Testing liquidity constraints in ten Asian developing countries: an error-correction model approach

Habibullah, Muzafar Shah; Smith, Peter; Azman-Saini, W.N.W

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ABSTRACT

An error-correction model is used to estimate the fraction of consumers who are liquidity-constrained in ten Asian developing countries. Our estimates of the fraction of consumers who are liquidity-constrained range between 0.25 and 0.98. We further investigate whether financial liberalisation has resulted in the reduction of liquidity constraints in these countries. However, the results find support for this only in the cases of South Korea, Sri Lanka and Taiwan.

1 INTRODUCTION

During the 1960s and most of the 1970s, the majority of Asian countries had tightly-regulated and administratively-controlled financial systems. Such common characteristics were manifested in interest rate restrictions, segmented financial markets and institutions, underdeveloped money and capital markets, credit allocation and control mechanisms and a variety of international capital and exchange controls. Among these financial distortions, interest rate ceilings on deposits and lending were important features. However, with the rapid advances in technology and communication and globalisation in financial markets worldwide, it became apparent that developing countries needed to be more flexible and responsive to the needs of their national and international economies. As a result, many Asian developing countries began to liberalise their financial system – in some cases, this began as early as the late 1970s.

Financial liberalisation has resulted in the development of a more sophisticated financial system not only in the developed countries but also in some developing countries. At times, such liberalisation has been associated with undesirable macroeconomic outcomes. Blundell-Wignall *et al.* (1990) have pointed out that financial liberalisation will reduce liquidity constraints on consumption. With financial deregulation, households will be able to increase their consumption based on expected earnings, future wealth and relative prices. Current income and current liquid wealth are no longer such relevant factors for spending decisions. As a result, Spending decisions are likely to be more closely associated with permanent income and expected wealth. Consequently, the relationship between money supply (a major component of liquid wealth) and nominal demand will be affected, and ultimately the effectiveness of monetary policy will be reduced.

In a regulated financial environment, households often face limits on borrowing, that is, they are subject to liquidity constraints. Constrained households want to consume more, but are prevented from doing so by restrictions on their ability to borrow through credit rationing. This limitation implies that the options for consumption smoothing are limited. Consumption could be shifted into the future through saving, but increased consumption in the present may have to await increases in actual income. Therefore, consumption is more sensitive to current income in a regulated financial market. Empirical studies have shown that with heavily-regulated financial markets, consumption tends to track current income closely. In other words, consumption seems to respond to predictable changes in current income, that is, there is evidence of "excess sensitivity". Excess sensitivity has been associated with the existence of liquidity constraints. The findings by Blundell-Wignall *et al*. (1995) and Campbell and Mankiw (1991) that there is excess sensitivity of current consumption to disposable income in the OECD countries suggest the existence of liquidity constraints. Nevertheless, Blundell-Wignall *et al*. found that in several of the OECD countries liquidity constraints have been declining over time as a result of financial liberalisation.

Thus, one important implication of financial liberalisation is that liquidity constraints would be reduced. As a result of financial deregulation, borrowing constraints are lifted. Households will be more able to smooth their consumption relative to income through borrowing and thus increase their debt. Furthermore, empirical studies have indicated that savings have fallen as a result of financial liberalisation due to the reduction in liquidity constraints (see Bayoumi, 1993; and Jappelli and Pagano, 1989). This is another undesirable effect of financial liberalisation.

Households that are not liquidity-constrained are able to base their consumption plans not only on current income but also on their future earnings and expected wealth. Thus, the effect of financial deregulation is that consumption should become more sensitive to factors such as wealth, future income (permanent income) and relative financial prices. As a result, the link between consumption and current income has become weaker in countries following the liberalisation of financial markets (see Blundell-Wignall *et al*., 1995). This paper sets out to examine whether similar effects may be found in developing countries as well as in OECD.

Thus, the motivation of this paper is two-fold. The first objective is to investigate whether financial liberalisation has reduced liquidity constraints in ten Asian developing countries. The second is to employ current econometric standard practice of dealing with non-stationary time series data to determine the fraction of consumers that are liquidity constrained in these Asian countries. In relation to several developed countries, empirical studies have indicated that liquidity constraints have declined in importance during the 1980s, as financial systems have been deregulated (see Blundell-Wignall *et al*., 1995). Following the work of Campbell and Mankiw (1991) and Blundell-Wignall *et al*. (1995), we explore this idea by allowing the 'excess sensitivity parameter', λ, to vary over time. Generally, a reduction in the size of the λ parameter signifies that liquidity constraints have been reduced as a result of financial liberalisation.

The paper is organised as follows. In Section 2, we briefly review previous studies on testing liquidity constraint and the method for testing liquidity-constrained consumers. In Section 3, we present our results. The last section is our conclusion.

2 TESTING FOR LIQUIDITY CONSTRAINTS

There have been two main approaches to determine the fraction of liquidity-constrained consumers in an economy. The first is the Euler equation approach. This approach, which was proposed by Hall (1978), is based on the estimation of the intertemporal first-order condition for the optimal choice of a fully forward-looking representative consumer. The second is the error-correction model approach which was popularised by Davidson *et al*. (1978) and Hendry and Ungern-Sternberg (1981). Both approaches have their own merits, as discussed, for example, by Deaton (1992), Favero (1993) and Muellbauer (1994), but Hendry and Davison (1981) and Favero (1993) argue persuasively against the Euler equation approach. For the purpose of this study, the approach is based on the single-equation error-correction methodology advocated by Hendry (1983) in empirical time series research. This type of model can be interpreted as a structural representation of dynamic adjustment towards some equilibrium about which economic theory can be informative, while short-run dynamics are data-based determined.

Modelling the consumption function using the error-correction approach was first introduced by Davidson *et al*. (1978, hereafter DHSY). The basic DHSY model is given as follows[1],

$$\Delta c_t = \theta_0 + \theta_1 \Delta y_t + \theta_2 (c_{t-1} - y_{t-1}) + \varepsilon_t \qquad (1)$$

where c denotes consumption and y disposable income. Estimation of equation (1) also implies a direct test for cointegration between consumption and income. Banerjee *et al*. (1993) and Kremers *et al*. (1992) have shown that the statistical significance of the coefficient of the error-correction term, θ_2 can be interpreted as evidence of cointegration. According to Blundell-Wignall *et al*. (1995) and Chah *et al*. (1995), the significance of θ_1 and θ_2 in equation (1) suggest that cointegration between consumption and income implies support for the liquidity constraints hypothesis. Thus, the significance of θ_1 (equivalent to λ) is the test for rule-of-thumb behaviour (myopia) and therefore can be used to estimate the fraction of consumers that are liquidity constrained (see also Campbell and Mankiw, 1991; Blundell-Wignal *et al*., 1995; and Agell and Berg, 1996).

In this study, we derived our final error-correction model from the following general autoregressive distributed lag (ARDL) consumption function (see for example, Hendry, *et al*., 1984),

$$c_t = \alpha + \sum_{j=0}^{k} \beta_j y_{t-j} + \sum_{j=1}^{m} \phi_j c_{t-j} + \varepsilon_t \qquad (2)$$

where ε_t is the error term. By adding and subtracting lags of the variables, equation (2) may be reparameterised without loss of generality as the following unrestricted error-correction model ,

$$\Delta c_t = \alpha + \beta_0 \Delta y_t + \sum_{j=1}^{k-1} \beta_j \Delta y_{t-j} + \sum_{j=1}^{m-1} \phi_j \Delta c_{t-j} + \delta_1 c_{t-1} + \delta_2 y_{t-1} + \varepsilon_t \qquad (3)$$

With minor algebraic manipulation, equation (3) may be rewritten so as to incorporate the long-run solution, $c_t = \gamma y_t$, directly as follows[2]

$$\Delta c_t = \alpha + \beta_0 \Delta y_t + \sum_{j=1}^{k-1} \beta_j \Delta y_{t-j} + \sum_{j=1}^{m-1} \phi_j \Delta c_{t-j} + \delta ecm_{t-1} + \varepsilon_t \qquad (4)$$

where the error-correction term, ecm_{t-1} is equal to $(c - \gamma y)_{t-1}$. If δ is significant and negative, this indicates that consumers adjust consumption in response to short-run changes in income, as well as to previous disequilibria $(c_{t-1} - \gamma y_{t-1})$, which can be interpreted as a feedback response to obtain a desired long-run condition. The parameter β_0 (equivalent to λ in the Euler equation in Blundell-Wignal *et al*., 1995) is then used to measure the fraction of consumers who are liquidity-constrained. Compared with the error-correction model of Campbell and Mankiw (1991), Blundell-Wignal *et al*. (1995) and Agell and Berg (1996), our equation (4) is a more general error-correction model with lagged consumption and income as additional explanatory variables.

Sources of Data

The Asian developing countries included in the study are Indonesia, Malaysia, Myanmar, Nepal, Philippines, Singapore, South Korea, Sri Lanka, Taiwan and Thailand. The model is estimated country by country using annual data, with the sample period covering from 1950 to 1994.[3] The variables included are: (a) real private consumption per capita to measure household consumption. (b) real income per capita to measure disposable income, where income is measured by GDP. (c) All nominal variables are deflated using the Consumer Price Index (CPI). Data were collected from various issues of *International Financial Statistics* published by International Monetary Fund. All variables were transformed into logarithms.

3 ESTIMATION AND RESULTS

Before we estimate equation (4), we have tested each series for unit roots and for cointegration between consumption and income. As reported in Table 1, our results clearly indicate that c_t and y_t are all integrated of order one. The cointegration test based on the Engle-Granger two-step procedure suggests that only in the cases of South Korea and Sri Lanka can the null of no cointegration between c_t and y_t be rejected.

We next proceed with a direct test for cointegration using the error-correction model as suggested by Kremers *et al*. (1992). The results are presented in Table 2. The final parsimonious error-correction models were searched between the first- through fourth-order ARDL model using the Hendry's general to specific modelling approach. In all cases, the final selected ARDL model passes the diagnostic tests of no serial correlation, normality of residuals and homoscedasticity.[4] Further, we have tested for weak exogeneity of income in the error-correction model. In order to test for the weak exogeneity of y_t, we have estimated the following equation,[5]

$$\Delta y_t = \pi_0 + \sum_{i=1}^{4} \pi_1 \Delta y_{t-i} + \sum_{i=1}^{4} \pi_2 \Delta c_{t-i} + \sum_{i=1}^{4} \pi_3 \Delta x_{t-i}$$

$$+ \sum_{i=1}^{4} \pi_4 \Delta pop_{t-i} + \pi_5 ecm_{t-1} + \omega_t \qquad (5)$$

The weak exogeneity test procedure using equation (5) is to test for the significance of the ecm_{t-1} coefficient, π_5. If π_5 is not significantly different from zero then the income process is weakly exogenous with respect to the long-run parameters (see Urbain, 1992; Johansen, 1992). Our results for weak exogeneity tests suggest that except in the case of Taiwan, income in nine Asian developing countries investigated is weakly exogenous. This implies that income in nine of the Asian countries is free from simultaneity bias, so the use of single-equation estimation is justified.[6]

We now turn to the results of our error-correction model. Our variables of interest are the significance of Δy_t and the ecm_{t-1} term. In all cases, both Δy_t and ecm_{t-1} are significantly different from zero at the five percent level.[7] The ecm_{t-1} variable has the correct negative sign. As pointed out by Chah *et al*. (1995) this provides supporting evidence for the presence of liquidity constraints for each country investigated. The fraction of liquidity-constrained consumers estimated from the error-correction model range from 0.25 in the case of Taiwan, to 0.98 in the case of Nepal.

Our next question is: did λ change during the deregulation era? If the financial liberalisation process seen in financial markets has caused liquidity constraints to be progressively relaxed, then estimating equations (4) for successive time periods should tend to indicate a reduction in the λ parameter. In this study, we follow Blundell-Wignal *et al*. (1995) by estimating separate λ equations for different time periods. We have divided the time period into two sub-sample periods of 1950s/70s and 1980s/90s for our tests. In all of the Asian countries considered in this study, activities related to financial liberalisation have been more active in the late 1980s and early 1990s.[8] Thus, if deregulation played a role, we would expect to see a reduction in the point estimate of λ in the second sub-sample period.

Table 3 presents the results from estimating equations (4) for the two sub-sample periods. Our results from the error-correction model suggest that both the estimates of λ and the ecm_{t-1} term are significantly different from zero in all ten Asian countries investigated. In fact the two parameters are statistically significant at the five percent level in both time periods. Furthermore, in all cases the ecm_{t-1} term has the correct negative sign implying that consumption and income are strongly cointegrated in both time periods. This evidence provides support for the existence of liquidity constraints in the ten Asian developing countries studied. As to the size of the estimates of λ, only in the cases of South Korea, Sri Lanka and Taiwan do the estimates of λ fall between the 1950s/70s and the 1980s/90s: by 73 percent, 24 percent and 20 percent respectively. However, for other countries, the estimate of λ has either remained unchanged (in the cases of Indonesia, Nepal, Philippines, Singapore and Thailand) or increased (in the cases of Malaysia and Myanmar) over time.

4 CONCLUSIONS

Financial liberalisation has been recognised as an important step towards achieving economic progress by allowing financial markets to be determined by market forces. The proliferation of financial intermediaries, financial instruments and the development of money and capital markets will enhance the formation of an efficient and sophisticated financial system. Nevertheless, one important implication for financial liberalisation is to reduce liquidity constraints. As a result of financial deregulation, households will be able to smooth their consumption relative to income through borrowing as borrowing constraints were lifted. The ability of households to borrow and adjust their financial portfolios has important implications for monetary aggregates and consequently for the conduct of monetary policy. In order to increase their current consumption, households will increase their borrowing (using available financial or physical assets as collateral) or adjust their financial portfolios or relinquish part of their accumulated wealth. As a result of financial liberalisation consumption becomes more sensitive to wealth, and the relationship between consumption and current income will be weakened. Consequently, we should observe that the relationship between monetary aggregates and current income will also be weakened in financially liberalised economies.

The purpose of the present study is to investigate whether financial liberalisation has reduced liquidity constraints in ten Asian developing countries. To do this, we have estimated an error-correction model to determine whether the estimates of the λ's have been reduced in the deregulation era. Our results suggest that it is only in the cases of South Korea, Sri Lanka and Taiwan that the estimates of the λ's was reduced in magnitude in the 1980s/90s, compared to the earlier sub-sample period. For the 1980s/90s sub-sample period, the fraction of consumers that were liquidity constrained in South Korea, Sri Lanka and Taiwan are 22 percent, 68 percent and 37 percent respectively. The estimates of the λ's for other Asian developing countries investigated, have either remain unchanged or increased in the latter sub-sample periods.

Despite the reductions in the estimates of λ's in several of these countries, the long-run relationship between consumption and income has been strong. In all the Asian developing countries investigated, the ecm_{t-1} term is negative and significantly different from zero and in most cases at the one percent level in both sub-sample periods. This implies that consumption and current income are strongly cointegrated. The finding for cointegration between consumption and income signifies that there will be a stable long-run relationship between the monetary aggregates and income and consequently, monetary aggregates will be useful for the purpose of monetary policy action in these Asian countries.

REFERENCES

Agell, J. and L. Berg (1996) Does Financial Deregulation Cause a Consumption Boom? *Scandinavian Journal of Economics*, 98(4), pp. 579-601.

Banerjee, A., J.J. Dolado, J.W. Galbraith and D.F. Hendry (1993) *Co-Integration, Error-Correction and the Econometric Analysis of Non-Stationary Data*, Oxford, Oxford University Press.

Banerjee, A., J.W. Galbraith and J. Dolado (1990) Dynamic Specification and Linear Transformations of the Autoregressive-Distributed Lag Model, *Oxford Bulletin of Economics and Statistics*, 52(1), pp. 95-104.

Bayoumi, T (1993) Financial Deregulation and Household Saving, *Economic Journal*, 103, pp. 1432-1443.

Blundell-Wignall, A., F. Browne and A. Tarditi (1995) Financial Liberalization and the Permanent Income Hypothesis, *The Manchester School*, 63(2) pp. 125-144.

Blundell-Wignall, A., F. Browne and P. Manasse, (1990) Monetary Policy in Liberalised Financial Markets, *OECD Economic Studies*, No. 15, Paris, OECD.

Campbell, J.Y. and N.G. Mankiw (1991) The Response of Consumption to Income: A Cross-Country Investigation, *European Economic Review*, 35, pp. 723-767.

Chah, E.Y., V.A. Ramey and R.M. Starr (1995) Liquidity Constraints and Intertemporal Consumer Optimization: Theory and Evidence from Durable Goods, *Journal of Money, Credit and Banking*, 27(1), pp. 272-287.

Davidson, J.E.H., D.F. Hendry, F. Srba and S. Yeo, (1978) Econometric Modelling of the Aggregate Time-Series Relationship between Consumers' Expenditure and Income in the United Kingdom, *Economic Journal*, 88, pp. 661-692.

Deaton, A. 1992, *Understanding Consumption*, Oxford, Clarendon Press.

Favero, C.A. (1993) Error Correction and Forward Looking Models for UK Consumers' Expenditure, *Oxford Bulletin of Economics and Statistics*, 55(4), pp. 453-472.

Habibullah, M.S. and P. Smith (1997) Financial Liberalization and Economic Development: Lessons from ASEAN Countries, *Journal of Asian Business* 13(3), pp. 69-97.

Hall, R.E. (1978) Stochastic Implications of the Life Cycle-Permanent income hypothesis: Theory and Evidence, *Journal of Political Economy*, 86, pp. 971-987.

Hendry, D.F. (1983) Econometric Modelling: The Consumption Function in Retrospect, *Scottish Journal of Political Economy*, 30, pp. 193-220.

Hendry, D.F. and T. von Ungern-Sternberg (1980) Liquidity and Inflation Effects on Consumers' Expenditure in *Essays in the Theory and Measurement of Consumers' Behaviour*, (Ed) A.S. Deaton, Cambridge, Cambridge University Press.

Hendry, D.F., A.R. Pagan and J.D. Sargan, (1984) Dynamic Specification in *Handbook of Econometrics*, *Volume II* (Ed) Z. Griliches and M. Intriligator, Amsterdam, North-Holland.

International Monetary Fund, *International Financial Statistics 1979-1996*, Washington, D.C., IMF.

Jappelli, T. and M. Pagano (1989) Consumption and Capital Market Imperfections: An International Comparison, *American Economic Review*, 79(5), pp. 1088-1105.

Johansen, S. (1992) Testing Weak Exogeneity and the Order of Cointegration in UK Money Demand, *Journal of Policy Modeling*, 14, pp. 313-402.

Kremers, J.J.M., N.R. Ericsson and J.J. Dolado (1992) The Power of Cointegration Tests, *Oxford Bulletin of Economics and Statistics*, 54(3), pp. 325-348.

McKinnon, R.I. (1973) *Money and Capital in Economic Development*, Washington, D.C., Brookings Institution.

Mokhtari, M. (1994) Testing for Liquidity Constraints among Households: An International Analysis, *Empirical Economics*, 19, pp. 709-715.

Muellbauer, J. (1994) The Assessment: Consumer Expenditure, *Oxford Review of Economic Policy*, 10(2), pp. 1-41.

Nickell, S. (1985) Error Correction, Partial Adjustment and All That: An Expository Note, *Oxford Bulletin of Economics and Statistics* 47(2), pp. 119-129.

Pesaran, M.H. and Y. Shin (1995) An Autoregressive Distributed Lag Modelling Approach to Cointegration Analysis, *DAE Working Paper No. 9514*, University of Cambridge.

Pesaran, M.H., Y. Shin and R.J. Smith (1996) Testing for the Existence of a Long-Run Relationship, *DAE Working Paper No. 9622*, University of Cambridge.

Urbain, J.P. (1992) On Weak Exogeneity in Error Correction Models, *Oxford Bulletin of Economics and Statistics*, 54(2), pp. 187-207.

Wickens, M.R. and T.S. Breusch (1988) Dynamic Specification, the Long Run and the Estimation of Transformed Regression Models, *Economic Journal* (Conference Supplement), 98, pp. 189-205.

Table 2: Results of Error-Correction Model

Variables	Indonesia	Malaysia	Myanmar	Nepal	Philippines
A. Error-correction models					
Constant	0.0224	0.0545	-0.4374	-0.0405	0.8750
	(0.6953)	(0.9035)	(1.5146)	(0.1947)	(6.7476)*
Δy_t	0.4065	0.5430	0.4928	0.9812	0.3550
	(4.5920)*	(6.8225)*	(5.1538)*	(15.758)*	(5.2446)*
ecm_{t-1}	-0.5424	-0.3251	-0.3841	-0.1237	-0.5640
	(4.3706)*	(2.9135)*	(5.5353)*	(1.1812)	(6.3646)*
Δc_{t-1}	0.0681	0.2454		-0.0728	
	(0.5060)	(2.6744)*		(1.1840)	
Δc_{t-2}		0.0471			
		(0.4707)			
R-squared	0.486	0.707	0.479	0.908	0.550
SER	0.042	0.027	0.065	0.025	0.026
Dw	1.864	1.744	1.634	2.133	1.521
Weak exogeneity:					
t: π_5	-0.1738	0.0639	-0.4161	0.7467	-0.1781
B. Underlying Autoregressive Distributed Lag (ARDL) models					
	ARDL (2,0)	ARDL (3,1)	ARDL (1,0)	ARDL (2,1)	ARDL (1,0)
Constant	0.0224	0.0545	-0.4374	-0.0405	0.8750
	(0.6953)	(0.9035)	(1.5146)	(0.1947)	(6.7476)*
c_{t-1}	0.5257	0.9202	0.6158	0.8034	0.4359
	(3.2316)*	(6.4389)*	(8.8745)*	(6.7131)*	(4.9184)*
c_{t-2}	-0.0681	-0.1982		0.0728	
	(0.5060)	(1.2889)		(1.1840)	
c_{t-3}		-0.0471			
		(0.4707)			
y_t	0.4065	0.5430	0.4928	0.9812	0.3550
	(4.5920)*	(6.8225)*	(5.1538)*	(15.758)*	(5.2446)*
y_{t-1}		-0.2843		-0.8543	
		(2.5716)*		(6.6548)*	
R-squared	0.988	0.993	0.835	0.973	0.969
SER	0.042	0.027	0.065	0.025	0.026
DW	1.864	1.744	1.634	2.133	1.521
LM (1)	0.077	0.466	1.496	0.315	2.478
	[0.781]	[0.494]	[0.221]	[0.574]	[0.115]
Norm (2)	1.279	3.864	1.202	3.638	6.086
	[0.527]	[0.145]	[0.548]	[0.162]	[0.048]*
ARCH (2)	0.580	0.422	1.775	0.242	0.831
	[0.446]	[0.516]	[0.183]	[0.622]	[0.362]

Notes: ecm_{t-1} is the error-correction term. SER and DW denote standard error of regression and Durbin-Watson statistic respectively. LM (1) and ARCH (1) are Lagrange multiplier tests for first-order serial correlation and autoregressive conditional heteroskedasticity. Norm (2) is a test for the normality of the residuals. All three tests are asymptoticlly distributed as χ-square. Figures in parentheses (.) and square brackets [.] are *t*-statistics and *p*-values respectively. Asterisk (*) denotes statistically significant at five percent level.

Table 2: Results of Error-Correction Model (continued)

Variables	Singapore	South Korea	Sri Lanka	Taiwan	Thailand
A. Error-correction models					
Constant	0.2045	0.0434	-0.3921	-0.1273	-0.3997
	(2.6386)*	(3.3592)*	(6.5777)*	(3.1836)*	(6.9276)*
Δy_t	0.6536	0.6879	0.8556	0.2535	0.4725
	(10.338)*	(9.9273)*	(9.0482)*	(5.1427)*	(8.8317)*
ecm_{t-1}	-0.2050	-0.8343	-0.8219	-0.2800	-0.5768
	(3.0579)*	(9.8210)*	(8.9038)*	(4.7285)*	(8.5767)*
Δc_{t-1}	0.5733		0.2779	0.0623	-0.0716
	(3.6224)*		(2.9966)*	(0.4853)	(0.9159)
Δc_{t-2}				-0.0790	-0.0807
				(0.6098)	(1.0283)
Δc_{t-3}					0.1307
					(1.8334)
Δy_{t-1}	-0.4232				
	(3.6925)*				
R-squared	0.869	0.724	0.680	0.502	0.748
SER	0.016	0.032	0.030	0.031	0.019
Dw	1.886	1.475	1.835	1.750	2.168
Weak exogeneity:					
t: π_5	-1.6187	0.1319	0.0315	-2.0933*	-0.9007
B. Underlying Autoregressive Distributed Lag (ARDL) models					
	ARDL (2,2)	ARDL (1,0)	ARDL (2,0)	ARDL (3,0)	ARDL (4,0)
Constant	0.2045	0.0434	-0.3921	-0.1273	-0.3997
	(2.6386)*	(3.3592)*	(6.5777)*	(3.1836)*	(6.9276)*
c_{t-1}	1.3683	0.1656	0.4560	0.7823	0.3515
	(8.8770)*	(1.9492)	(4.1191)*	(5.2333)*	(3.8013)*
c_{t-2}	-0.5733		-0.2779	-0.1414	-0.0090
	(3.6224)*		(2.9966)*	(0.7262)	(0.0921)
c_{t-3}				0.0790	0.2114
				(0.6098)	(2.2856)*
c_{t-4}					-0.1307
					(1.8334)
y_t	0.6536	0.6879	0.8556	0.2535	0.4725
	(10.338)*	(9.9273)*	(9.0482)*	(5.1427)*	(8.8317)*
y_{t-1}	-0.9400				
	(7.3501)*				
y_{t-2}	0.4232				
	(3.6925)*				
R-squared	0.998	0.998	0.996	0.997	0.997
SER	0.016	0.032	0.030	0.031	0.019
DW	1.886	1.475	1.835	1.750	2.168
LM (1)	0.047	3.256	0.131	2.055	0.871
	[0.827]	[0.071]	[0.716]	[0.152]	[0.351]
Norm (2)	2.313	1.941	0.736	0.255	3.721
	[0.315]	[0.379]	[0.692]	[0.880]	[0.156]
ARCH (2)	0.575	1.060	0.569	2.781	1.016
	[0.448]	[0.303]	[0.451]	[0.095]	[0.313]

Notes: ecm_{t-1} is the error-correction term. SER and DW denote standard error of regression and Durbin-Watson statistic respectively. LM (1) and ARCH (1) are Lagrange multiplier tests for first-order serial correlation and autoregressive conditional heteroskedasticity. Norm (2) is a test for the normality of the residuals. All three tests are asymptoticlly distributed as χ-square. Figures in parentheses (.) and square brackets [.] are t-statistics and p-values respectively. Asterisk (*) denotes statistically significant at five percent level.

Table 1: Results of Unit Root Tests

Variables	Indonesia	Malaysia	Myanmar	Nepal	Philippines	Singapore	South Korea	Sri Lanka	Taiwan	Thailand
A. Integration tests on levels of series										
c_t	-2.95 (3)	-3.17 (1)	-3.38 (2)	-2.78 (1)	-1.92 (1)	-3.10 (1)	-2.84 (1)	-2.06 (1)	-3.31 (4)	-1.93 (3)
y_t	-2.40 (1)	-2.66 (1)	-2.81 (1)	-0.68 (2)	-1.42 (1)	-3.19 (3)	-3.06 (1)	-2.45 (1)	-3.43 (4)	-1.55 (1)
B. Integration tests on first-differences of series										
Δc_t	-3.22 (1)*	-3.90 (1)*	-5.52 (1)*	-6.39 (1)*	-4.40 (1)*	-3.87 (1)*	-4.40 (1)*	-3.55 (1)*	-3.16 (2)*	-3.79 (1)*
Δy_t	-3.07 (2)*	-5.28 (1)*	-4.61 (1)*	-7.53 (1)*	-4.24 (1)*	-3.85 (3)*	-4.16 (1)*	-3.24 (1)*	-3.42 (2)*	-3.62 (1)*
C. Integration tests on residuals of cointegrating regression: $c_t = a + by_t + e_t$										
e_t	-0.89 (1)	-2.23 (1)	-2.45 (3)	-1.97 (1)	-2.03 (1)	-2.35 (1)	-3.60 (1)*	-4.71 (2)*	-1.28 (1)	-2.05 (1)

Notes: The relevant tests are derived from the OLS estimation of the following augmented Dickey-Fuller (ADF) regression:

$$\Delta y_t = a + bt + \beta y_{t-1} + \sum_{i=1}^{n} d_i \Delta y_{t-i} + \nu_t$$

where Δ is the difference operator, t is a linear time trend and ν is the disturbance term. The hypothesis that a series contains a unit root is tested by $H_0 : \beta = 0$ while the hypothesis that the series is non-stationary with a stochastic trend rather than a deterministic time trend is tested by $H_0 : b = -\beta$. Rejection of the latter hypothesis suggests the existence of a deterministic trend. τ_τ is the t-statistic for testing the significance of β when a time trend is included in the above equation while τ_μ when time trend is excluded. The lag length n, was chosen based on Schwarz Bayesian Criterion (SBC). The calculated statistics are those computed in MacKinnon (1991). The critical values at 5 percent are -3.62 (Indonesia), -3.56 (Malaysia, Nepal), -3.53 (Myanmar, Philippines, South Korea, Sri Lanka, Taiwan, Thailand), -3.57 (Singapore) for τ_τ. When testing for first-differences of the series, time trend was dropped from the above regression equation. The critical values for τ_μ at 5 percent level are -3.00 (Indonesia), -2.96 (Malaysia, Nepal), -2.94 (Myanmar, Philippines, South Korea, Sri Lanka, Taiwan, Thailand), and -2.97 (Singapore). The critical values for cointegration tests at 5 percent level are -3.61 (Indonesia), -3.53 (Malaysia, Nepal), -3.50 (Myanmar, Philippines, South Korea, Sri Lanka, Taiwan, Thailand), and -3.55 (Singapore).

Table 3: Testing for Liquidity Constraints Over Time

Method of Estimation	Sub-sample periods	Indonesia Δy_t	Indonesia ecm_{t-1}	Malaysia Δy_t	Malaysia ecm_{t-1}	Myanmar Δy_t	Myanmar ecm_{t-1}	Nepal Δy_t	Nepal ecm_{t-1}	Philippines Δy_t	Philippines ecm_{t-1}
ARDL/ECM	1950s/70s	0.65	-1.34	0.44	-0.86	0.34	-0.37	0.89	0.04	0.37	-0.57
		(6.04)*	(5.59)*	(9.30)*	(4.12)*	(2.72)*	(4.11)*	(8.96)*	(0.25)	(4.38)*	(4.93)*
	1980s/90s	0.64	-0.76	0.82	-0.73	0.87	-0.88	0.89	-0.99	0.31	-0.53
		(4.18)*	(4.06)*	(8.65)*	(3.84)*	(8.09)*	(7.72)*	(10.06)*	(3.63)*	(2.64)*	(2.51)*

Method of Estimation	Sub-sample periods	Singapore Δy_t	Singapore ecm_{t-1}	South Korea Δy_t	South Korea ecm_{t-1}	Sri Lanka Δy_t	Sri Lanka ecm_{t-1}	Taiwan Δy_t	Taiwan ecm_{t-1}	Thailand Δy_t	Thailand ecm_{t-1}
ARDL/ECM	1950s/70s	0.67	-0.41	0.83	-1.01	0.90	-0.87	0.46	-0.61	0.49	-0.56
		(7.69)*	(2.63)*	(9.48)*	(9.07)*	(6.98)*	(5.99)*	(6.07)*	(5.53)*	(4.18)*	(4.04)*
	1980s/90s	0.64	-0.22	0.22	-0.25	0.68	-0.75	0.37	-0.35	0.50	-0.58
		(7.52)*	(2.17)*	(2.83)*	(2.74)*	(3.55)*	(3.58)*	(3.15)*	(3.37)*	(4.89)*	(4.37)*

Notes: Sample periods for each country are: Indonesia (1966-1994), Malaysia (1958-1994), Myanmar (1950-1994), Nepal (1958-1994), Philippines (1950-1994), Singapore (1960-1994), South Korea (1953-1994), Sri Lanka (1950-1994), Taiwan (1950-1994) and Thailand (1952-1994). GIV (2SLS) denotes Generalised Instrumental Variable (Two Stage Least Squares) method. ARDL/ECM denotes Autoregressive Distributed Lag/Error-correction model. Asterisk (*) denotes statistically significant at five percent level.

[1] Following Nickell (1985), Mokhtari (1994) has shown that equation (8) can be derived by minimising a quadratic loss function based on adjusting the actual consumption, $\ln C$, to its desirable value, $\ln C^*$: $\ln Lt = \delta 1(\ln Ct - \ln Ct^*)2 + \delta 2(\ln Ct - \ln Ct\text{-}1)2 - 2\delta 3(\ln Ct - \ln Ct\text{-}1)(\ln C^*t - \ln C^*t\text{-}1)$, where adjustment factors $\delta 1$, $\delta 2$ and $\delta 3 \geq 0$, and $(\ln Ct - \ln Ct\text{-}1) \times (\ln C^*t - \ln C^*t\text{-}1)$ reflect the attenuation of cost if Ct moves toward C^*t. Minimizing $\ln Lt$ with respect to $\ln Ct$ and rearranging, yields: $\Delta \ln C^*t = \phi 1 \Delta \ln Ct + (1\text{-}\phi 3)(\varphi \ln Ct\text{-}1 - \ln C^*t\text{-}1)$, where $\phi 1 = \delta 1/(\delta 1+\delta 2)$, $\phi 3 = \delta 2/(\delta 1+\delta 2)$ and $\varphi = (\phi 1+\phi 2)/(1\text{-}\phi 3)$. The error-correction term, $(\varphi \ln Ct\text{-}1 - C^*t\text{-}1)$ represents disequilibrium experienced by consumers. In practice, C^*t and $\Delta \ln Ct$ are approximated by the predicted value of a cointegrated regression, $Ct\hat{} = \alpha t\hat{}Yt + \eta t$, and $\Delta \ln Yt$, respectively; hence: $\Delta \ln Ct = \phi 1 \Delta \ln Yt + \gamma(Ct\text{-}1 - \alpha 1\hat{}\ln Yt\text{-}1)$.

[2] Extensive discussions of the relationship between the error-correction model and its long-run solutions appear in Hendry *et al*. (1984), Wickens and Breusch (1988), Banerjee *et al*. (1990) and more recently, by Pesaran and Shin (1995) and Pesaran *et al*. (1996).

[3] See notes in Table 1 for details.

[4] Only in the case of the Philippines was the test for normality of residuals marginally rejected.

[5] Variable x denotes real exports per capita and pop denotes total population.

[6] The study by Davidson and Hendry (1981) also found out that including income does not induce substantial simultaneity bias in the consumption model. Thus, estimating the Euler equation is not warranted.

[7] This result implies that consumption and income are cointegrated. The finding of cointegration using this approach clearly indicates the low power of the Engle-Granger two-step procedure for the test of cointegration.

[8] See Habibullah and Smith (1997) for further discussions on financial liberalisation in the Asian developing countries under investigation.