	-2.37	-7.57	-1.85	-7.14	-2.18	-14.51	0.80	0.12	4.09	0.16	-6.30	-157.66	I-1
LIBOR 3_M	-2.07	-8.31	-1.69	-8.27	-2.35	-17.24	0.95	0.11	3.44	0.12	-7.60	-201.19	I-1
1% Critical Values	-3.44		-2.57		-3.44		0.74		1.99		-13.80		
5% Critical Values	-2.87		-1.94		-2.87		0.46		3.26		-8.10		
Velocity	0.46	-4.61	-0.16	-4.73	0.12	-4.80	0.62	0.39	20.38	0.85	0.34	-21.68	I-1
1% Critical Values	-3.58		-2.62		-3.58		0.74		1.87		-13.8		
5% Critical Values	-1.95		-2.93		-2.93		0.463		2.97		-8.1		

Notes: In all the cases the lag lengths are automatically selected using modified Akaike Criteria. In the case of PP and KPSS, ERS, and NP (Mza) methods the frequency zero spectrum used are obtained from Kernel (Bartlett) sum-of-variances, AR spectral regression (OLS) and AR spectral regression (GLS-de-trended) methods respectively. However, Mza1 statistics corresponding to frequency zero spectrums obtained from AR spectral regression (OLS). ADF test includes constant and trend.

Ng-Perron MZa Null Hypothesis: variable has a unit root

ERS Null Hypothesis: variable has a unit root

KPSS Null Hypothesis: variable is stationary

PP Null Hypothesis: variable has a unit root

ADF Null Hypothesis: variable has a unit root

Table A3: Test Results for Cointegration in Selected Sets of Variables

Cointegration Test Results									
Variables: MMR_ROW MMR_USA									
Order of VAR =3									
Structure: Cointegration with unrestricted intercept and no trend in the VAR									
Maximum Eigen value Test				Trace Test				No. of vectors selected (r)	
Null Hypothesis	Alternative Hypothesis	Statistic	95% Critical Value	Null Hypothesis	Alternative Hypothesis	Statistic	95% Critical Value		
Period: 1976M4 - 2009M10 VAR-3									
r = 0	r = 1	26.36	14.88	r = 0	r = 1	28.04	17.86	1	
r <= 1	r = 2	1.68	8.07	r <= 1	r <= 2	1.68	8.07		
r <= 2	r = 3			r <= 2	r <= 3				
Period: 1991M1 - 2009M10 VAR-3									
r = 0	r = 1	12.28	14.88	r = 0	r = 1	15.44	17.86	-	
r <= 1	r = 2	3.16	8.07	r <= 1	r <= 2	3.16	8.07		
r <= 2	r = 3			r <= 2	r <= 3				
Period: 2000M4 - 2009M10 VAR-3									
r = 0	r = 1	12.80	14.88	r = 0	r = 1	15.63	17.86	1	
r <= 1	r = 2	2.83	8.07	r <= 1	r <= 2	2.83	8.07		
r <= 2	r = 3			r <= 2	r <= 3				
Variables: LIBOR3 FFO									
Order of VAR =3									
Structure: Cointegration with unrestricted intercept and no trend in the VAR									
Maximum Eigen value Test				Trace Test				No. of vectors selected (r)	
Null Hypothesis	Alternative Hypothesis	Statistic	95% Critical Value	Null Hypothesis	Alternative Hypothesis	Statistic	95% Critical Value		
Period: 1963M4-2009M11 VAR-3									
r = 0	r = 1	36.94	14.88	r = 0	r = 1	41.97	17.86	1	
r <= 1	r = 2	5.02	8.07	r <= 1	r <= 2	5.02	8.07		
Period: 1991M1-2009M11 VAR-3									
r = 0	r = 1	19.75	14.88	r = 0	r = 1	22.88	17.86	1	
r <= 1	r = 2	3.13	8.07	r <= 1	r <= 2	3.13	8.07		
Period: 2000M1-2009M11 VAR-3									
r = 0	r = 1	9.92	14.88	r = 0	r = 1	12.23	17.86	-	
r <= 1	r = 2	2.31	8.07	r <= 1	r <= 2	2.31	8.07		
Variables: Y_USA, Y_HIC1, Y_UMC, Y_LMC, Y_LIC, Trend									
Structure: Cointegration with unrestricted intercept and no trend in the VAR									
Maximum Eigen value Test				Trace Test				No. of vectors selected (r)	
Null Hypothesis	Alternative Hypothesis	Statistic	95% Critical Value	Null Hypothesis	Alternative Hypothesis	Statistic	95% Critical Value		
Period: 1962-2006 VAR-3									
r = 0	r = 1	39.96	37.86	r = 0	r = 1	122.72	87.17	1	
r <= 1	r = 2	36.69	31.79	r <= 1	r <= 2	82.76	63.00		
r <= 2	r = 3	23.42	25.42	r <= 2	r <= 3	46.07	42.34		
Period: 1962-1990 VAR 3									
r = 0	r = 1	57.74	37.86	r = 0	r = 1	132.68	87.17	1	
r <= 1	r = 2	25.56	31.79	r <= 1	r <= 2	74.94	63.00		
r <= 2	r = 3	20.36	25.42	r <= 2	r <= 3	49.37	42.34		
Period: 1980-2006 VAR 3									
r = 0	r = 1	40.48	37.86	r = 0	r = 1	131.89	87.17	1	
r <= 1	r = 2	38.83	31.79	r <= 1	r <= 2	91.41	63.00		
r <= 2	r = 3	32.62	25.42	r <= 2	r <= 3	52.58	42.34		

As of April 2010