CAPITAL INFLOWS AND THE DEMAND FOR MONEY IN SOUTH ASIAN COUNTRIES

By

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Abstract

The aim of this paper is to estimate the real demand for money in three South Asian Countries – Bangladesh, India and Pakistan – allowing for the possible effect of foreign exchange inflows (which have tended to increase in recent years). As identifying the stability of estimated elasticities is an important concern, we employ cointegration analyses allowing for structural breaks.

JEL Classification: E41, O11, O23

Keywords: Money Demand, South Asia, Cointegration and Structural Breaks.

1. Introduction

The aim of this paper is to estimate the real demand for money, i.e. the money demand function (MDF), in three South Asian Countries – Bangladesh, India and Pakistan. One of the most important issues in this literature is whether the parameters of the MDF are stable. A stable MDF is crucial to the theory and application of macroeconomic policies as it provides a reliable and predictable link between changes in monetary aggregates and changes in variables included in the MDF (Siddiki, 2000a; Deadman *et al.*, 1981; Ericsson, 1998; Ghatak, 1995; Judd *et al.*, 1982). A stable MDF is particularly important in the context of the three South Asian countries as they have recently undergone financial liberalisation, targeting monetary growth in order to increase saving and the level and efficiency of investment to support increased economic growth and living standards. To test for stability in our analysis, we use cointegration analysis with structural breaks following Gregory and Hansen (1996).

The analysis is based on quarterly data from the mid-1970s to early 2000s, which therefore includes the period since the early 1990s when these countries, to a greater or lesser extent, implemented economic reforms. This suggests the desirability of allowing for structural breaks. Some of the reforms may impact directly on the MDF, such as financial liberalisation facilitating a more 'market determined' interest rate. Others may have an indirect effect via money supply, in particular opening up of the economy so that the level of foreign exchange inflows increases. Trade liberalisation is expected to ultimately increase incentives to exporters; if the balance of payments improves there is an increase in foreign exchange inflows. More importantly, in this context, liberalisation of investment and the capital account may increase inflows of foreign exchange through foreign direct investment (FDI) or private capital.

The ability of the monetary authorities to accommodate foreign exchange inflows has implications for money demand and monetary policy. We address this issue by examining the pass-through effect from foreign exchange inflows to money demand. A complete pass-through occurs when an increase in foreign exchange inflows is fully reflected in a rise in the monetary base without affecting net domestic monetary assets: the concerned government or central bank is unable to adjust (i.e. control) net domestic assets through its sterilisation programmes. On the other hand, no pass-through effect indicates that an increase in foreign exchange inflows is offset by a reduction of net domestic assets, implying that the government has complete control on domestic assets to accommodate foreign inflows. Incorporating this in the money demand function permits us to consider the effects of external liberalisation.

Bahmani-Oskooee and Rehman (2005), which includes references to the existing literature on Asian economies, is the closest in spirit to the current study (although they do not consider foreign exchange inflows). Their primary concern is that finding cointegration does not in itself ensure parameter stability, especially in the presence of structural breaks, so long-run estimates need to be augmented by short-run dynamics. They estimate the MDF for seven Asian economies, including India and Pakistan but not Bangladesh, using the Autoregressive Distributed Lag (ARDL) method as this allows one to combine stationary and non-stationary variables and obviates the need to test for unit roots. From our perspective, their main finding is that while the MDF for the M1 monetary aggregate is cointegrated with stable elasticities for India, for Pakistan stability is only found for the M2 measure. Hossain (1996) and Siddiki (2000a) are among the few studies that estimate the demand for money in Bangladesh, but neither examines the impact of foreign exchange inflows nor allows for regime shifts. In addition, the coefficient on income (the marginal propensity to consume, MPC) in Siddiki (2000a) is 3.26 and in Hossain (1996) within the range of 2.64-3.96. These high values of MPC are economically less plausible and not sustainable in the long-run.

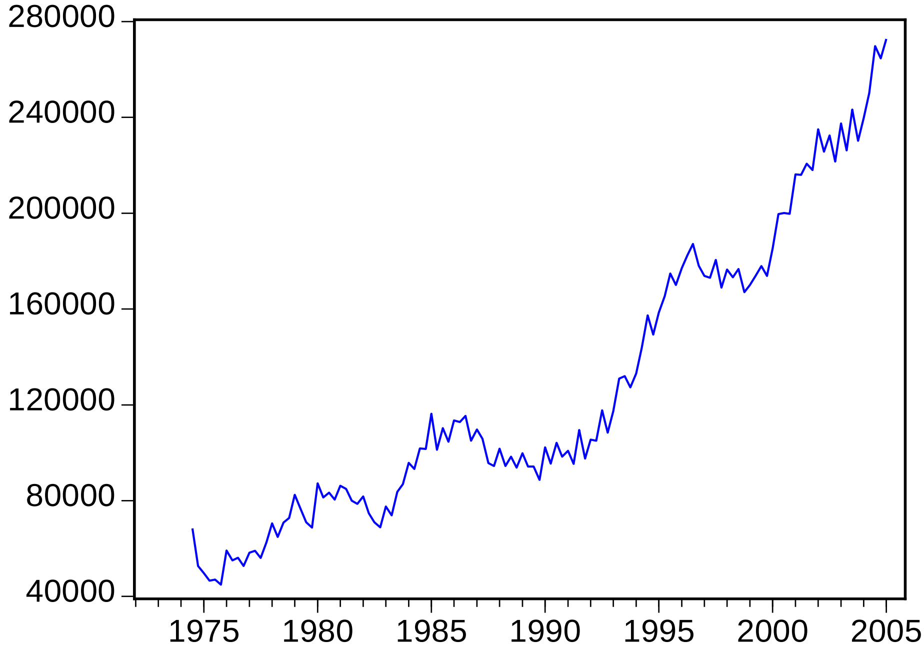
This paper contributes to the literature by including foreign exchange inflows and allowing for regime shifts. Tests for cointegration that follow Engle and Granger (1986) presume that the cointegrating vector is time-invariant, the long-run equilibrium represents a stable underlying relationship. This is not appropriate if the relationship between the variables of interest experiences a structural break within the sample period. Identifying the existence of such regime shifts is important as unacknowledged regime changes might lead to mis-specification bias in model estimation and to mis-diagnosis of the time-series properties of the data. Cointegration with regime shifts is particularly important for the South Asian countries that have recently undertaken financial and external liberalisation.

This paper is organised as follows: Section 2 provides an overview of relevant financial and economic policies and trends in Bangladesh, India and Pakistan. In section 3, we explain the theory and model specification used in the analysis, specifically the method of cointegration analysis with regime shifts. We estimate a standard MDF where real money demand is determined by real income and interest rates, augmented with real foreign capital inflows. Section 4 presents and discusses the empirical results while Section 5 draws conclusions and policy implications.

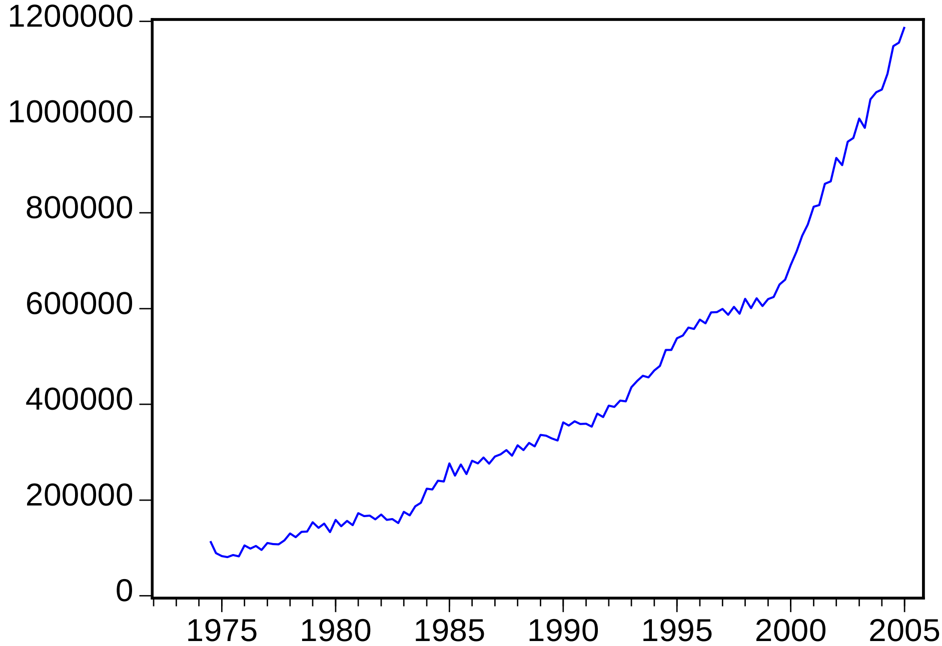
2. Overview of Economic Policy in Bangladesh, India and Pakistan

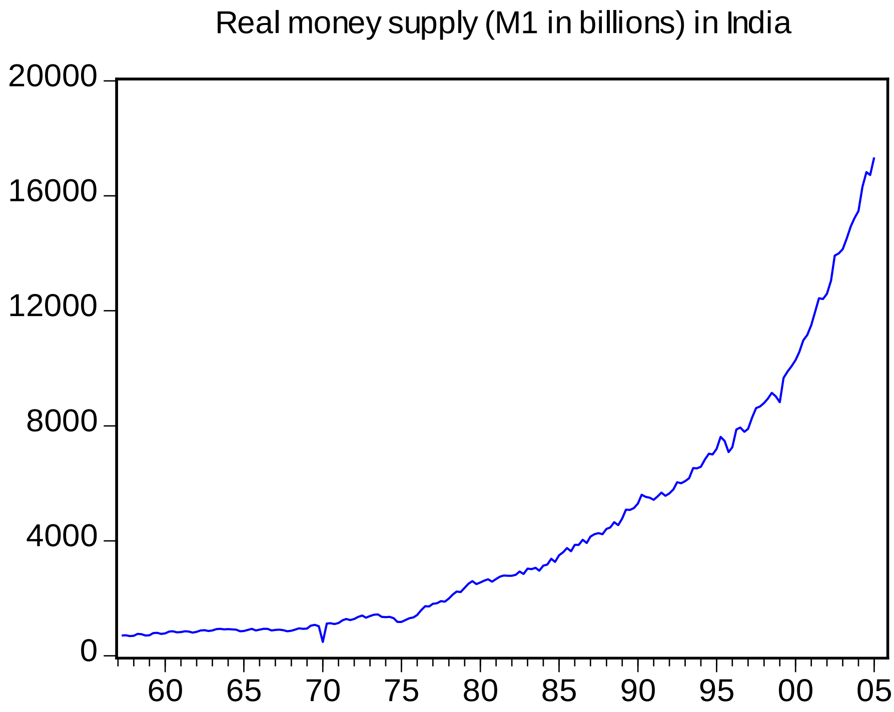
The aim of this section is not to review macroeconomic policy in any detail but rather to discuss the most important policy reforms that may have implications for money demand in Bangladesh, India and Pakistan. Each country is considered in turn, and the section includes a discussion of trends in the variables used in the subsequent analysis. The following graphs include the real money supply (M1 and M2) in Bangladesh, India and Pakistan. Structural breaks are apparent for M1 in 1982 and 1990 in Bangladesh and for M1 in 1975 in Pakistan but not obvious in India.

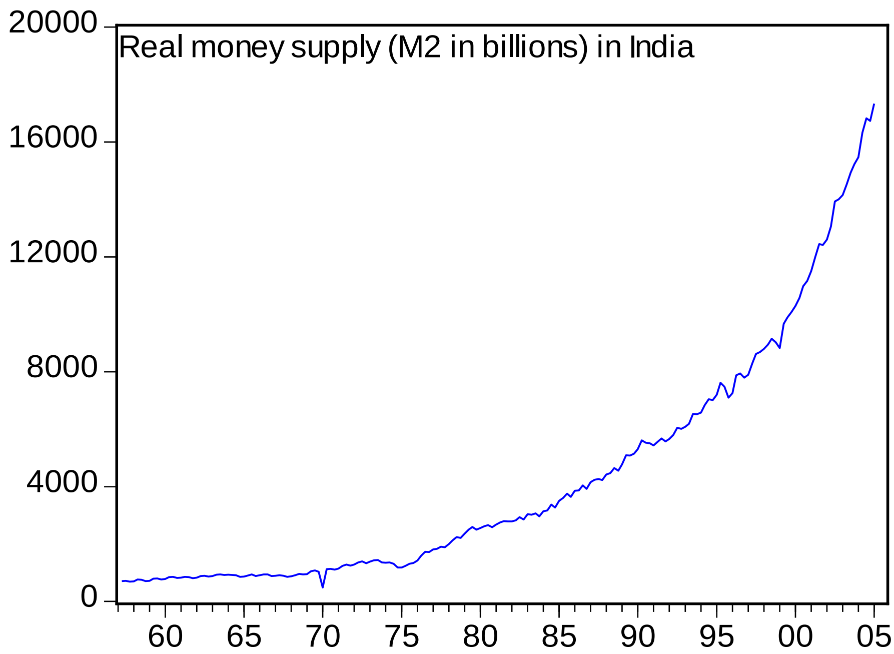
Real money supply (M1 in millions) in Bangladesh

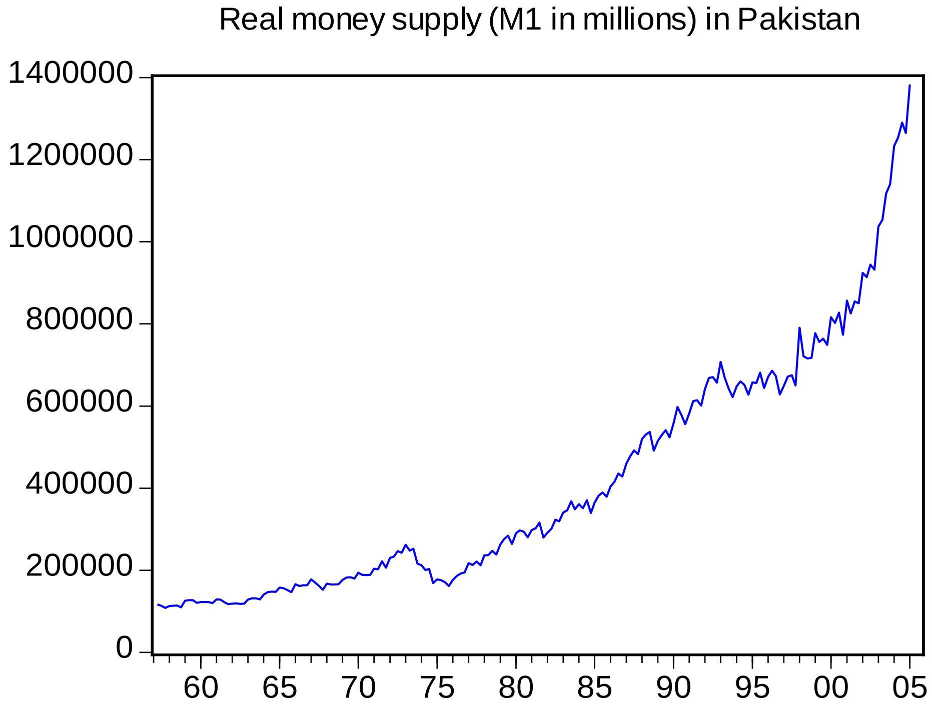


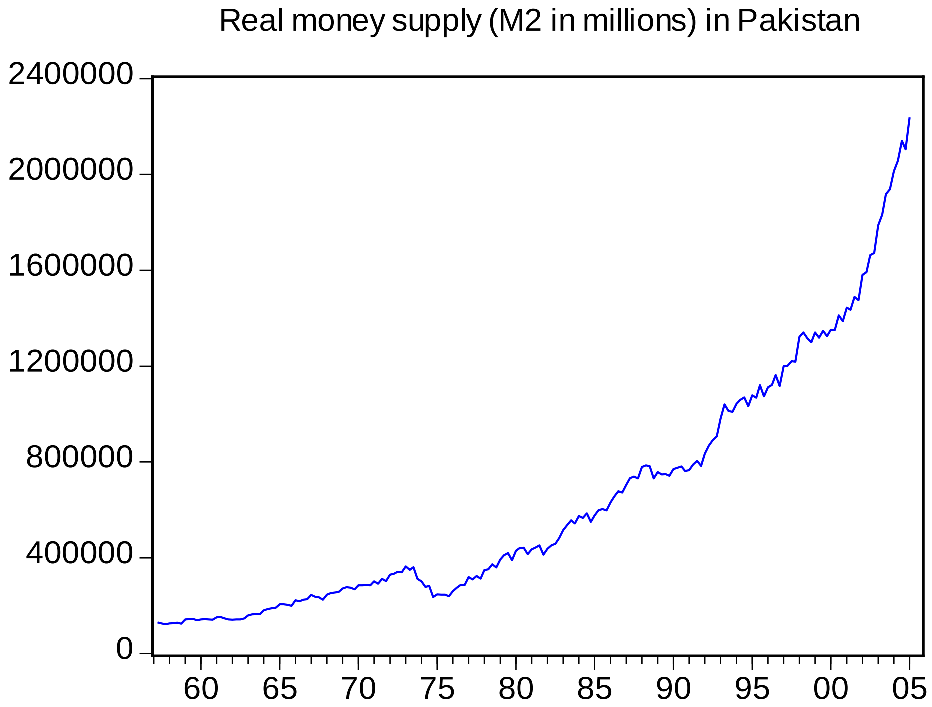
Real money supply (M2 in millions) in Bangladesh




Real money supply (M1 in billions) in India
20000
16000
12000
8000
4000
0
60
65
70
75
80
85
90
95
00
05


Real money supply (M2 in billions) in India
20000
16000
12000
8000
4000
0
60
65
70
75
80
85
90
95
00
05


Real money supply (M1 in millions) in Pakistan
1400000
1200000
1000000
800000
600000
400000
200000
0
60
65
70
75
80
85
90
95
00
05


Real money supply (M2 in millions) in Pakistan
2400000
2000000
1600000
1200000
800000
400000
0
60
65
70
75
80
85
90
95
00
05

2. 1 Bangladesh[1]

Historically, Bangladesh has had an underdeveloped and inefficient financial system with low levels of intermediation, tight state control (including government ownership of the largest banks and nominal interest rates controlled and fixed by the Bangladesh Bank, the central bank) and a lack of competition. The controlled regime from 1971 to 1986 exhibited a variety of features of financial repression, in particular government over-borrowing and directed credit towards 'preferential' sectors, while controlled nominal interest rates with high inflation resulted in negative real interest rates for most of the period. Repressive interest rate policies were an instrument to limit the strain on the government budget, yet budget deficits remained around 7-9% during 1971-1995 (Siddiki, 2000a). The high rate of inflation with administratively determined lower levels of nominal interest rates caused real interest rates to be negative until 1985. Liberalisation began slowly from 1986, and had fairly rapid effects on interest rates (real rates were mostly positive after 1986) but a slower impact on the budget deficit, which only fell to 3-6% during 1997 -2005 (ADB, 2005: 27).

Financial markets have been relatively inefficient at financial intermediation: average interest rate spreads (the difference between prime lending and commercial bank deposit rates) have been high relative to other countries since 1990 (IMF, 2005: 6), while broad money as a per cent of GDP has been consistently below the average for low-income and other South Asian countries throughout the period 1976–2003. Since the late 1990s, however, interest rate spreads have declined and the broad money ratio has risen as the economy has become more monetized. These positive outcomes of banking and financial sector reforms are also reflected in lower rates of inflation (from six percent in 1987-1995 to four percent in 1996-2003) and higher GDP growth rates (from 3.8% in 1976-85 to 4.8 percent in 1996-2003 and above 5% more recently).

Capital inflows have always been important for Bangladesh, although the composition has changed – the importance of foreign aid has declined since the 1970s whereas remittances have risen to more than six percent of GDP in 2004. The country also received large amounts of foreign assistance over the past 30 years, though this has fallen

[1] This section is based on Siddiki (2000a) and IMF (2005) if not stated otherwise.

off since the mid-1990s. The levels of FDI have always been low, partly because Bangladesh has been a relatively closed economy (IMF, 2005: 7) but perhaps largely because of the lack of attractive investment opportunities. Restrictive exchange rate policies may have deterred capital inflows: the fixed exchange rate policy of 1971-1979, associated with black market premiums (as a percentage of unofficial rates) as high as 49%, was replaced by a "managed flexible" regime in 1979 (Rahman, 1993; Cowitt, 1996), although black market premiums rose to about 66% in 1985-1992. In April 1994, restrictions on most current account transactions were lifted and further liberalisation measures were implemented (GOB, 1995; World Bank, 1995), reflected in a decline in premiums from to about 30% in 1993-1995. However, it is only as recently as May 2003 that Bangladesh floated the Taka and could claim to have a liberalised exchange rate. In summary, at least until the mid-1990s, Bangladesh can be characterised by high levels of financial repression, low openness, high black market premiums and low levels of saving, investment and real GDP growth.

2.2 India[2]

Although India had a relatively liberal financial policy in the 1950s, it can be described as a relatively closed (to trade and investment) and controlled (in terms of financial and exchange rate policy) economy until the early 1990s, and a largely planned economy during the 1950s and 1960s (Demetriades and Luintel, 1997; Joshi and Little, 1994; Sen and Vaidya, 1998). While some liberalisation began in the mid 1980s, most commentators date liberalisation from 1991, although imports of consumer goods are still restricted: tariffs, especially in agriculture, remain among the highest in the world, foreign exchange is strictly regulated (World Bank, 1994: 224; IMF, 1997) and black market premia are high (Siddiki, 2000b). Reforms since 1991 saw a reduction in non-agricultural tariffs and removal of exchange rate controls and trade liberalisation had a visible effect on trade performance (Panagariya, 2004): the ratio of total exports of goods and services to GDP almost doubled from 7.3 percent in 1990 to 14 percent in 2000.

[2] This section is largely based on Siddiki (2000b) and Daly and Siddiki (2002).

Financial repression, as indicated by quantitative controls on financial intermediation, seignorage (Kletzer and Kohli, 2001: 21), preferential interest rates and reserve requirements (cash reserves and statutory liquidity ratios), increased from 1969 through 1984 and only began to decline after 1988 (Demetriades and Luintel, 1997). The Government of India nationalised the 14 largest commercial banks in 1969 and another six in 1980, with public sector banks accounting for 86% of deposits in 1970 and 92% after 1980 (when directed credit amounted to 40% of total credit), in line with the aim for 'social control' over commercial banks (Demetriades and Luintel, 1997; Joshi and Little, 1994; Sen and Vaidya, 1998). From the late 1980s the financial sector was gradually liberalised, with removal of ceilings on lending rates in 1989 and concessionary lending rates in 1990 (Demetriades and Luintel, 1997).

Reforms have been gradual but sustained since 1991: interest rates have been deregulated, controls on capital inflows have been relaxed, the rupee has been made convertible for current account transactions and during the 1990s 'restrictions on foreign direct investment, portfolio borrowing, and foreign equity ownership have been relaxed' (Kletzer, 2004: 236). Such reforms have helped to reverse the adverse effects of financial repression and have encouraged an increase in capital inflows – international reserves increased from some two per cent of GDP in 1990-91 to 16% in 2002-03 (Kletzer, 2004: 254). Joshi and Sanyal (2004) observe that the 2000s witnessed a surge of foreign capital inflows to India, but the strategy of reserve accumulation and a managed exchange rate with capital controls enabled the monetary authorities to manage the inflow. The increase in reserves 'was driven by invisibles (remittances and software exports), banking capital and other capital' (Joshi and Sanyal, 2004: 155). Although the details differ, the scenario is similar: after a period of prolonged financial repression, the period since the early 1990s has been one of gradual liberalisation and increasing foreign exchange inflows in Bangladesh and India.

2.3 Pakistan[3]

The financial sector in Pakistan has been controlled and repressed by the government, which compelled the sector to direct credits to preferential agricultural and industrial

[3] This section is based on Ahmed (2005) and Hussain (2005)

projects and also to finance budget deficits. Nominal interest rates were controlled and fixed. Although the traded or external sector was relatively liberalised, the capital and current accounts were closed and exchange rates were fixed along with stringent financial suppression. All banks operating in Pakistan exclusively owned by Pakistani nationals were nationalised in 1974 with the objectives of directing bank credits towards the preferential sectors or projects ensuring government funding (Patti and Hardy, 2005: 2384). Until 1980, financial repression along with restrictions in the external sector and the nationalisation of the financial and industrial sectors misallocated scarce national resources and created inefficiency. In 1984-90, the efforts were focused to reduce and eventually eliminate these subsidies without significant success.

In the early 1990s, the economy experienced serious economic and financial crisis and a substantial decline in foreign reserves which pushed the country several times to a point of bankruptcy. It took some efforts to undertake reforms with a wider focus on the foreign exchange and trade sector, privatisation and on the financial sector. However, the outcomes from these reforms were frustrating, reflected in poor performances of economic growth, caused by serious political instability and corruption. In the later half of the 1990s, the non-performing loans of the private sector worsened, reaching loan defaults of about seven percent of GDP in 1997. The country also encountered serious problems in the external sectors: remittances from nationals working abroad declined and the demand for exports fell. The allocation of funds to service external debt increased: foreign debt in 1999 was US$28 billion, 44.5 percent of GDP.

The post-September 11 events gave Pakistan opportunities to become an ally of the US-led war against terrorism. Economic sanctions (imposed after it declared itself as a nuclear power in 1999) were gradually removed and foreign debts were rescheduled or written off. Remittances recovered and foreign exchange reserves reached their highest level of US$14 billion in 2003. Macroeconomic stability has been achieved through reduction in fiscal deficits, a major and perceptible liberalisation of foreign exchange regime, acquiring a surplus on the current account balance of payments, lowering of inflation and a transformation of debt profile. The impact of the economic reforms on the financial sector is low compared to other neighbouring countries. M3/GDP was stable until 2001 and has increased to around 56 percent, compared to 64 percent in India.

Liberalisation to date has not significantly affected the economy; of our three countries, Pakistan remains the most financially repressed.

3. Theory and Model Specifications

We begin by considering how foreign inflows relate to the money stock. At the risk of over-simplification, the balance sheet of a central bank is the sum of net domestic and foreign assets which comprise the monetary base and, given the money multiplier, this determines the money stock. Assuming the money multiplier is constant (and suppressing it), $\Delta M = \Delta NFA + \Delta NDA$, where ΔM is the change in the money stock, ΔNFA is the change in net foreign assets and ΔNDA the change in net domestic assets of the central bank. We assume *NFA* comprises only foreign assets of the central bank and not of the whole economy (Fielding, 1996). The *NDA* comprises net credit to government (*NCG*) by the central bank and other items net (*OIN*) which may include net loans to commercial banks and commercial banks' deposits with the central bank.

The impact of ΔNFA on ΔM depends on the extent to which the central bank can monetise the inflows of foreign assets or foreign exchange reserves by purchasing and providing domestic money, i.e. ΔNDA. The central bank can regulate *NFA* through open market operations by selling and buying foreign exchange reserves or other forms of sterilization. This is what India has done since the 1990s, 'fixing the nominal exchange rate or managing it to resist a market-driven exchange rate appreciation and preventing the consequent reserve accumulation from increasing the supply of money' (Joshi and Sanyal, 2004: 158). The control of the central bank over *NDA* depends on its ability to refuse to monetise or finance budget deficits. Thus, the effect of inflows on money stock depends on the accommodation of ΔNFA and management of ΔNDA. In simple terms, this can be written as:

$$\Delta M = (1-\lambda)\Delta NFA + \lambda\, \Delta NDA \qquad (1)$$

The term $(1-\lambda)$ measures the extent of pass-through from foreign exchange (forex) receipts to money. If $\lambda = 0$, the central bank is not able to adjust *NDA* in response to forex inflows (i.e. no sterilisation), there will be a complete pass-through from forex inflows to money, implying $\Delta M = \Delta NFA$. On the other hand, if $\lambda = 1$, the central bank can completely adjust *NDA* to accommodate forex inflows and $\Delta M = 0$ (because $\Delta NFA = -\Delta NDA$). Thus, the coefficient on *NFA* in the MDF is in effect a measure of the pass through to real money stock.

We augment a standard money demand function (Ericsson, 1998) where real money is a function of real income and the real interest rate by including real inflows (all variables measured in real terms and all except the interest rate in logs):

$$m_t = \beta_0 + \beta_1 y_t + \beta_2 fa_t + \beta_3 i_t + \varepsilon_t \qquad (2)$$

where m_t is the demand for real balances, y_t is real income and fa_t is real foreign exchange inflows (i.e. deflated by prices). In equation (2), β_1 measures the long-run elasticity between real money and income and is assumed, based on the cash balance theory, equal to unity, implying that a rise in real income is completely reflected in the rise in real money demand. The coefficient β_2 measures the pass-though effect from real forex inflows to real money, and may take any value between zero and unity. The coefficient β_3 measures the long-run semi-interest elasticity of money and is expected to be negative as the interest rate captures the opportunity cost of holding money.

We estimate (2) following the method of Gregory and Hansen (1996), henceforth GH, who modify the Engle-Granger (1986) approach to testing for the existence of a single cointegrating relationship by allowing that the coefficients may be subject to a structural break. The timing of the break is not imposed; it is estimated by considering all dates within the sample (except the first and last few observations, as tests are known to be very sensitive to breaks early or late in the series) as candidates. A structural break is accepted if the date produces significant evidence of cointegration, for which the GH procedure replaces the critical values appropriate to the standard approach with critical values arrived at by Monte Carlo simulation of their modified procedure.

Equation (2) is the basis for Engle-Granger tests for cointegration and we term this the "standard cointegration model" (SC Model). The GH procedure requires that we modify this equation by introducing a dummy variable to indicate the break date, which is (for $t = 1, 2, \ldots, n$ and $[x]$ indicates the integer part of x) given by:

$$\varphi_{1t} = \begin{cases} 0 & if \quad t \le [n\tau] \\ 1 & if \quad t > [n\tau] \end{cases} \quad 0.15 \le \tau \le 0.85$$

This dummy variable can be used to model a variety of forms of structural break. We consider two of these: a level shift (LS) and a regime shift (RS) of the cointegrating equation:

Model LS:
$$m_t = \mu_1 + \mu_2\varphi_{1t}\beta_1 y_t + \beta_2 fa_t + \beta_3 i_t + \varepsilon_t \qquad (3)$$
$$t = 1,2\cdots n$$

The regime shift model allows for the possibility that the slope coefficients of the cointegrating equation break at the same date:

Model RS:
$$m_t = \mu_1 + \beta_1 y_t + \beta_2 fa_t + \beta_3 i_t$$
$$+ \mu_2\varphi_{1t} + \beta_4\varphi_{1t} y_t + \beta_5\varphi_{1t} f_t + \beta_6\varphi_{1t} i_t + \varepsilon_t \qquad (4)$$
$$t = 1,2\cdots n$$

The GH procedure consists of applying one of these models sequentially for all break dates within the permitted range of $[0.15n] \le t \le [0.85n]$ and, for each such break date, computing a statistic to test the null of no cointegration. If the most extreme value obtained for the test statistic[4] exceeds the GH critical value then we reject the null in favour of "cointegration with a structural break". The benefit of this approach allows us to use the data to determine if there is a break and when it occurs.

4. Empirical results

We fist investigate univariate time series properties of each series. We follow GH in considering only the case where the individual series are I(1) throughout and undergo no change on drift rate or any other parameter. Our ADF test results show that all series in Bangladesh, India and Pakistan behave as I(1) within the estimation period. The results are summarised in tables 1-3. Appendix A contains the data sources and descriptions of variables and appendix B contains details of the estimation results.

[4] We use an ADF t-statistic. GH also provide tables for the Z_α and Z_t tests of Phillips (1987).

Table 1: Summary Results for Bangladesh

Table 1a : cointegration between *m (m1 & m2) , y, fa, i, prim*								
SC			LS			RS		
β_1	β_2	β_3	β_1	β_2	β_3	β_1	β_2	β_3
Model: *m1=f(c,y,fa)*			Model: m1=*f(c,y,fa)*			Model: *m1=f(c,y,fa)*		
1.16 (23.61)	0.02 (1.02)		1.29[b] (21.68)	0.05[b] (2.20)		1.33[c] (11.56)	-0.02[c] (-0.69)	
Model: *m1=f(c,y,fa, i)*			Model: *m1=f(c,y,fa, i)*			Model: *m1=f(c,y,fa,i)*		
1.15 (23.20)	0.01 (0.52)	-0.01 (-1.34)	1.32[b] (22.73)	0.03[b] (1.55)	-0.02[b] (-3.07)	1.15 (5.09)	-0.01 (-0.17)	0.02 (0.91)
Model*: m1=f(c,y,fa, prim)*			Model: *m1=f(c,y,fa, prim)*			Model: *m1=f(c,y,fa, prim)*		
1.11 (13.72)	0.03 (1.05)	-0.08 (-2.51)	1.33[b] (14.38)	0.05[b] (1.69)	-0.09[b] (-3.35)	1.33 (10.54)	-0.02 (-0.65)	-0.001 (-0.02)
Model: *m2=f(c,y,fa)*			Model: *m2=f(c,y,fa)*			Model: *m2=f(c,y,fa)*		
1.77 (40.59)	0.11 (5.48)		1.66 (43.36)	0.03 (5.03)		2.52[b] (37.03)	0.06[b] (2.72)	
Model: *m2=f(c,y,fa, i)*			Model: *m2=f(c,y,fa, i)*			Model: *m2=f(c,y,fa, i)*		
1.81[c] (54.54)	0.16[c] (9.84)	0.04[c] (9.09)	1.68 (48.01)	0.07 (4.02)	0.02 (2.81)	2.40[b] (18.65)	0.07[b] (3.10)	0.01[b] (1.10)
Model: *m2=f(c,y,fa, prim)*			Model: *m2=f(c,y,fa, prim)*			Model: *m2=f(c,y,fa, prim)*		
1.98 (35.00)	0.07 (3.62)	0.15 (6.97)	1.74 (30.00)	0.10 (5.96)	0.13 (7.01)	2.51 (35.80)	0.05 (2.55)	0.02 (0.58)

Notes: Although not strictly valid, OLS *t*-statistics are reported in parentheses. The shaded cells highlight cases where the GH procedure suggests cointegration at either 5% (superscripted "c") or 10% (superscripted "b") asymptotic size of test.

Table 2: Summary results for India

Table 1a : cointegration between *m (m1 & m2)* , *y, fa, i, prim*								
SC			LS			RS		
β_1	β_2	β_3	β_1	β_2	β_3	β_1	β_2	β_3
Model: *m1=f(c, y, fa)*			Model: *m1=f(c, y, fa)*			Model*: m1=f(c, y, fa)*		
0.94^{c} (29.96)	0.04^{c} (3.06)		0.97^{c} (34.15)	0.05^{c} (3.83)		0.34^{c} (3.41)	-0.07^{c} (-1.40)	
Model: *m1=f(c, y, fa, i)*			Model: *m1=f(c, y, fa, i)*			Model: *m1=f(c, y, fa, i)*		
0.96^{c} (29.32)	0.04^{c} (2.93)	-0.01^{c} (-2.14)	0.96^{c} (32.79)	0.05^{c} (3.84)	0.001^{c} (0.40)	0.39^{c} (2.56)	-0.08^{c} (-1.39)	-0.01^{c} (-.44)
Model: *m1=f(c, y, fa, prim)*			Model: *m1=f(c, y, fa, prim)*			Model: *m1 = f(c, y, fa, prim)*		
0.95^{c} (27.68)	0.05^{c} (2.64)	0.08^{c} (1.22)	0.98^{c} (30.17)	0.05^{c} (2.92)	0.04^{c} (0.66)	0.27^{b} (2.53)	-0.13^{b} (-2.14)	-0.05^{b} (-0.46)
Model: *m2=f(c, y, fa)*			Model: *m2 = f(c, y, fa)*			Model: *m2 = f(c, y, fa)*		
1.42 (25.91)	0.07 (3.01)		1.20^{c} (28.41)	0.06^{c} (3.66)		0.56^{c} (5.81)	0.28^{c} (8.92)	
Model: *m2 = f(c, y, fa, i)*			Model: *m2 = f(c, y, fa, i)*			Model: *m2 = f(c, y, fa, i)*		
1.33 (24.92)	0.08 (3.58)	0.02 (5.11)	1.28^{c} (29.65)	0.03^{c} (1.77)	-0.01^{c} (-0.93)	0.31^{c} (2.53)	0.26^{c} (8.76)	0.03^{c} (3.00)
Model: *m2 = f(c, y, fa, prim)*			Model: *m2 = f(c, y, fa, prim)*			Model: *m2 = f(c, y, fa, prim)*		
1.44 (25.67)	0.10 (3.50)	-0.09 (-0.88)	1.20^{c} (24.95)	0.05^{c} (2.14)	-0.13^{c} (-1.67)	0.55^{c} (5.39)	0.27^{c} (7.73)	-0.08^{c} (-1.05)

Table 3: Summary results for Pakistan

Table 1a : cointegration between *m (m1 & m2)* , *y, fa, i, prim*								
SC			LS			RS		
β_1	β_2	β_3	β_1	β_2	β_3	β_1	β_2	β_3
Model: *m1=f(c, y, fa)*			Model: *m1=f(c, y, fa)*			Model*: m1=f(c, y, fa)*		
0.88^{c} (48.58)	0.04^{c} (2.06)		0.93^{c} (44.64)	0.04^{c} (2.15)		0.78^{c} (7.39)	0.02^{c} (0.28)	
Model: *m1=f(c, y, fa, i)*			Model: *m1=f(c, y, fa, i)*			Model: *m1=f(c, y, fa, i)*		
0.94^{c} (39.72)	0.02^{c} (1.31)	-0.01^{c} (-4.11)	0.97^{c} (40.15)	0.03^{c} (1.54)	-0.01^{c} (-3.05)	0.81^{c} (6.31)	0.01^{c} (0.11)	-0.02^{c} (-0.41)
Model: *m1=f(c, y, fa, prim)*			Model: *m1=f(c, y, fa, prim)*			Model: *m1 = f(c, y, fa, prim)*		
0.91^{c} (35.99)	0.03^{c} (1.08)	0.10^{c} (1.57)	0.99^{c} (36.56)	0.04^{c} (1.53)	-0.09^{c} (-1.31)	0.75^{c} (18.76)	0.05^{c} (1.31)	0.08^{c} (1.35)
Model: *m2=f(c, y, fa)*			Model: *m2 = f(c, y, fa)*			Model: *m2 = f(c, y, fa)*		
1.03 (58.06)	0.02 (1.44)		1.07^{c} (56.25)	0.03^{c} (1.75)		1.11^{c} (10.97)	0.003^{c} (0.4)	
Model: *m2 = f(c, y, fa, i)*			Model: *m2 = f(c, y, fa, i)*			Model: *m2 = f(c, y, fa, i)*		
1.03^{b} (43.19)	0.02^{b} (1.17)	-0.004^{b} (-1.30)	1.06^{c} (47.79)	0.03^{c} (2.09)	0.002^{c} (0.74)	1.38^{c} (24.79)	0.05^{c} (1.75)	-0.09^{c} (-10.55)
Model: *m2 = f(c, y, fa, prim)*			Model: *m2 = f(c, y, fa, prim)*			Model: *m2 = f(c, y, fa, prim)*		
1.02^{c} (48.22)	0.02^{c} (1.02)	0.19^{c} (3.66)	1.06^{c} (45.15)	0.03^{c} (1.46)	0.06^{c} (0.93)	0.99^{c} (23.37)	-0.01^{c} (-0.31)	0.13^{c} (1.91)

Our empirical results show that the money demand has generally a long-run relationship (i.e. is cointegrated) with real income (*y*), real foreign assets (*fa*) and (nominal) interest rates (*i*). The signs and magnitudes of most of the coefficients are as expected and economically plausible. Our empirical modelling reveals that the monetary policy in Bangladesh went through a structural break in 1990, i.e. the break year is 1990 (1989q4) which is consistent with the policy change started from 1990. The break years in Pakistan are 1971 and 1975, which are consistent with the civil way in 1971 and a major rise in prices in 1975. The structural break years for India vary which may warrant further thorough investigation of the impact of major policy change and other external shocks including the war with Pakistan in 1965 and droughts in 1977 and 1978 and changes in monetary policy since the 1990s.

Results for Pakistan reveal that both M1 and M2, for all specifications except one (SC: $m2 = f(c, y, fa)$), for the three models (SC, LS and RS) are cointegrated with *y*, *fa* and *i* at a 5% level of significance. In India, cointegrated relationships for M1 as a dependent variable are found in all specifications; while models for M2 are cointegrated for level and regime shift specifications, but not for SC. The results are less decisive for Bangladesh since some models reveal cointegrated relationship while others do not. For example, the models for M1 of all specifications with level shifts offer cointegrated relationships at a 10% level of significance. Results on Bangladesh also show that the following specifications gave cointegrated relationships: RS: $m1=f(c, y, fa)$, SC: $m2=f(c, y, fa, i)$, RS: $m2=f(c, y, fa)$ and $m2 = f(c, y, fa, i)$.

The coefficient of *y* (β_1) is positive as expected and statistically significant. The values of β_1 in models for M1 in India and Pakistan are less than one while they are more than one in models for M2. In India, the range of β_1 in models for M1 with cointegrated relationships is 0.27-0.96. The values in SC and LS models are 0.94-0.98, which are economically more plausible than the values in RS models, which are somewhat lower: 0.27-0.39. In Pakistan, the values of β_1 are within range of 0.78-0.99, which are economically plausible. The values of β_1 in Bangladesh, when cointegrated relationships are found, are within range 1.29-2.52, which are significantly greater than one but much lower and more economically plausible than the values obtained by Hossain (1996) and Siddiki (2000a): β_1 in Siddiki (2000a) is 3.26 and in Hossain (1996) within the range of 2.64-3.96.

The values of β_1 in models with M2 as a dependent variable in all three countries are higher than one, which is economically less plausible and not sustainable in the long-run. The high magnitude of β_1 is the result of many factors (Siddiki, 2000a: 1982). Firstly, the high growth rates of money demand relative to the growth of income. This difference between the growth of real money demand and real income is reflected in the high rate of inflation. Secondly, the economy is under-monetised. A rise in the growth of bank branches has been increasing the monetisation of the economy and the saving behaviour of the people. Finally, the scarcity of alternative domestic financial assets and the strong distrust in them induces people to use money as the main asset in their portfolios.

The coefficients (β_2) of real foreign assets (*fa*) are generally positive and statistically significant in the three countries. $\beta_2 = (1-\lambda)$ measures the extent of pass-through effects from real foreign exchange inflows to real money. The magnitudes of β_2 are very low, ranging from 0.04-0.28. Lower values of β_2 imply higher values for λ, i.e. a lower level of pass-through implies greater ability for the central bank (or government) to adjust net domestic assets in order to accommodate the increase in foreign currency inflows. These results highlight the fact that none of the countries in our sample are economically vulnerable to external monetary shocks. This finding is consistent with the fact that Bangladesh, India are Pakistan were unaffected by economic crisis in Asian countries in 1997.

The impact of interest rates (*i*) on the demand for money is very small. The low values of interest rate coefficients are consistent with the fact that interest rates in our sample countries have been controlled and rigid for very long periods of time and they alone are unable to generate notable influences on saving, investment and real income in these countries. The directions or signs of the impact of the interest rate on the demand for money vary depending on the measurements of the demand for money. The interest rate in Bangladesh and India generally positively affects the demand for broad money (M2) (i.e. *i* is considered as returns to financial assets or saving such as time deposits in M2) and generally negatively affects the demand for narrow money (M1) in all three countries (i.e. *i* is considered as costs of holding money for transaction purposes). These results may imply that the interest rate encourage financial saving such as time deposit (a component of M2) and discourages people in holding cash money such as M1.

The coefficients on unofficial exchange rate premiums in all three countries are small, implying a small effect of foreign exchange rate policy on the demand for money. This finding is consistent with our finding above that domestic economies are less vulnerable to external shocks. The black exchange rate premiums in Bangladesh and India negatively affect the demand for money. The increase in premiums occurs when the demand for foreign exchange is higher than the supply of forex. The increase in premiums also signals the overvaluation of domestic money and induces investors to believe that domestic currencies would be devalued in the recent future (Siddiki, 2000a: 1982). Thus, agents change the assets in their portfolios in favour of foreign assets. The coefficient of unofficial premiums in Pakistan is positive which is counterintuitive and warrants further investigation.

5. Conclusions

In this paper we estimated the demand for money in three south Asian countries namely Bangladesh, India and Pakistan using the Gregory and Hansen (1996) method of single equation cointegration analyses with regime shifts. Our empirical results reveal that the income elasticity of money is positive and yields plausible coefficients mostly close to unity, justifying the incorporation of regime shifts in single equation cointegration analyses. We also find that the pass-through effects of foreign capital inflows are low; the governments or the central banks of these countries have the ability to adjust net domestic assets in response to currency inflows. The results also imply that unofficial exchange rate premiums have little impact on the demand for money, highlighting the fact again that these countries have sufficient control of their monetary policies to protect themselves from external shocks. The impact of unofficial exchange rate premiums in Bangladesh and India is negative, reflecting the overvaluation of domestic currency, which induces investors to change the assets in their portfolios in favour of foreign assets.

The results reveal that the impact of interest rates on the demand for money is very small and the signs of its impact vary depending on the measurement of the demand for money. The very small coefficient reflects rigid and controlled monetary policy in Bangladesh, India and Pakistan and highlights the fact that the interest rate alone is unable to generate a significant impact on saving, investment and real income in these countries. That is, other variables must be used in conjunction with the interest rate for effective monetary policy.

Although we find some evidence of structural breaks or regime shifts, the MDF has been reasonably stable in these three South Asian countries since the 1970s. Because of controls and financial repression, interest rates have a negligible effect on money demand. Our main finding is that the pass-through rate of foreign exchange is very low, implying that these countries can adjust to inflows and protect the monetary sector from external shocks.

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Appendix A

Data Descriptions and sources

m1 = logarithm of real narrow money supply;

m2 = logarithm of real broad supply;

y = logarithm of real gdp;

fa = logarithm of real foreign assets;

GDP deflator with base 2000 is used to derive real gdp; consumer price index with base 2000 is used for m1, m2, fa; i is central bank's discount rates.

All data are collected from International Monetary Fund, *International Financial Statistical Yearbook.*

Quarterly figures for GDP are not available and obtained by minimising the square differences between the successive quarterly values subject to the constraint that the sum of the quarterly totals should equal to the sum of (available) yearly totals (Boot et al. (1967)). The performance of this type of interpolation is better than other newly available methods (Chan (1993)).

Appendix B

Table A1:

Unit Toot tests or ADF statistics (Check)

	Bangladesh: 1974- 2003		India: 1960 - 2004		Pakistan: 1960 - 2004	
Variables	Levels	First difference	Levels	First difference	Levels	First difference
m1	-0.478 (2)	-3.214(1)****	2.207 (2)	-5.81(1)****	0.865 (2)	-4.747****
M2	-0.454 (2)	-3.555(1)****	1.409(1)	-4.427(1)****	0.504(1)	-5.511(1)****
Y	3.705(2)	-5.145(1)****	1.948(1)	-5.068(1)****	-0.782(1)	-5.246(1)****
fa	-1.298(2)	-4.533(1)****	0.255(1)	-3.467(1)****	0.127(1)	-4.765(1)****
i	-2.207 (1)***	-3.225(1)****	-1.772(1)**	-3.119(1)****	-1.812(1)**	-3.562(1)****
* => sig at upper 10%; ** => sig at lower 10%; *** => sig at upper 5%;**** => sig at lower 1%; using Table 1 in appendix to Charemza & Deadman (1997);						

Table A2: Empirical results (Bangladesh) of the Gregory Hansen (1996) procedures

Sample: 1976Q1:2003Q2 in models without prim; nob = 111; Sample: 1976Q1:1999q2 in models with prim; nob=94												
Model specifications	μ_1	$\mu_1\ \varphi_{1\tau}$	β_1	β_2	β_3	$\beta_4\varphi_{1\tau}$	$\beta_5\varphi_{1\tau}$	$\beta_6\varphi_{1\tau}$	Break year	ADF	R^2	DW
SC: m1=f(c,y,fa)	-3.47*** (-7.57)		1.16*** (23.61)	0.02 (1.02)						-3.24	0.94	0.44
LS: m1=f(c,y,fa)	-5.45*** (-7.84)	-0.14*** (-3.65)	1.29*** (21.68)	0.05** (2.20)					1989Q4	-4.68*	0.94	0.54
RS: m1=f(c,y,fa)	-5.16*** (- 4.17)	-2.01 (-1.32)	1.33*** (11.56)	-0.02 (-0.69)		0.01 (0.04)	0.16*** (3.47)		1989Q4	-5.96**	0.96	0.72
SC: m1=f(c,y,fa, i)	-3.15*** (-6.08)		1.15*** (23.20)	0.01 (0.52)	-0.01 (-1.34)					-3.30	0.94	0.45
LS: m1=f(c,y,fa, i)	-5.35*** (-7.99)	-0.19*** (-4.66)	1.32*** (22.73)	0.03 (1.55)	-0.02*** (-3.07)				1989Q4	5.16*	0.96	0.76
RS: m1=f(c,y,fa, i)	-3.26 (-1.36)	1.01 (0.33)	1.15*** (5.09)	-0.01 (-0.17)	0.02 (0.91)	-0.02 (-0.6)	-0.02 (-0.22)	-.08*** (-2.86)	1989Q4	-5.47	0.96	0.76
SC: m1=f(c,y,fa, prim)	-2.82*** (-3.58)		1.11*** (13.72)	0.03 (1.05)	-0.08** (-2.51)					-3.20	0.90	0.45
LS: m1=f(c,y,fa, prim)	-5.80*** (-5.65)	-0.17*** (-4.10)	1.33*** (14.38)	0.05 (1.69)	-0.09*** (-3.35)				1989Q4	-5.26*	0.92	0.62
RS: m1=f(c,y,fa, prim)	-5.17*** (-3.64)	11.30 (1.93)	1.33*** (10.54)	-0.02 (-0.65)	-0.001 (-0.02)	-0.85** (-2.10)	-0.001 (-0.02)	-0.47 (-2.66)	1989Q4	-5.54	0.92	0.75

Critical values (CVs) with two regressors (without intercept) and without structural breaks ((nobs=125)): - 4.68 (at lower 1% level of significance); - 3.68 (at upper 5% level of significance); -3.33 (at upper 10% level of significance); CVs with three regressors (without intercept) and without structural breaks ((nobs=125)): - 4.63 (at lower 1% level of significance); - 3.90 (at upper 5% level of significance); -3.59 (at upper 10% level of significance); critical values with two (three) regressor and structural breaks : at 1% level of significance: LS = -5.44 (-5.77), LST = -5.80 (-6.05), RS = -5.97 (-6.51): at 5% level of significance: LS = -4.92 (-5.28), LST = -5.29 (-5.57), RS = -5.50 (-6.00): at 10% level of significance: LS = -4.69(-5.02), LST = -5.03(-5.33), RS = -5.23(-5.75); *** - significant at the 1% level, ** - significant at the 5% level, * - significant at the 10% level

Table A2 (continued): Empirical results (Bangladesh) of the Gregory Hansen (1996) procedures

Sample: 1976Q1:2003Q2 in models without prim; nob = 111; Sample: 1976Q1:1999q2 in models with prim; nob=94												
Model specifications	μ_1	$\mu_1\ \varphi_{1\tau}$	β_1	β_2	β_3	$\beta_4\varphi_{1\tau}$	$\beta_5\varphi_{1\tau}$	$\beta_6\varphi_{1\tau}$	Break year	ADF	R^2	DW
SC: m2=f(c,y,fa)	-11.24*** (-27.56)		1.77*** (40.59)	0.11*** (5.48)						-2.77	0.98	0.40
LS: m2=f(c,y,fa)	-9.69*** (-24.80)	0.18*** (7.53)	1.66*** (43.36)	0.08** (5.03)					1982Q1	-4.58	0.98	0.71
RS: m2=f(c,y,fa)	-20.12*** (-27.52)	11.98*** (13.33)	2.52*** (37.03)	0.06*** (2.72)		-0.94*** (-12.02)	0.002 (0.07)		1989q4	-5.80**	0.99	1.21
SC: m2=f(c,y,fa, i)	-12.73*** (-36.51)		1.81*** (54.54)	0.16*** (9.84)	0.04*** (9.09)					-3.79**	0.99	0.79
LS: m2=f(c,y,fa, i)	-9.91*** (-19.40)	0.19*** (6.74)	1.68*** (48.01)	0.07*** (4.02)	0.02*** (2.81)				1982Q3	-4.40	0.99	1.10
RS: m2=f(c,y,fa, i)	-18.81*** (-13.81)	14.56*** (8.56)	2.40*** (18.65)	0.07*** (3.10)	0.01 (1.10)	-0.98*** (-7.07)	-0.14*** (-3.40)	-.06*** (-3.86)	1989Q4	-5.46*	0.99	1.49
SC: m2=f(c,y,fa, prim)	-13.61*** (-24.56)		1.98*** (35.00)	0.07*** (3.62)	0.15*** (6.97)					-2.53	0.98	0.72
LS: m2=f(c,y,fa, prim)	-10.88*** (-18.23)	0.15*** (6.94)	1.74*** (30.00)	0.10*** (5.96)	0.13*** (7.01)				1981q1	-4.60	0.99	1.13
RS: m2=f(c,y,fa, prim)	-19.91*** (-25.31)	21.68*** (6.70)	2.51*** (35.80)	0.05** (2.55)	0.02 (0.58)	-1.63*** (-7.22)	-0.06 (-1.31)	-.26*** (2.70)	1989q4	-5.15	0.99	1.50

Critical values (CVs) with two regressors (without intercept) and without structural breaks ((nobs=125)): - 4.68 (at lower 1% level of significance); - 3.68 (at upper 5% level of significance); -3.33 (at upper 10% level of significance); CVs with three regressors (without intercept) and without structural breaks ((nobs=125)): - 4.63 (at lower 1% level of significance); - 3.90 (at upper 5% level of significance); -3.59 (at upper 10% level of significance); critical values with two (three) regressor and structural breaks : at 1% level of significance: LS = -5.44 (-5.77), LST = -5.80 (-6.05), RS = -5.97 (-6.51): at 5% level of significance: LS = -4.92 (-5.28), LST = -5.29 (-5.57), RS = -5.50 (-6.00): at 10% level of significance: LS = -4.69(-5.02), LST = -5.03(-5.33), RS = -5.23(-5.75); *** - significant at the 1% level, ** - significant at the 5% level, * - significant at the 10% level

Table A2: Empirical results (India) of the Gregory Hansen (1996) procedures

Sample: 1960Q2:2004Q4 in models without prim; nob = 176												
Model specifications	μ_1	$\mu_1\ \varphi_{1\tau}$	β_1	β_2	β_3	$\beta_4\varphi_{1\tau}$	$\beta_5\varphi_{1\tau}$	$\beta_6\varphi_{1\tau}$	Break year	ADF	R^2	DW
SC: m1=f(c, y, fa)	-0.23 (-1.35)		0.94*** (29.96)	0.04*** (3.06)						-4.51**	0.98	0.80
LS: m1=f(c, y, fa)	-0.38** (-2.511)	-0.12*** (-6.67)	0.97*** (34.15)	0.05*** (3.83)					1966Q3	-5.89***	0.99	1.00
RS: m1=f(c, y, fa)	4.34*** (6.30)	-4.83*** (-6.84)	0.34*** (3.41)	-0.07 (-1.40)		0.63*** (6.01)	0.11** (2.18)		1996Q3	-6.18***	0.99	1.12
SC: m1=f(c, y, fa, i)	-0.32* (-1.87)		0.96*** (29.52)	0.04*** (2.93)	-0.01** (-2.14)					-4.62***	0.98	0.82
LS: m1=f(c,y,fa, i)	-0.37** (-2.36)	-0.12*** (-6.23)	0.96*** (32.79)	0.05*** (3.84)	0.001 (0.40)				1966Q3	-5.90***	0.99	1.00
RS: m1=f(c,y,fa, i)	4.11*** (4.72)	-4.61*** (-5.21)	0.39** (2.56)	-0.08 (-1.39)	-0.01 (-0.44)	0.59*** (3.75)	0.11** (1.99)	0.01 (0.33)	1970Q2	-6.33***	0.99	1.13
SC: m2=f(c,y,fa)	-3.27*** (-11.14)		1.42*** (25.91)	0.07*** (3.00)						-2.61	0.98	0.44
LS: m2=f(c,y,fa)	-1.75*** (-7.33)	0.34	1.20*** (28.41)	0.06*** (3.66)					1978Q2	-5.51***	0.99	0.94
RS: m2=f(c,y,fa)	1.84*** (3.20)	-3.82*** (-6.14)	0.56*** (5.81)	0.28*** (8.92)		0.75*** (7.16)	-0.27*** (-7.44)		1978Q3	-8.83***	0.99	1.23
SC: m2=f(c,y,fa, i)	-2.90*** (-10.21)		1.33*** (24.92)	0.08*** (3.58)	0.02*** (5.11)					-3.06	0.98	0.52
LS: m2=f(c,y,fa, i)	-2.06*** (-8.61)	0.34*** (10.13)	1.26*** (29.20)	0.04** (2.22)	-0.00 (-0.74)				1977Q2	-7.10***	0.99	0.90
RS: m2=f(c,y,fa, i)	3.42*** (4.46)	-5.31*** (-6.61)	0.31** (2.53)	0.26*** (8.76)	0.03*** (3.00)	1.01*** (7.70)	-0.27*** (-7.54)	-.05*** (-3.55)	1978Q3	-8.85***	0.99	1.40

Critical values (CVs) with two regressors (without intercept) and without structural breaks ((nobs=175)): - 4.71 (at lower 1% level of significance); - 3.67 (at upper 5% level of significance); -3.33 (at upper 10% level of significance); CVs with three regressors (without intercept) and without structural breaks ((nobs=175)): - 4.61 (at lower 1% level of significance); - 3.88 (at upper 5% level of significance); -3.58 (at upper 10% level of significance); Critical values with two (three) regressor and structural breaks : at 1% level of significance: LS = -5.44 (-5.77), LST = -5.80 (-6.05), RS = -5.97 (-6.51): at 5% level of significance: LS = -4.92 (-5.28), LST = -5.29 (-5.57), RS = -5.50 (-6.00): at 10% level of significance: LS = -4.69(-5.02), LST = -5.03(-5.33), RS = -5.23(-5.75); *** - significant at the 1% level, ** - significant at the 5% level, * - significant at the 10% level

Table A3: Empirical results (Pakistan) of the Gregory Hansen (1996) procedures

Sample: 1960Q3:2004Q4 in models without prim; nob = 175; Sample: 1960Q3:1993q4 in models with prim; nob=135												
Model specifications	μ_1	$\mu_1\ \varphi_{1\tau}$	β_1	β_2	β_3	$\beta_4\varphi_{1\tau}$	$\beta_5\varphi_{1\tau}$	$\beta_6\varphi_{1\tau}$	Break year	ADF	R^2	DW
SC: m1=f(c, y, fa)	1.17*** (8.32)		0.88*** (48.58)	0.04** (2.06)						-4.75***	0.97	0.26
LS: m1=f(c, y, fa)	0.58*** (3.11)	-0.12*** (-4.49)	0.93*** (44.64)	0.04** (2.15)					1971q3	-6.24***	0.97	0.31
RS: m1=f(c, y, fa)	2.55 (1.30)	-2.42 (-1.22)	0.78*** (7.39)	0.02 (0.28)		0.20 (1.82)	-0.01 (-0.07)		1972q2	-6.29***	0.98	0.34
SC: m1=f(c, y, fa, i)	0.59*** (3.01)		0.94*** (39.72)	0.02 (1.31)	-0.01*** (-4.11)					-5.10***	0.97	0.30
LS: m1=f(c,y,fa, i)	0.26 (1.25)	-0.09*** (3.53)	0.97*** (40.15)	0.03 (1.54)	-0.01*** (-3.05)				1971q2	-6.28***	0.97	0.33
RS: m1=f(c,y,fa, i)	2.41 (1.24)	-2.59 (-1.33)	0.81*** (6.31)	0.01 (0.11)	-0.02 (-0.41)	0.22 (1.65)	-0.02 (-0.18)	0.01 (0.23)	1972Q1	-6.42**	0.98	0.37
SC: m1=f(c, y, fa, prim)	0.79** (2.05)		0.91*** (35.99)	0.03 (1.08)	0.10 (1.57)					-4.33**	0.95	0.24
LS: m1=f(c,y,fa, prim)	-0.03 (-0.07)	-0.20*** (-5.27)	0.99*** (36.56)	0.04 (1.53)	-0.09 (-1.31)				1972Q1	-5.90	0.96	0.34
RS: m1=f(c,y,fa, prim)	2.50*** (3.29)	-5.61*** (-6.05)	0.75*** (18.76)	0.05 (1.31)	0.08 (1.35)	0.49*** (8.36)	-0.06 (-1.10)	0.15 (1.15)	1975Q4	-6.29	0.98	0.51

Critical values (CVs) with two regressors (without intercept) and without structural breaks ((nobs=175)): - 4.71 (at lower 1% level of significance); - 3.67 (at upper 5% level of significance); -3.33 (at upper 10% level of significance); CVs with three regressors (without intercept) and without structural breaks ((nobs=175)): - 4.61 (**CHECK**) (at lower 1% level of significance); - 3.88 (at upper 5% level of significance); -3.58 (at upper 10% level of significance); Critical values with two (three) regressor and structural breaks : at 1% level of significance: LS = -5.44 (-5.77), RS = -5.97 (-6.51): at 5% level of significance: LS = -4.92 (-5.28), RS = -5.50 (-6.00): at 10% level of significance: LS = -4.69(-5.02), RS = -5.23(-5.75); *** - significant at the 1% level, ** - significant at the 5% level, * - significant at the 10% level

Table A3 (continued)**:** Empirical results (Pakistan) of the Gregory Hansen (1996) procedures

Sample: 1960Q3:2000Q4 in models without prim; nob = 175; Sample: 1960Q3:1996q4 in models with prim; nob=135												
Model specifications	μ_1	$\mu_1\ \varphi_{1\tau}$	β_1	β_2	β_3	$\beta_4\varphi_{1\tau}$	$\beta_5\varphi_{1\tau}$	$\beta_6\varphi_{1\tau}$	Break year	ADF	R^2	DW
SC: m2=f(c,y,fa)	0.09 (0.65)		1.01*** (58.06)	0.02 (1.44)						-3.31	0.98	0.19
LS: m2=f(c,y,fa)	-0.66*** (-3.80)	-0.14*** (-6.08)	1.07*** (56.25)	0.03 (1.75)					1971Q4	-7.30***	0.99	0.24
RS: m2=f(c,y,fa)	-0.91 (-0.48)	0.17 (0.09)	1.11*** (10.97)	0.003 (0.4)		-0.06 (-0.58)	0.04 (0.50)		1971Q4	-7.22***	0.98	0.52
SC: m2=f(c,y,fa, i)	0.10 (-0.49)		1.03*** (43.19)	0.02 (1.17)	-0.004 (-1.30)					-3.36*	0.98	0.19
LS: m2=f(c,y,fa, i)	-0.64*** (-3.27)	-0.16*** (-6.30)	1.06*** (47.79)	0.03** (2.09)	0.002 (0.74)				1972Q2	-7.29***	0.99	0.28
RS: m2=f(c,y,fa, i)	-4.14*** (-5.16)	3.46*** (4.16)	1.38*** (24.79)	0.05 (1.75)	-0.09*** (-10.55)	-0.37*** (-6.07)	0.01 (0.59)	0.10*** (11.34)	1978Q3	-7.43***	0.99	0.41
SC: m2=f(c,y,fa, prim)	-0.16 (-0.48)		1.02*** (48.22)	0.02 (1.02)	0.19*** (3.66)					-5.28***	0.97	0.30
LS: m2=f(c,y,fa, prim)	-0.66 (-1.94)	-0.13*** (-3.58)	1.06*** (45.14)	0.03 (1.46)	0.06 (0.93)				1972Q2	-7.29***	0.97	0.30
RS: m2=f(c,y,fa, prim)	0.59 (0.74)	-2.43** (-2.47)	0.99*** (23.37)	-0.01 (-0.31)	0.13 (1.91)	0.11 (1.79)	0.09 (1.70)	-0.07 (-0.61)	1975Q3	-7.34***	0.98	0.34

Critical values (CVs) with two regressors (without intercept) and without structural breaks ((nobs=175)): - 4.71 (at lower 1% level of significance); - 3.67 (at upper 5% level of significance); -3.33 (at upper 10% level of significance); CVs with three regressors (without intercept) and without structural breaks ((nobs=175)): - 4.61 (at lower 1% level of significance); - 3.88 (at upper 5% level of significance); -3.58 (at upper 10% level of significance); Critical values with two (three) regressor and structural breaks : at 1% level of significance: LS = -5.44 (-5.77), RS = -5.97 (-6.51): at 5% level of significance: LS = -4.92 (-5.28), RS = -5.50 (-6.00): at 10% level of significance: LS = -4.69(-5.02), RS = -5.23(-5.75); *** - significant at the 1% level, ** - significant at the 5% level, * - significant at the 10% level