Stock Market Development and Capital Accumulation: What the Time Series Evidence Shows

Sarkar, Prabirjit

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Prabirjit Sarkar

Jadavpur University, Kolkata, India
Email: prabirjitsarkar@gmail.com

Abstract

The present study analysed time series data of 37   developed and less developed countries over the period 1976-2002. It shows that in the majority of cases (including France, UK and USA) the stock market turnover ratio - an important indicator of stock market development- has no positive long-term relationship with the growth rates of gross fixed capital formation. For some developed countries such as Austria, Italy, Japan and Germany and less-developed countries such as Chile, Egypt, Jamaica, Jordan, Philippines and Venezuela we get a positive long-term relationship. These are by and large the so-called French or German-origin civil law countries.

Key words: stock market, capital accumulation, growth and liberalisation

JEL CODES: O16, F3, G 00

I

Stock market has become an integral part of a mature capitalist society. It is expected to provide a market mechanism for financing a new venture, which is profitable on the basis of private cost calculations. As a part of the development strategy many less developed countries (LDCs) are now trying to promote the growth of stock market, often under the advice of the mentors of the Bretton Woods System. However a lot of speculative activities and movements of speculative capital take place in the stock market particularly for stock trading. Accordingly stock prices move up and down and in many cases it has no connection with real economic activities. That's why Keynes compared this with casino and held the view that long-term investment decision taken on the basis of this gambling is harmful for the economy.

The study of World Bank (1993) showed that stock markets have played little role in the post-war industrialisation of Japan, Korea and Taiwan. So Singh (1997) argued that the recent move towards stock market liberalisation is 'unlikely to help in achieving quicker industrialisation and faster long-term economic growth' in most of the LDCs.

There are, however, many studies supporting the positive link between stock market development and growth. These are by and large cross-country studies. Let us mention some of the recent studies. One important study was undertaken by Levine and Zervos (1998). Their cross-country study found that the development of banks and stock markets has a positive effect on growth. In another study Levine (2003) argued that although theory provides ambiguous

relationship between stock market liquidity and economic growth, the cross-country data for 49 countries over the period 1976-93 suggest a strong and positive relationship (see also Levine, 2001). Henry (2000) studied a sample of 11 LDCs and observed that stock market liberalisations lead to private investment boom. Recently, Bekaert et al (2005) analysed data of a large number of countries and observed that the stock market liberalisation 'leads to an approximate 1 % increase in annual real per capita GDP growth'.

In a time-series study of 5 developed countries, Arestis *et al* (2001) found a favourable role of stock market along with bank in economic growth; but they observed that the favourable role of stock market is exaggerated in different cross-country studies.

In this perspective we shall examine the relationship between stock market development and capital accumulation in a number of developed and less-developed countries for which the relevant data are available (Section II). Section III concludes.

II

From the Financial Structure Dataset constructed by Thorsten Beck of World Bank (available on-line) we have been able to collect annual data on the most important indicator of stock market development for 37 countries since the mid-1970s (for some countries since the early 1980s). It is the turnover ratio (TURN) defined as the ratio of the value of total shares traded in a country's stock market to average real market capitalization. [1] Out of 37 countries 16 countries are old (as

at 1975) members of OECD group (nicknamed rich countries' club).   We considered 21 other countries (including Mexico and Korea – the present members of OECD).

We have World Bank WDI (World Development Indicators) data for the growth of gross capital formation (GKFG) for all these countries up to 2002. [2]   So our period of analysis is 1976-2002 (in some cases shorter periods are considered due to non-availability of data).

In Table 1 the full list of countries along with their 1976-2002- average turn over ratio, per capita GDP (purchasing power parity 2000 dollar) etc data are presented.   Without bothering for the tests of stationarity for the time being we have examined the trends in the turnover ratio (Table 2). Excepting Japan, all the OECD (1975) countries experienced significant growth in the turnover ratio (so far as the over-all picture is concerned).   Among the other countries, South Africa, Hong Kong, Korea and Pakistan experienced significant growth in the turnover ratio.

The process is however not smooth (as can be checked by plotting the turnover ratio against year for each country). Austria, for instance, actually experienced a decline in the turnover ratio since the mid-1980s. Germany had a similar story since 1990-91 (which corresponds with the time of German unification). The most of the OECD (1975) countries (including Japan) experienced decline in the turnover ratio since the middle of the 1980s till the end of that decade or till the early years of the next decade (perhaps a hang-over of the dooms day of 1987). Among the other group, the growth of the turnover ratio is a comparatively recent phenomenon for South Africa and Pakistan – due to the rapid growth in the late 1990s, the over-all trend is found to be highly

significant. Amidst fluctuations Korea and Hong Kong experienced regular growth in the turnover ratio.

With this preliminary information about the behaviour of the turnover ratio over time for each country, we would like to examine whether there exists any meaningful relationship between this indicator of stock market development (TURN) and the growth of capital accumulation (GGKF) for each of these 37 countries over the period since the mid-1970s or early 1980s till 2001/2 for which we have the relevant data.

This analysis often requires a pre-testing of the stationarity of the variables as done in Table 3. As expected the GGKF series is stationary in almost all the country-cases. But the turnover ratio is non-stationary in many cases. So we shall use Autoregressive Distributive Lag (ARDL) approach to cointegration developed by Pesaran and Shin (1999). It can be used to test for the existence of a long run relationship between two variables irrespective of whether they are stationary or stochastic. This approach does not require any pre-testing of the variables to determine the order of their integration (how many times the data are to be differenced to achieve the stationary property of the data). It is especially useful here as our tests of stationarity give mixed result.[3] Furthermore we don't have a long time span; it is a recognised fact that the standard tests of stationarity have very low power for a small sample.

First, we shall include no other variables that are expected to influence capital accumulation. The following ARDL (p, q) model is fitted:

$$\text{(1)} \qquad G_t = a + b.t + \sum_{i=1}^{p} b_i \, G_{t-i} + \sum_{j=0}^{q} c_j \, S_{t-j}$$

where G is the growth rate of Gross Capital Formation (GGKF), S is the stock market turnover ratio (TURN), t is the time trend which captures the effect of other explanatory variables (it is omitted from the ARDL equation when its coefficient is found to be insignificant), the subscripts t, t-i, t-j, indicate different time periods and p and q are unknown lags to be determined by Schwarz Bayesian criterion (SBC) as suggested by Pesaran and Shin (1999).

The estimates of the long-term coefficients are reported in Table 4. Estimates show that for only Austria in the OECD (1975) group and for 7 countries belonging to the other group (Argentina Chile, Egypt, Jamaica, Jordon, Philippines and Venezuela) a positive long-run relationship exists between stock market development (indicated by turnover ratio, TURN) and capital accumulation (GGKF).

Excepting Jamaica all these are so-called 'French or German-origin civil-law' countries with relatively 'poor' protection of shareholders compared to 'English-origin common law' countries *a la* the controversial theory of LLSV (La Porta *et al*, 1998). This requires further investigation beyond the scope of the present paper.

 For Korea we got a negative relationship. It could be due to the fact that the period of our study includes the years of 1997 crisis and subsequent recovery. So we have added intercept dummy for 1997-02 to the equation (1) and found no significant relationship between TURN and GGKF.

Similarly for Germany we have used dummies for the period 1990/91-2002 to take into account the possible influence of German unification (both GGKF and TURN series showed structural breaks around that time) but the conclusion of no relationship does not change (details are skipped).

Next we have extended the ARDL analysis to accommodate other factors that are often expected to influence the growth of capital accumulation such as domestic credit to the private sector as percentage of GDP (PCRGDP) [4] and foreign direct investment (importance of FDI to gross capital formation, FDIGKF).

The following ARDL (p, q, r, s) model has been fitted:

$$(2) \qquad G_t = a + b.t + \sum_{i=1}^{p} b_i\, G_{t-i} + \sum_{j=0}^{q} c_j\, S_{t-j} + \sum_{k=0}^{r} d_k\, F_{t-k} + \sum_{l=0}^{s} e_l.B_{t-l}$$

where G = GKFG, S = TURN, F = FDIGKF and B = PCRGDP; the subscripts t, t-i, t-j, t-k, t-l, indicate different time periods and p, q, r and t are unknown lags to be determined by the SBC.

The estimates of the long-term coefficients show that our observation of positive relationship based on ARDL (p, q) equation can be maintained for Austria and five countries in the non-OECD group (Argentina and Egypt are the exception). Three more countries now can be added to the list – all from OECD (1975) group: Italy, Japan and Sweden. None of them has English common-law heritage.

For India and many other countries we get the surprising result – a negative relationship between turnover ratio and GGKF particularly after taking into account the impact of private credit (PCRGDP) and FDI (FDIGKF). For India we have looked into the data on the growth of private fixed capital formation (calculated from the relevant data available from Government of India, Economic Survey). The GGKF data covers both private and public capital formation and during our period of analysis (since the mid-1980s) the importance of public capital formation started declining. Fitting both ARDL equations to these data we observed that only private credit (PCRGDP) and private capital accumulation have a positive long-term relationship. In our earlier study on Indian experience (Sarkar, 2007) we have used many other indicators of stock market development and found no relationship between stock market behaviour and private capital accumulation.

For Korea, Thailand and Malaysia we used intercept and/or slope dummies for the period of financial crisis 1997-2002 and it did not alter our finding of no relationship (details are skipped). For Germany, the use of intercept and slope dummies for the period, 1990/91-2002 shows a strong positive relationship between the turnover ratio and the growth of capital formation.

As a bye-product of our study we find no positive relationship between capital formation (GGKF) and private credit (PCRGDP) or FDI (FDIGKF) in most of the cases. This calls for further investigation which is beyond the scope of the present study.

III

In the present era of financial liberalisation under the aegis of the three pillars of the Britton Woods system (IMF, World Bank and WTO) stock market development has been an important part of both internal and external financial liberalisation in the less development countries (LDCs).

Our earlier cross-country average and panel data study (Sarkar,2006) finds no positive link between the stock market capitalisation as percentage of GDP and growth of fixed capital formation (GGKF) even after controlling for the level of per capita GDP, trade openness, FDI and financial sector development (as indicated by PCRGDP)

In the present time series study of individual country cases, based on ARDL method of cointegration, we observe that in the majority of cases there is no positive relationship between growth of capital formation and stock market. This is true not only for the less-developed countries but also for the mature capitalist countries such as UK, USA and France. Given this lack of relationship between stock market development and capital accumulation, there is limited usefulness of the policy of promoting stock market for achieving the developmental goals of the LDCs.

1   Turnover Ratio (TURN) is the ratio of the value of total shares traded to average real market capitalization. It   is calculated using the following method: $T_t/P\_a_t/\{(0.5)*[Mt/P\_e_t+ M_{t-1}/P\_e_{t-1}]$ where T is   total value traded, M is stock market capitalization, P_e is end-of period CPI, P_a is average annual CPI.

2   For Korea and Jamaica we have calculated GKFG from the data on gross capital formation available in International Financial Statistics published by IMF.

3   We did not try Perron tests of stationarity although many series have structural breaks, as the ARDL methodology used here does not require ascertaining the order of integration – I(1) or I(2).

4   Due to gaps in the PCRGDP series, bank credit as percentage of   GDP (BCRGDP) was used for two countries: Brazil and Malaysia.

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Table 1. Per Capita Income, Stock Market Turnover, Private Credit, FDI and Growth of Capital Formation, 1976-2002: Selected Countries

(annual averages)

Country	PCGDPP[a]	TURN[b]	PCRGDP[c]	FDIGKF[d]	GGKF[e]
I. Non-OECD (1975) Countries					
ARGENTINA	10927	0.31[1]	21.91	8.19	-0.08
BRAZIL	6683	0.49[1]	48.91[2]	7.07	2.33
CHILE	6250	0.08[3]	54.7	14.61	9.21[1]
COLOMBIA	5556	0.08	31.55[4]	9.01	3.81
COTE D' IVOIRE	1883	0.02[5]	30.15	7.42	3.94
EGYPT	2796	0.15[5]	35.6	7.6	3.29
HONG KONG	18445	0.38	153.62[4]	61.32[6]	7.06
INDIA	1688	0.81	26.1	1.06	6.05
INDONESIA	2232	0.64[1]	32.02	0.26	6.93
JAMAICA	3573	0.07[5]	27.49	7.03	2.12[7]
JORDAN	4070	0.14[3]	64.76	5.03[1]	4.96[1]
KOREA	9180	1.33	61.9	1.52	17.98[7]
MALAYSIA	5918	0.31[1]	97.67	13.24	9.04
MEXICO	7743	0.47[1]	20.17	7.69	3.62
PAKISTAN	1490	0.96[8]	26.65	3.01	4.23
PERU	4814	0.18[5]	27.21	6.99	2.98
PHILIPPINES	3867	0.26	36.75	5.5	3.66
SOUTH AFRICA	10110	0.12	87.59	3.06	-0.24
THAILAND	4340	0.75	83.87	5.88	6.35
VENEZUELA	6207	0.12[1]	32.84	7.04	2.71
ZIMBABWE	2596	0.11[9]	24.56	2.94	-3.02[10]
II. OECD (1975) Countries					
AUSTRALIA	21085	0.34	52.08	7.35	4.66
AUSTRIA	22118	0.36	82.39	3.46	2.42
BELGIUM	21448	0.15	46.39	47.68	2.63
CANADA	22785	0.38	72.17	8.89	4.12
DENMARK	24126	0.36	53.17	10.72	3.17
FRANCE	21118	0.42	89.08	6.22	2.37
GERMANY	21218	0.8	93.22	3.88	1.61
GREECE	14256	0.25	37.06	4.32	1.93
ITALY	20589	0.44	60.1	1.96	29.24
JAPAN	21259	0.51	171.44	0.19	2.3
NETHERLANDS	21507	0.56	89.92	16.42	2
NORWAY	26707	0.51[5]	68.64	4.74	1.64
SPAIN	15356	0.65	81.04	7.83	2.77
SWEDEN	20118	0.42	93.23	16.09	1.28
UK	19522	0.44	84.93	13.15	3.36
USA	27537	0.75	158.19	4.9	4.7

1   Average of 1977-02 data.

2   Excluding data for 1986 and 1987 due to non-availability.

3   Average of 1978-02 data.

4   Average of 1990-02 data.

5   Average of 1981-02 data.

6   Average of 1998-02 data.

7   Calculated from IMF data (International Financial Statistics).

8   Average of 1984-2002 data.

9   Average of 1980-2002 data.

10   Average of 1980-2001 data.

a   PCGDPP: GDP per capita, PPP (constant 2000 international $).

b   TURN: Stock market turnover as a ratio of real stock market capitalisation.

c   PCRGDP: Domestic credit to the private sector as percentage of GDP.

d   FDIGKF: Foreign direct investment as percentage of gross capital formation.

e   GGKF: Annual percentage rate of growth of gross capital formation.

Source: Calculated from on-line data from World Bank (World Development Indicators and Financial Structure Data Base).

Table 2. Trends in Stock Market Turnover Ratio, 1976-2002: Selected Countries

Country	Procedure[1]	a	b	Adj. R-sq	D-W ratio
I. Non-OECD (1975) Countries					
ARGENTINA[2]	OLS	0.99	-0.01	0.01	1.65
BRAZIL[2]	OLS	0.22	0.01	0.03	1.4
CHILE[3]	AR(1)	-0.01	0.002	0.41	1.83
COLOMBIA	OLS	0.16**	-0.002	0.09	1.52
COTE D' IVOIRE[4]	OLS	0.06	0.001	-0.01	2.22
EGYPT[4]	AR(1)	-0.19	0.01	0.52	1.91
HONG KONG	OLS	-0.23	0.02**	0.42	1.79
INDIA	OLS	-0.15	0.02	0.06	1.67
INDONESIA[2]	OLS	-3.13	0.09	0.1	2.34
JAMAICA[4]	OLS	0.12	-0.002	-0.02	1.22
JORDAN[3]	AR(1)	-0.02	0.004	0.29	1.81
KOREA	AR(1)	-2.66*	0.1**	0.82	1.65
MALAYSIA[2]	AR(1)	-0.12	0.01	0.23	1.9
MEXICO[2]	OLS	0.67	-0.005	-0.03	1.36
PAKISTAN[5]	AR(1)	-7.29*	0.19**	0.62	1.89
PERU[4]	AR(2)	-0.005	0.004	0.71	2.06
PHILIPPINES	OLS	0.33*	-0.002	-0.03	1.32
SOUTH AFRICA	AR(2)	-0.07	0.02*	0.92	1.58
THAILAND	AR(2)	0.32	0.009	0.36	2.29
VENEZUELA[2]	AR(1)	-0.06	0.004	0.36	1.99
ZIMBABWE[6]	AR(1)	0.11	0.002	0.14	2.06
II. OECD (1975) Countries					
AUSTRALIA	OLS	-0.34**	0.02**	0.85	1.41
AUSTRIA	OLS	-0.14	0.02*	0.11	1.34
BELGIUM	AR(1)	-0.06	0.01**	0.8	1.61
CANADA	OLS	-0.29**	0.02**	0.86	1.63
DENMARK	OLS	-0.69**	0.03**	0.88	1.24
FRANCE	OLS	-0.37**	0.03**	0.83	1.31
GERMANY	AR(1)	-0.01	0.04*	0.64	1.97
GREECE	AR(2)	-0.65**	0.03**	0.62	1.9
ITALY	AR(1)	-0.46	0.03**	0.7	1.88
JAPAN	AR(1)	0.37	0.005	0.42	1.72
NETHERLANDS	OLS	-0.52**	0.04**	0.57	1.28
NORWAY[4]	OLS	-0.62**	0.03**	0.64	1.74
SPAIN	AR(1)	-1.64*	0.08**	0.88	1.81
SWEDEN	AR(1)	-0.66**	0.04**	0.89	1.89
UK	AR(2)	-0.08	0.03**	0.63	1.62
USA	AR(1)	-0.43	0.06**	0.88	1.82

*   Significant at 5 per cent level.

**   Significant at 1 per cent level.

1   A simple linear trend is fitted:

$$Y = a + b.t + e$$

where Y = turnover ratio (TURN), a is the intercept, b is the coefficient of time, t and e is the

error term.

Initially this equation is fitted through the ordinary least squire technique (OLS). Then the

log-likelihood ratio tests of AR(1) versus OLS and AR(2) versus AR(1) are conducted to

ascertain the lag-order of the error term, e. If the tests ascertain the error term as AR(1) or

AR(2), we use the maximum log-likelihood procedure to estimate the parameters.

2   Period of study is 1977-02.

3   Period of study is1978-02.

4   Period of study is1981-02.

5   Period of study is1984-2002.

6   Period of study is1980-2002.

Source: Calculated from on-line data from World Bank (Financial Structure Data Base).

Table 3. Stock Market Turnover, Private Credit, FDI and Growth of Capital Formation, 1976-2002[1]: Tests of Stationarity[2]

Country	TURN	PCRGDP	FDIGKF	GGKF
ARGENTINA	-4.04 (0)**X	-3.43(0)*X	-3.96(0)**	-3.07(0)*X
AUSTRALIA	-3.33(0)**	-2.38(5)**	-5.96(0)**	-4.61(0)**
AUSTRIA	-3.21(0)**X	-5.3(0)**	-3.61(0)**	-5.04(1)**X
BELGIUM	-2.35(0)*	-3.56(5)**	-2.48(0)X	-4.68(0)**
BRAZIL	-3.38(0)**X	-2.22(0)*X	-1.85(1)X	-4.65(0)**X
CANADA	-3.89(0)**	-3.55(1)**	-3.16(0)*	-5.72(0)**X
CHILE	-2.17(0)X	-3.65(5)*	-3.3(0)**	-5.15(0)**X
COLOMBIA	-3.37(0)*X	-1.49(0)X	-3.19(0)*	-3.62(0)*X
COTE D' IVOIRE	-4.67(0)X	-2.6(0)	-3.42(0)*	-4.56(0)**X
DENMARK	-3.45(0)**	-0.23(0)	5.33(5)X	-4.84(0)**X
EGYPT	-1.82(0)X	-3.92(0)**	-0.06(0)	-3.69(0)**
FRANCE	-3.3(0)**	-3.91(5)**	2.83(5)X	-3.8(0)**X
GERMANY	-1.67(0)X	-0.11(0)X	-4.4(0)**	-2.57(0)*
GREECE	-2.02(0)X	-2.91(0)*X	-3.22(0)**	-6.27(0)**
HONG KONG	-4.27(0)**	-3.49*(3)*X	-	-4.91(0)**X
INDIA	-3.56(4)**X	-1.11(0)X	-2.07(0)	-6.85(0)**X
INDONESIA	-5.62(0)**	-1.5(0)X	-3.46(5)**X	-3.71(0)**
ITALY	-2.36(0)*	-2.75(5)*	-2.28(0)	-17.9(0)**X
JAMAICA	-2.9(0)*X	-1.77(0)X	-4.01(0)**	-4.14(0)**X
JAPAN	-1.99(0)X	-2.65(5)*X	-2.24(0)*	-2.78(0)**X
JORDAN	-2.51(0)*X	-2.41(0)X	-2.67(3)*X	-4.97(0)**X
KOREA	-1.88(0)	1.69(0)X	-3.77(1)**	-2.36(0)X
MALAYSIA	-2.77(0)**X	-3.84(5)**	-3.2(3)**	-3.98(0)**X
MEXICO	-3.53(0)**X	-2.37(5)**	-3.84(0)**	-4.87(0)**
NETHERLANDS	-3.41(0)**	-3.51(0)*X	-4.33(2)**	-3.37(0)**
NORWAY	-4.76(5)**	-1.39(1)X	-2.14(0)X	-3.21(5)**X
PAKISTAN	-2.02(5)	-1.63(0)X	-2.78(0)**	-3.49(5)*
PERU	-1.3(0)X	-1.76(1)X	-2.83(0)*	-3.46(0)**X
PHILIPPINES	-4.19(0)**X	-1.26(0)X	-3.34(5)**	-3.97(0)**X
SOUTH AFRICA	2.78(0)X	-4.06(0)**	1.33(3)	-4.76(0)**X
SPAIN	-1.52(0)	-0.04(0)	-2.13(0)*	-2.42(0)*X
SWEDEN	-0.06(0)X	-2.85(0)*X	9.72(3)X	-4.22(0)X
THAILAND	-3.1(0)X	-3.65(1)**	-4.25(3)**	-3.52(0)**X
UK	-2.86(1)**	-0.4(0)X	-3.77(2)**	-3.46(0)**X
USA	0.64(0)X	1.54(5)X	-4.07(1)**	-4.42(0)**X
VENEZUELA	-2.25(0)*X	-3.18 (5)**	0.33(5)X	-5.06(0)**X
ZIMBABWE	-2.74(0)X	-1.61(0)X	-3.64(0)*X	-4.42(0)**X

1   For some series for some countries the period of analysis is shorter. See notes to Table 1 for details.

2   The Augmented Dickey-Fuller (ADF) tests are used. The data-dependent General-to-specific (GS) criterion is used to choose the optimum lag structure of the error process of the Dickey-Fuller equation as advocated by Ng-Perron (1995) and Perron (1997). Under this process, the specific order is chosen out of the general order (we considered here maximum 5 lags depending on the period for which the data are analysed) on the basis of the standard t-tests of significance of the lag terms. For instance, if out of 5 lag terms, the 3rd lag term is statistically significant but all higher order lag terms are insignificant, we run a 3rd order ADF equation and check whether the 3rd order lag is significant. If the 3rd order lag term is significant the appropriate ADF model is taken to be of 3rd order. If not, the process continues until we arrive at the zero-order ADF (i.e. DF) equation.

The null hypothesis of unit root is tested against the trend-stationary alternative. To tackle the problem of a small sample we accept or reject the null hypothesis on the basis of 1000 simulations through a boot-strapping method. In the appropriate cases we have considered the stationary alternative. It is marked by X. The order of the test statistic is given in parentheses.

**   The unit root hypothesis is rejected at 5 per cent level (on the basis of 1000 simulations through a boot-strapping method).

*   The unit root hypothesis is rejected at 10 per cent level (on the basis of 1000 simulations through a boot-strapping method).

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Table 4. Capital Accumulation and Stock Market Development: Estimates of Long-term Relationships through ARDL Method[1], 1976-2002

Country	TURN	PCRGDP	FDIGKF	c	t
I. Non-OECD (1975) Countries					
ARGENTINA					
1977-2002 (0,0)	37.36*			-12.26*	
1977-2002 (0,0,1,3)	18.42	-2.21*	-0.72	49.18**	
BRAZIL					
1977-2002 (0,0)	21.86			-9.46	
1977-2002 (0,0,0,0)	20.08	-0.02	-0.2	-5.19	
CHILE					
1978-2002 (3,1)	262.79**			36.01	-1.12**
1978-2002 (2,0,0,0)	327.72*	0.1	-0.88**	-8.02	
COLOMBIA					
1976-2002 (0,0)	111.57			-5.68	
1990-2002 (0,0,2,2)	90.91	-3.23*	-2.76	134.99*	
COTE D' IVOIRE					
1981-2002 (0,2)	-3049.3**			-60.17*	3.64**
1981-2002 (1,2,0,0)	-1975.6**	-2.27**	-0.08	184.47**	-2.32
EGYPT					
1981-2002 (3,4)	90.89**			15.04	-0.82*
1981-2002 (3,0,3,2)	-27.85**	-0.07	-1.06*	13.19**	
HONG KONG					
1976-2002 (0,0)	13.64			-1.58	
1990-2002 (2,2,2)	-44.53*	-0.17		57.05*	
INDIA					
1976-2002 (2,0)	1.25			5.03**	
1976-2002 (3,2,2,3)	-6.32*	0.94*	5.85*	11.21	-0.48*
1976-2002 (2,1)[2]	-5.74			21.79**	
1976-2002 (3,4,4,4)[2]	4.11	0.84*	-2.27*	-7.63	
INDONESIA					
1977-2002 (0,0)	0.05			4.55	
1980-2002 (3,2,2,3)	-132.63	3.79	-26.06	-25.91	
JAMAICA					
1981-2002 (0,0)	185.93*			13.03	
1981-2002 (0,3,0,2)	605.34**	-1.73	9.49**	431.71**	-14.63**
JORDAN					
1977-2002 (0,0)	118.02*			-17.15**	
1977-2002 (0,0,0,0)	122.16*	-0.62	0.42	24.17	
KOREA					
1976-2002 (0,0)	-4.53*			20.36*	
1976-2002 (0,0)[3]	2.88			15.14*	
1976-2002 (0,0,0,1)[4]	-7.46	-0.21	2.19	35.48*	
MALAYSIA					
1976-2002 (0,0)[4]	16.35			2.47	
1976-2002 (0,0,0,0)[4]	27.34	-0.32*	0.28	33.45	
MEXICO					
1977-2002 (0,0)	3.41			1.03	
1977-2002 (0,0,0,2)	5.68	0.76	0.84	-18.01	
PAKISTAN					
1984-2002 (1,1)	-1.02			3.82**	

1984-2002 (2,1,2,0)	-0.2	-1.3	0.19	77.52*	
PERU[4]					
1981-2002 (0,0)	63.74			-8.75	
1981-2002 (0,0,2,0)	120.69	0.56	-0.21	-27.12	
PHILIPPINES					
1976-2002 (2,3)	85.87*			-19.67*	
1977-2002 (3,3,2,1)	31.11*	-0.09	0.19	-3.11	
SOUTH AFRICA					
1976-2002 (0,1)	12.96			-1.95	
1976-2002 (4,4,4,1)	-47.37	0.49*	1.55*	-18.24	-1.17*
THAILAND					
1976-2002 (0,0) [4]	7.83			0.61	
1976-2002 (0,0,0,1) [4]	10.16	-0.08	-0.57	9.17	
VENEZUELA					
1977-2002 (3,1)	70.71**			-6.39*	
1977-2002 (2,2,1,0)	141.79*	1.17*	0.16	-142.24*	2.18*
ZIMBABWE					
1980-2001 (0,0)	-110.66			8.8	
1980-2001 (0,0,3,1)	90.28	-2.03*	-0.19	44.11*	
II. OECD (1975) Countries					
AUSTRALIA					
1976-2002 (2,0)	12.09			-0.61	
1976-2002 (2,4,4,0)	5.92	0.51	-0.31*	22.48*	-1.45*
AUSTRIA					
1976-2002 (2,1)	7.75**			-1.11	
1976-2002 (4,3,4,3)	9.79**	-0.06	-0.76	4.95	
BELGIUM					
1976-2002 (0,2)	14.35			1.59	
1976-2002 (0,2,0,0)	62.25	0.02	-0.04	-3.93	
CANADA					
1977-2002 (0,0)	13.77			-2.38	
1977-2002 (2,0,0,0)	31.88	-0.61*	-0.16	38.17*	
DENMARK					
1976-2002 (0,0)	5.72			1.65	
1976-2002 (0,4,1,3)	-298.54**	-1.29*	4.44**	-112.89**	7.12**
FRANCE					
1976-2002 (0,0)	6.57			-1.02	
1976-2002 (1,0,0,0)	21.15	-0.34	-1.04	30.63	
GERMANY[5]					
1976-2002 (0,0)	3.29			-1.98	
1976-2002 (0,4,3,2)	3.07	0.06	-0.17	-4.22	
GREECE					
1976-2002 (0,0)	9.56			-0.51	
1976-2002 (0,1,0,1)	15.54	-0.04	0.93	-5.33	
ITALY					
1976-2002 (1,4)	13.32			3.02	
1976-2002 (3,1,0,0)	44.11**	-1.09	-1.73	57.02	
JAPAN					
1976-2002 (1,0)	12.38			-4.67	
1976-2002 (3,2,3,4)	26.58**	0.03**	-28.42**	-12.21**	
NETHERLANDS					
1976-2002 (0,0)	2.17			0.66	
1976-2002 (4,4,4,4)	5.56	-0.44**	0.31*	41.48**	-0.26*

NORWAY					
1981-2002 (0,4)	-89.14*			-51.8**	2.91**
1981-2002 (2,3,3,3)	30.36	-1.16	-1.25	15.57	1.76*
SPAIN					
1976-2002 (1,0)	1.52			2.58	
1976-2002 (3,4,3,4)	10.69	-2.31**	-5.57**	130.84**	2.73*
SWEDEN					
1976-2002 (0,0)	2.89			0.31	
1976-2002 (4,4,1,2)	12.39*	-0.09*	-0.03	8.11*	
UK					
1976-2002 (2,0)	2.91			2.66	
1976-2002 (2,0,0,0)	6.56	-0.01	0.02	0.18	
USA					
1976-2002 (0,0)	-2.27			6.23	
1976-2002 (4,4,4,4)	-12.81*	0.09**	-2.21**	-3.01*	0.3*

1   The following ARDL (p, q, r, s) model has been fitted:

$$G_t = a + b.t + \sum_{i=1}^{p} b_i\, G_{t-i} + \sum_{j=0}^{q} c_j\, S_{t-j} + \sum_{k=0}^{r} d_k\, F_{t-k} + \sum_{l=0}^{s} e_l.B_{t-l}$$

where G = GKFG, S = TURN, F = FDIGKF and B = CRPGDP; the subscripts t, $t-i$, $t-j$, $t-k$, $t-l$, indicate different time periods and p, q, r and s are unknown lags to be determined by the SBC. Setting the coefficients such as b, d_k and e_l (for all k, l) we have fitted alternative ARDL equations such as ARDL (p, q), ARDL (p, q, r, s) with or without time trend.

2   Instead of GGKF data we used data on growth of private fixed capital formation, GPGKF.

3   Intercept dummy, D97 is added to the ARDL equation; it is 0 for 1976-96 and =1 for 1997-02. Its estimate is -18.46 significant at 1 per cent level.

4   We have used intercept dummy (D97) and/or slope dummy (SD97=D97*t) and observed that the basic conclusion holds.

5   We have used intercept dummy (D90 or D91) and slope dummy (SD90=D90*t or SD91 = D91*t) and observed that the dummies are statistically significant but the basic conclusion holds in the ARDL (p, q) model. In the ARDL (p, q, r, s) model, however, the relationship between the turnover ratio and GGKF is positive.

**   Significant at 1 per cent level (based on asymptotic standard errors).

*   Significant at 5 per cent level (based on asymptotic standard errors).