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ABSTRACT

In this paper, we examine convergence of stocks markets. Our empirical exercise is based on 12 different panels, including a full panel consisting of 120 countries and disaggregated panels, such as high income, middle income, low income, OECD, CSI, and developing countries. In addition, we used regional panels, such as those representing the Arab States, East Asia and the Pacific, South Asia, Latin America and the Caribbean, and Sub-Saharan Africa. Our main finding is that, based on the conditional convergence model, convergence of stock market capitalization and stocks traded is found for five panels, namely the all country panel, the high and low income panels, the OECD panel, and the Sub-Saharan African panel. The speed of convergence is high, in most cases between 20-30 per cent.

Keywords: Convergence; Stock Markets; Market Capitalization; Stocks Traded.

JEL Codes: G15.

1. Introduction

The convergence hypothesis is now over two decades old, and began with the work of Baumol (1986). Baumol's work inspired the application of the convergence hypothesis to growth empirics, where essentially two issues have been of great interest: whether or not low growth countries converge to those that have high economic growth; and if this convergence is present, then what is the speed of convergence? (see, for instance, Barro, 1991; and Barro and Sala-i-Martin, 1991, 1992, 1995).

While the convergence hypothesis is widely tested based on economic growth, there is relatively little research on convergence of financial markets. The work that comes closest to our study is Fung (2009). Fung (2009) examines the convergence of financial development (defined as private credit and quasi-money). Our work in this paper is different from Fung (2009) in three distinct ways. First, while Fung (2009) effectively considers the convergence of the banking sector, we concentrate on the stock market. Essentially, we test for absolute (or unconditional convergence) and conditional convergence of stock market capitalization and stocks traded. The end result is that we provide additional insights on convergence relating specifically to stock markets.

Second, apart from considering the convergence hypothesis for panels of low, middle, and high income countries, we consider regional panels, such as those for the Arab States, East Asia and the Pacific, South Asia, and Latin America and the Caribbean. We also test for convergence in developing countries, countries that make up the CIS, and the OECD. The motivation for considering a wide range of panels is to test the convergence hypothesis in homogenous panels. Whether or not a panel has a homogenous set of countries can have a direct bearing on the outcome of the convergence hypothesis test for the simple reason that

one is unlikely to find convergence of the stock market in a very heterogeneous set of countries. This point has been strongly made by Canova and Marcet (1995), who explain that the slow convergence rates obtained by cross-sectional studies (see, *inter alia*, Barro, 1991; Barro and Sala-i-Martin, 1992) maybe an upshot of fixed-effects bias in pooled heterogenous set of countries.

Third, given the dearth of tests for the convergence hypothesis relating to stock markets, we provide a discussion of the key motivations for the existence of the convergence hypothesis in stock markets. We are able to draw on the tenets of arbitrage and the hypothesis proffered by the portfolio theory to devise a framework that motivates convergence of stock markets.

We organize the balance of the paper as follows. In section 2, we discuss the key motivations for the convergence of stock markets. In section 3, we explain our model and the estimation procedure. In section 4, we discuss the data and results. In the final section, we provide some concluding remarks.

2. Motivation for Convergence of Financial Markets

The motivation for convergence of financial markets has origins in the literature on stock market interdependence and portfolio diversification; see, for instance, Grubel (1968), Granger and Morgenstern (1970) and Levy and Sarnat (1970). These studies have essentially considered the short-run linkages of stock markets and have generally found evidence that in the short-run stock markets co-move. Inspired by this group of studies, another branch of research has considered co-movement of stock markets over the long-run; see, for instance, Bessler and Yang (2003). The majority of these studies have found evidence of cointegration. That stock prices of different countries share a long-run and a short-run relationship, in that

they are highly correlated, implies that convergence of stock markets is possible. Convergence also implies that markets are integrated. Financial theory deems integrated markets to be relatively more efficient compared with divergent markets. Integrated markets offer investors the opportunity to efficiently allocate capital. Click and Plummer (2005) argue that an integrated stock market by virtue of stimulating cross-border flow of funds, boosts the volume of trading. An increase in trading volume improves in stock market liquidity. The upshot is a lower cost of capital for firms and lower transactions costs for investors (see Click and Plummer, 2005).

Second, stock markets may converge to reflect the level of arbitrage activity. If a market converges to another market, then this implies that there is a common force, such as arbitrage activity, that brings markets together. It follows that convergence of any two (or more) markets would imply that the potential for making above normal profits through international diversification will be limited. As von Furstenberg and Jeon (1989) explain, this results because supernormal profits are arbitraged away. Moreover, if barriers or potential barriers generating country risk and exchange rate premiums are absent, the result is: similar yields for financial assets of similar risk and liquidity irrespective of nationality or location (von Furstenberg and Jeon, 1989). Stock markets can potentially diverge too; in this case the implication will be one of no arbitrage activity to bring the markets together. It follows that in divergent markets, investors can potentially benefit from international portfolio diversification (see Masih and Masih, 1997, 1999).

Third, portfolio theory perceives investors as having diversified assets across countries. The basic tenet of the portfolio theory is that diversified markets should be less correlated. In this case, a diversified portfolio of assets will reduce risk and open up greater avenues for returns;

a nice discussion on this is provided in Solnik and McLeavey (2003, chapter 9; and Narayan and Smyth, 2005). It follows that as more and more investors diversify their portfolios, overtime convergence of markets occur naturally. Consider a simple example to see how this works. Assume that there are only two stock markets, A and B; and, five investors. If five investors have shares in market A and only two investors have shares in market B (shares of equal value), then the level of activity in market A is greater than in market B, assuming that the shares are of equal value in the two markets. In other words, in market A, three investors have invested 100% of their funds and two have invested only 50% of their funds. In Market B, the two investors who invested 50% of their funds in Market A have invested 50% in Market B. Based on this evidence, one can claim that market A is relatively more developed. If overtime, more investors from Market A diversify their portfolio, that is they investment in Market B, the two markets are likely to converge. In this case, the speed of convergence depends on how much investors from Market A invest in Market B.

3. Model and Estimation Approach

Our estimation procedure typically follows cross-country studies of economic growth, and can be explained using the following general specification:

$$\ln(Y_{i,t}) - \ln(Y_{i,t-\tau}) = \beta \ln(Y_{i,t-\tau}) + \delta W_{i,t-\tau} + \eta_i + \xi_t + \epsilon_{i,t} \qquad (1)$$

where $Y_{i,t}$ is per-capita market capitalisation (MC) or stocks traded (ST) in country i in period t, $W_{i,t}$ is a vector of determinants of the growth of market capitalisation, η_i is a country specific effect, ξ_t is a time specific constant, and $\epsilon_{i,t}$ is an error term. A statistically significant negative coefficient on beta (consistent with the neo-classical growth model) suggests that countries relatively close to their steady state of MC or ST level will experience a slowdown in growth, known as conditional convergence. The variables in $W_{i,t-\tau}$ and the individual effect η_i are proxies for the long-run level the country is converging too. The

country-specific effect η_i captures the existence of other determinants of a country's steady state that are not captured by $W_{i,t-\tau}$.

On the other hand, in the absence of $W_{i,t-\tau}$, a significantly negative coefficient on the level of per capita MC or ST is known as absolute convergence. This can be achieved if the growth rates of MC or ST in developing countries are significantly higher than those of developed countries. For both conditional and absolute convergence, we expect $\beta < 0$. Equation (1) can be re-written as:

$$y_{i,t} = \tilde{\beta} y_{i,t-\tau} + \delta W_{i,t-\tau} + \eta_i + \xi_t + \epsilon_{i,t} \quad (2)$$

where $\tilde{\beta} = 1 + \beta$ and $y_{i,t} = \ln(Y_{i,t})$. The first step is to eliminate the individual effects (η_i and ξ_t), which can be achieved by first differencing, as follows:

$$\mathrm{y_{i,t}} - \mathrm{y_{i,t-\tau}} = \tilde{\beta}\left(\mathrm{y_{i,t-\tau}} - \mathrm{y_{i,t-2\tau}}\right) + \delta(W_{i,t-\tau} - W_{i,t-2\tau}) + (\epsilon_{i,t} - \epsilon_{i,t-\tau}) \quad (3)$$

We cannot estimate Equation (3) by ordinary least squares (OLS) because the variables in $W_{i,t-\tau}$ and $W_{i,t-2\tau}$ are endogenous and the lagged dependent variable is now correlated with the composed error term through period $t-\tau$. Thus, instruments are required for the regression. Our approach, following Arellano and Bond (1991), is to use all past values of the explanatory variables as instruments in the regression. For details regarding how the instruments matrix is constructed, see Caselli *et al*. (1996) and Arellano and Bond (1991). In this setup, the generalized method of moments (GMM) procedure is most ideal for estimating Equation (3). However, the estimation depends on the assumption that the lagged values of the dependent variable and the other explanatory variables are valid instruments in the regression. A necessary condition in this respect is the lack of $\tau - order$ serial correlation in the errors, $\epsilon_{i,t}$, of the equation in levels. Since we have only 21 years of data, we use a 3-year non-overlapping interval, such as 1988-1990, 1991-1993 etc. So in our regression τ is set to 3.

Based on (3), we estimate the following regression model:

$$\ln(Y_{i,t}) - \ln(Y_{i,t-\tau}) = \beta \ln(Y_{i,t-\tau}) + \delta W_{i,t-\tau} + \epsilon_{i,t}$$

We can compute the implied rate of convergence $\hat{\hat{\beta}}$ by calculating $(1+\beta)/3$. We divide $(1+\beta)$ by 3 since we have taken a 3 year interval. If the coefficient of any explanatory variable is negative then it means that the variable has a positive impact on convergence since our left hand side variable is a growth variable. If the left hand side variable decreases it means the difference between $y_{i,t} - y_{i,t-\tau}$ decreases, which means that the country is approaching its steady state.

4. Data and Empirical Findings

4.1.1 Data

The data used in this study are documented in an appendix to this paper. In brief, the data series considered are stock market capitalization, stocks traded, inflation, interest rate spread, primary school and secondary school years, domestic credit provided by banking sector, domestic credit provided to private sector, trade, foreign direct investment, and capital formation. We used these conditional variables to explain growth in financial and banking sector indicators because in the determinants of financial sector developed these variables are commonly used. All explanatory variables are in percent of GDP form. Our dataset is a balanced panel with an annual time component covering the period 1985-2008. The global (or full panel) consists of a total of 120 countries. The list of countries is provided in Table 1. Out of these 120 countries, we form various balanced panels that include a panel of developing countries, CIS countries, OECD countries, high income countries, middle income countries, low income countries, Arab States, East Asia and the Pacific, South Asia, Latin American and Caribbean, and Sub-Saharan Africa. In all, then, we have 12 different panels, including a global panel of 120 countries. The motivation for this level of disaggregation, as

explained earlier, is to achieve as much homogenous a panel as possible. All data are extracted from the *World Development Indicators*.

INSERT TABLE 1

Given the detailed nature of our database, it is space consuming discussing all descriptive statistics of the data series. We, thus, provide a snapshot of the dataset by considering only the mean and the standard deviation of the core variables, namely stock market capitalization and stocks traded.

Some key features of the data by various regions in a comparative sense are as follows. Beginning with market capitalization, we notice that the mean is highest for high income countries and lowest for low income countries (see Table 2a). Further analysis reveals that compared with the high income countries, the mean market capitalization for high income countries is about 44 times the mean for low income countries and about 16 times the mean for middle income countries. So there seems to be significant disparity in mean market capitalization.

Next, we compare the mean market capitalization for the five regional panels. We find that the mean market capitalization is the highest for East Asia and the Pacific followed by South Asia, and it is the lowest for Sub-Saharan Africa. Now we consider the coefficient of variation as a measure of the volatility of market capitalization. The coefficient of variation suggests that volatility is highest for low income countries followed by middle income countries. The high income countries, which had the highest mean market capitalization, have the lowest volatility. Amongst regional panels, evidence suggests that volatility is lowest for the Arab States followed by East Asia and the Pacific, and it is highest for Sub-Saharan Africa, which also had the lowest mean.

INSERT TABLE 2a

We now consider mean and volatility of stocks traded. The results are reported in Table 2b. Like with market capitalization, high income countries have the highest mean stock traded followed by middle income countries. Low income countries have the lowest mean stock traded. However, compared with the mean market capitalization amongst these three groups of countries, the disparities in mean stock traded are greater between high income countries and the two panels of countries. In terms of regional panels, evidence is similar to that for market capitalization in that East Asian and the Pacific region boosts the highest mean stocks traded while Sub-Saharan African has the lowest mean.

INSERT TABLE 2b

In terms of volatility of stocks traded, low income countries experience the highest volatility while high income countries have the lowest volatility. In fact, the OECD countries have the lowest volatility when compared with all high income countries. Amongst the regional panels volatility seems to be the lowest for South Asia, followed by East Asian and the Pacific, and highest for Sub-Saharan Africa.

Overall, the descriptive statistics give two messages. First, high income countries, including OECD countries, have the highest mean and lowest volatility of stock market performance indicators. When considered region wise, evidence seems to suggest that the Sub-Saharan African region is the least developed while East Asia and the Pacific region seems to be the most developed. This is not surprising in that mean seems to be highest for the most developed (in terms of economic and social indicators) panel and lowest for the least developed panel.

4.2. Empirical findings

4.2.1. Results market capitalisation

In Table 3, we provide a summary of our results from convergence of market capitalization. This summary result is based on detailed results presented in Tables 5, 6a, b, and c. The results are organized as follows. In column 1, the various panels, 12 in total, are listed. In columns 2 and 3, evidence on the existence or otherwise of absolute and conditional convergence together with their statistical significance level is presented. In the final two columns, the respective speeds of convergence are calculated and presented.

INSERT TABLE 3, 5, 6a, b, and c

We notice that for eight out of the 12 panels, there is evidence of absolute convergence and for 10 out of 12 panels there is evidence of conditional convergence. Of the eight cases of absolute convergence, seven are statistically significant at the 1 per cent level while one is statistically significant at the 10 per cent level. In the case of conditional convergence, for eight panels, convergence is statistically significant at the 1 per cent level, one at the 5 per cent level, and one at the 10 per cent level.

We notice that for eight out of the 12 panels, namely the all country panel, high and middle income country panels, the developing country panel, the CIS country panel, the OECD country panel, the Latin America and the Caribbean country panel, and the Sub-Saharan country panel, there is evidence of both absolute and conditional convergence. For the low income country and the East Asian and the Pacific country panel, there is no evidence of absolute convergence but there is evidence of conditional convergence. Finally, for the Arab country panel and the South Asian country panel, there is neither any evidence of unconditional nor conditional convergence of market capitalization.

Next, we examine the speed of convergence. First we discuss the results based on the absolute convergence. Of the eight cases of absolute convergence, the speed of convergence of market capitalization is the highest for the developing country panel (30 per cent), followed by the all country panel (27 per cent). For all panels, the convergence is between 20-30 per cent.

Now we consider the speed of convergence based on the conditional model. In all the eight cases for which we found absolute convergence, the speed of conditional convergence is lower, but only marginally. For two panels– low income country and East Asia and the Pacific – where there was no absolute convergence, we notice that the speed of conditional convergence is 24.6 and 25.3 per cent, respectively. From these convergence rates, we can work out the number of years it will take each of the panels to reach their steady state. For example, for the all country panel with a convergence rate of 25.3 per cent implies that a 100 per cent convergence will be achieved in around 11.9 years. The fastest convergence to steady state is found for the developing country panel (10.5 years) while the slowest is for the CIS country panel (15.3 years).

4.2.2. Results for stocks traded

In Table 4, we present a summary of the results on absolute and conditional convergence of stocks traded for the 12 panels. The summary results are based on Tables 7 and 8a, b, and c. The organization of the results is similar to those discussed for the convergence of market capitalization. We make four observations regarding the findings on the convergence of stocks traded.

INSERT TABLES 4, 7, 8a, b and c

First, in six cases (all countries, high income countries, low income countries, OECD countries, Arab States, and Sub-Saharan Africa), there is evidence of both absolute and conditional convergence. Out of these six cases for absolute convergence, four are statistically significant at the 1 per cent level and two are statistically significant at the 5 per cent level. Out of the six cases of conditional convergence, five are statistically significant at the 1 per cent level and one is statistically significant at the 10 per cent level.

Second, for six panels (Middle income, developing country, CIS country, East Asia and the Pacific, South Asia, and Latin America and the Caribbean), there is neither any evidence for absolute convergence nor conditional convergence.

Third, based on the speed of convergence obtained from the unconditional convergence model, the Arab States record the lowest speed of convergence (around 16 per cent per annum). For the rest of the panel, the convergence rate is between 23-26 per cent per annum, implying that it takes around 11.5 to 13 years for these panels to converge to their steady state.

Fourth, based on conditional convergence, the speed of convergence becomes lower for the Arab States (13.6 per cent per annum), while for the all country panel (29.3 per cent per annum) and the developing country panel (25.3 per cent per annum), convergence rates have increased compared with the unconditional model. For the OECD and the Sub-Saharan African country panels, convergence rates have declined, however, they are still over 20 per cent.

To test the validity of the model and indeed the convergence hypothesis, we undertake two tests, namely the Sargan test, which examines the over-identification restrictions, and the Arrellano and Bond test for autocorrelation, which examines the null hypothesis of no autocorrelation. The Sargan test examines whether the instruments are uncorrelated with the error terms in the estimated equation. The null hypothesis is that the instruments as a group are exogenous, which is needed for the validity of the GMM estimates. The Sargan test statistic, together with its associated p-values, for each of the panels is reported in the tables. The test statistics mostly appear with a p-value of greater than 0.10, hence we are unable to reject the null hypothesis. The autocorrelation test relates to the differenced residuals. We only report the test statistics and its associated p-values for AR(2) because it detects autocorrelation in levels. For all the estimated models, we are unable to reject the null hypothesis of .no autocorrelation. There is robust evidence that all models are free from autocorrelation at the 1 per cent level.

4.2.3. Discussion of the results

Our results do not find convergence of stock market capitalization and stocks traded for all countries; in other words, there are some panels for which no convergence is found. These include the Arab States and South Asia in the case of stock market capitalization and middle income, developing countries, CIS, East Asia and the Pacific, South Asia, and Latin America and the Caribbean in the case of stocks traded. It follows that while the evidence is at best mixed, greater cases of convergence of stock market capitalization is found relative to stocks traded.

If evidence is considered based on both absolute and conditional convergence, then we find convergence of stock market capitalization and stocks traded for four panels, namely all

countries, high income, OECD, and Sub-Saharan Africa. If we consider results based on conditional convergence only, then there is evidence of convergence in five panels (all countries, high income, low income, OECD, and Sub-Saharan Africa).

In the literature on convergence of per capita incomes, the root of the convergence theory, the argument is that per capita incomes of countries identical in structural characteristics (such as preferences, technologies, rate of population growth, government policies, etc) have a tendency to converge to one another on the proviso that their initial conditions are similar (see Gador, 1996: 1056, and a nice discussion on this in Pritchett, 2003: 127). It is, however, possible that despite similar initial conditions—of which capital stock is an integral component—convergence of countries to a steady-state may not eventuate because of institutional differences, including varying levels of democracy. It follows that structural characteristics together with institutional features provide a strong foundation for the existence of convergence of economies.

The same reasoning is valid for convergence or divergence of stock markets. For example, the lack of convergence found in various panels reflects the heterogeneity of initial conditions, including differences in structural and institutional characteristics, which give rise to different levels of capital market development.

At the heart of the commonality of structural features is long-term interest rate. The equalization of long-term interest, an upshot of globalization, has brought capital markets together. The IMF (2005) contends that it is possible that over the last couple of decades the integration of capital markets has been responsible for the convergence of long-term interest rates. This granted, the implication is also that the convergence of long-term interest rates

among countries, say at the regional level, has been responsible for the convergence of capital markets.

5. Concluding remarks

This paper represents the first exercise in convergence of stock markets. In this paper, we identify the dearth of research on absolute and conditional convergence of stock markets. We witness in this literature related work done but focusing only on the banking sector (Fung, 2009). Our interest on stock market convergence was bolstered by the fact that stock markets around the world have grown and grown impressively in many emerging and developing countries. Hence, while economic growth convergence has been the central pre-occupation of economists, we provide a motivation for why one should expect stock markets to converge.

Our empirical exercise is based on 12 different panels, including a full country panel consisting of 120 countries and disaggregated panels, such as high income, middle income, low income, OECD, CSI, and developing countries. In addition, we had regional panels, such as those representing the Arab States, East Asia and the Pacific, South Asia, Latin America and the Caribbean, and Sub-Saharan Africa. Our main finding is that, based on the conditional convergence model, convergence of stock market capitalization and stocks traded is found for five panels, namely the all country panel, the high and low income panels, the OECD panel, and the Sub-Saharan African panel.

Above all, it seems to us that our paper has confirmed the existence of convergence beyond economic growth and productivity evidenced in the macroeconomic literature. The finding suggests that convergence of those variables and indicators closely related to economic growth, such as the stock market, is a distinct possibility.

REFERENCES

Barro, R.J., (1991) Economic growth in a cross section of countries, *Quarterly Journal of Economics*, 106, 407–443.

Barro, R.J. and X. Sala-i-Martin (1991) Convergence Across States and Regions, *Brooking Papers on Economic Activity*, 1, 107-158.

Barro, R.J., and Sala-i-Martin, X., (1992) Convergence, *Journal of Political Economy*, 100, 223-251.

Barro, R.J., and Sala-i-Martin, X., (1995) *Economic Growth*, New York: Mc Graw Hill.

Barro, R.J., Sala-i-Martin, X.X., (1995) *Economic Growth*, McGraw Hill, New York.

Baumol, W.J., (1986) Productivity, growth, convergence, and welfare: what the long run data show, *American Economic Review*, 76, 1072-1085.

Bernard, A. B., and Durlauf, S. N., (1995) Convergence in International Output, *Journal of Applied Econometrics*, 10, 97-108.

Bessler, D.A., and Yang, J., (2003) The structure of interdependence in international stocks markets, *Journal of International Money and Finance*, 22, 261-287.

Canova, F., and Marcet, A., (1995) The Poor Stay Poor: Non-Convergence Across Coun-tries and Regions, Mimeo, Universitat Pompeu Fabra, 1995.

Click, R.W., and Plummer, M.G., (2005) Stock market integration in ASEAN after the Asian Financial crisis, *Journal of Asian Economics*, 16, 5-28.

Durlauf, S. N., and Johnson, P. A., (1994) Multiple Regimes and Cross-Country Growth Behavior, Social Systems Research Insti-tute Working Paper No. 9419R, University of Wisconsin-Madison.

Fung, M.K., (2009) Financial Development and Economic Growth: Convergence or Divergence? *Journal of International Money and Finance*, 28, 56-67.

Galor, O., (1996) Convergence? Inferences from theoretical models, *Economic Journal*, 106, 1056-1068.

Grubel, H., (1968) Internationally diversified portfolio: welfare gains and capital flows, *American Economic Review*, 58, 89-94.

IMF (2005) World Economic Outlook, IMF, Washington, D.C.

Levy, H., and Sarnat, M., (1970) International diversification of investment portfolios, *American Economic Review*, 60, 668-675.

Masih, A.M.M., and Masih, R., (1997) Dynamic linkages and the propagation mechanism driving major international stock markets: an analysis of the pre-and-post-crash eras, *Quarterly Review of Economics and Finance*, 37, 859-88.

Masih, A.M.M. and Masih, R., (1999) Are Asian stock market fluctuations due mainly to intra-regional contagion effects? Evidence based on Asian emerging stock markets, *Pacific Basin Finance Journal*, **7**, 251-82.

Quah, D., (1993a) Galton's Fallacy and Tests of the Convergence Hypothesis, *Scandinavian Journal of Economics*, 95, 427-43.

Quah, D., (1993b) Empirical Cross-Section-Dynamics in Economic Growth, *European Economic Review*, 37, 426- 34.

Solnik, B., and McLeavey, D., (2003) International investments (Boston: Addison-Wesley, 5th edition).

Von Furstenberg, G.M., and Jeon, B.N., (1989) International stock price movements: links and messages, *Brookings Papers on Economic Activity*, 1, 125-79.

Table 1: List of countries

Argentina	Cote d'Ivoire	Hong Kong, China	Luxembourg	Pakistan	Swaziland
Armenia	Croatia	Hungary	Macao, China	Panama	Sweden
Australia	Cyprus	Iceland	Macedonia, FYR	Papua New Guinea	Switzerland
Austria	Czech Republic	India	Malawi	Paraguay	Tanzania
Azerbaijan	Denmark	Indonesia	Malaysia	Peru	Thailand
Bahrain	Dominican Republic	Iran, Islamic Rep.	Malta	Philippines	Trinidad and Tobago
Bangladesh	Ecuador	Ireland	Mauritania	Poland	Tunisia
Barbados	Egypt, Arab Rep.	Israel	Mauritius	Portugal	Turkey
Belgium	El Salvador	Italy	Mexico	Qatar	Uganda
Bermuda	Estonia	Jamaica	Moldova	Romania	Ukraine
Bhutan	Fiji	Japan	Mongolia	Russian Federation	United Arab Emirates
Bolivia	Finland	Jordan	Montenegro	Saudi Arabia	United Kingdom
Botswana	France	Kazakhstan	Morocco	Serbia	United States
Brazil	Georgia	Kenya	Namibia	Singapore	Uruguay
Bulgaria	Germany	Korea, Rep.	Nepal	Slovak Republic	Uzbekistan
Canada	Ghana	Kuwait	Netherlands	Slovenia	Venezuela, RB
Chile	Greece	Kyrgyz Republic	New Zealand	South Africa	Vietnam
China	Guatemala	Latvia	Nigeria	Spain	West Bank and Gaza
Colombia	Guyana	Lebanon	Norway	Sri Lanka	Zambia
Costa Rica	Honduras	Lithuania	Oman	St. Kitts and Nevis	Zimbabwe

Table 2a: Mean and coefficient of variation for market capitalization

	All Countries	High Income	Middle Income	Low Income
Mean ($m)	210000	613000	37100	14000
Std. Dev ($m)	1150000	2000000	197000	86900
Coeff. Variation	5.48	3.26	5.31	6.21
	Developing	CIS	OECD	Arab states
Mean ($m)	51200	10500	892000	27700
Std. Dev ($m)	208000	41400	2430000	53700
Coeff. Variation	4.06	3.94	2.72	1.94
	East Asia Pacific	South Asia	Latin America	Sub-Saharan
Mean ($m)	169000	42100	27600	17200
Std. Dev ($m)	465000	151000	79100	67400
Coeff. Variation	2.75	3.59	2.87	3.92

Table 2b: Mean and coefficient of variation for stocks traded

	All Countries	High Income	Middle Income	Low Income
Mean ($m)	234000	682000	24400	12700
Std. Dev ($m)	1800000	3120000	231000	68600
Coeff. Variation	7.69	4.57	9.47	5.40
	Developing	CIS	OECD	Arab states
Mean ($m)	41700	4540	1000000	22200
Std. Dev ($m)	244000	20400	3830000	93600
Coeff. Variation	5.85	4.49	3.83	4.22
	East Asia Pacific	South Asia	Latin America	Sub-Saharan
Mean ($m)	164000	42100	8760	5500
Std. Dev ($m)	559000	121000	32200	28800
Coeff. Variation	3.41	2.87	3.68	5.24

Table 3: Summary of results on convergence of market capitalisation

	Absolute convergence (AC)	Conditional Convergence (CC)	Speed of AC (%)	Speed of CC (%)
All countries	Yes (1%)	Yes (1%)	27.0	25.3
High income countries	Yes (1%)	Yes (1%)	26.0	24.6
Middle income countries	Yes (1%)	Yes (1%)	26.3	23.6
Low income countries	No	Yes (5%)	-	24.6
Developing countries	Yes (10%)	Yes (1%)	30.0	28.6
CIS countries	Yes (1%)	Yes (1%)	23.3	19.6
OECD countries	Yes (1%)	Yes (1%)	24.6	23.0
Arab States	No	No	-	-
East Asia & Pacific	No	Yes (10%)	-	25.3
South Asia	No	No	-	-
Latin America & Caribbean	Yes (1%)	Yes (1%)	26.0	26.3
Sub-Saharan Africa	Yes (1%)	Yes (1%)	21.6	21.0

Notes: The summary is based on full results reported in Tables. In columns 2 and 3, the parenthesis includes the statistical significance level for convergence.

Table 4: Summary of results on convergence of stocks traded

	Absolute convergence (AC)	Conditional Convergence (CC)	Speed of AC (%)	Speed of CC (%)
All countries	Yes (5%)	Yes (1%)	26.3	29.3
High income countries	Yes (1%)	Yes (1%)	23.3	23.3
Middle income countries	No	No	-	-
Low income countries	Yes (1%)	Yes (10%)	23.3	25.3
Developing countries	No	No	-	-
CIS countries	No	No	-	-
OECD countries	Yes (1%)	Yes (1%)	26.0	22.0
Arab States	Yes (1%)	Yes (1%)	16.3	13.6
East Asia & Pacific	No	No	-	-
South Asia	No	No	-	-
Latin America & Caribbean	No	No	-	-
Sub-Saharan Africa	Yes (5%)	Yes (1%)	25.0	21.6

Notes: The summary is based on full results reported in Tables. In columns 2 and 3, the parenthesis includes the statistical significance level for convergence.

Table 5: Results for absolute convergence of market capitalisation convergence

Panel A

Variable	All Countries Coefficient (P value)	High Income Coefficient (P value)	Middle Income Coefficient (P value)	Low Income Coefficient (P value)
Initial Per Capita	-0.19*** (0.00)	-0.22*** (0.00)	-0.21*** (0.00)	-0.15 0.21
Sargan Test	0.88	0.12	0.97	0.87
Second order Autocorrelation Test	0.67	0.29	0.78	0.87
Countries	120	37	61	22
Observation	598	185	304	109

Panel B

Variable	Developing Countries Coefficient (P value)	CIS Countries Coefficient (P value)	OECD Countries Coefficient (P value)
Initial Per Capita	-0.1* (0.07)	-0.3*** (0.002)	-0.26*** (0.003)
Sargan Test	0.5	0.99	0.0004***
Second order Autocorrelation Test	0.33	0.54	0.62
Countries	69	22	24
Observation	345	109	120

Panel C

Variable	Arab States Coefficient (P value)	East Asia and the Pacific Coefficient (P value)	South Asia Coefficient (P value)	Latin America and Caribbean Coefficient (P value)	Sub-Saharan Africa Coefficient (P value)
Initial Per Capita	-0.07 (0.07)	0.15 (0.29)	-0.27 (0.1)	-0.22*** (0.005)	-0.35*** (0.00)
Sargan Test	0.87	0.62	0.58	0.54	0.04**
Second order Autocorrelation Test	0.11	0.16	0.56	0.06*	0.07*
Countries	11	11	7	22	15
Observation	55	55	35	110	75

Table 6a: Results for conditional convergence of market capitalisation

Variable	All Countries Coefficient P value	High Income Coefficient P value	Middle Income Coefficient P value	Low Income Coefficient P value
Initial Per Capita	-0.24***	-0.26***	-0.29***	-0.27**
	(0.00)	(0.001)	(0.00)	(0.034)
Inflation	-0.0005***	-0.01	0.0002	0.0001
	(0.00)	(0.62)	(0.53)	(0.4690)
Interest rate spread	0.02***	0.00	0.03***	-0.0043
	(0.00)	(1.00)	(0.00)	(0.285)
Primary School (years)	-0.04	-0.01	-0.10*	0.06
	(0.25)	(0.75)	(0.07)	(0.49)
Secondary School (years)	-0.03	0.01	0.04	-0.02
	(0.13)	(0.68)	(0.29)	(0.58)
Dom. Credit (Bank)	-0.01	0.09	-0.01	-0.14
	(0.96)	(0.48)	(0.95)	(0.66)
Dom. Credit (Private sector)	-0.01	-0.20	-0.06	0.38
	(0.96)	(0.24)	(0.83)	(0.56)
Trade	0.06	0.00	0.30***	-0.06
	(0.11)	(0.91)	(0.00)	(0.75)
FDI	0.01	-0.08	-0.56	0.42
	(0.97)	(0.56)	(0.56)	(0.78)
Capital formation	-0.65	-0.37	-0.15	0.56
	(0.17)	(0.67)	(0.84)	(0.62)
Intercept	0.56*	0.10	-0.33	-0.12
	(0.06)	(0.81)	(0.55)	(0.85)
Sargan Test	0.78	0.007***	0.21	0.79
Second order Autocorrelation Test	0.27	0.21	0.41	0.31
Countries	106	32	285	17
Observation	530	160	57	85

Table 6b: Results for conditional convergence of market capitalization

	Developing Countries Coefficient	CIS Countries Coefficient	OECD Countries Coefficient
Variable	P value	P value	P value
Initial Per Capita	-0.14	-0.41	-0.31
	0.01**	0.00***	0.00***
Inflation	0.0001	-0.0001	0.01
	0.602	0.84	0.65
Interest rate spread	-0.003	0.05	0.01
	0.31	0.00***	0.77
Primary School (years)	0.02	-0.56	-0.03
	0.65	0.03**	0.45
Secondary School (years)	-0.02	0.06	0.02
	0.46	0.58	0.56
Dom. Credit (Bank)	0.14	-2.60	0.22
	0.30	0.01**	0.10
Dom. Credit (Private sector)	-0.24	1.86	-0.24
	0.14	0.14	0.16
Trade	0.05	0.80	0.02
	0.19	0.01**	0.82
FDI	0.14	-1.52	-0.14
	0.88	0.37	0.43
Capital formation	-0.99	0.84	-2.49
	0.03**	0.71	0.06*
Intercept	0.37	2.09	0.39
	0.25	0.30	0.39
Sargan Test	0.72	0.54	0.003***
Second order Autocorrelation Test	0.22	0.14	0.4
Countries	62	18	23
Observation	310	90	115

Table 6c: Results for conditional convergence of market capitalization

	Arab States Coefficient	East Asia and the Pacific Coefficient	South Asia Coefficient	Latin America and Caribbean Coefficient	Sub-Saharan Africa Coefficient
Variable	P value	P value	P value	P value	P value
Initial Per Capita	-0.09	-0.24	-0.26	-0.21	-0.37
	0.71	0.07*	0.20	0.01**	0.00***
Inflation	0.002	-0.02	0.06	-0.001	0.0001
	0.97	0.32	0.041**	0.46	0.75
Interest rate spread	0.05	-0.001	0.11	0.003	-0.002
	0.21	0.94		0.57	0.68
Primary School (years)	-0.55	-0.03		-0.005	0.11
	0.21	0.88	0.26	0.96	0.57
Secondary School (years)	0.15	-0.08	0.002	0.05	-0.02
	0.18	0.73	1.00	0.63	0.85
Dom. Credit (Bank)	0.12	1.09	0.13	0.34	-0.24
	0.84	0.19	0.96	0.25	0.27
Dom. Credit (Private sector)	0.65	-1.71	0.44	-0.43	0.34
	0.60	0.10	0.91	0.22	0.31
Trade	-0.33	0.37	0.97	0.20	-0.15
	0.48	0.05*	0.32	0.041**	0.22
FDI	-1.84	1.92	-23.90	-0.59	0.88
	0.43	0.39	0.28	0.74	0.70
Capital formation	-4.63	2.51	-7.01	-0.99	0.38
	0.04**	0.34	0.25	0.33	0.75
Intercept	2.23	0.29	0.04	-0.54	-0.35
	0.30	0.90	0.99	0.59	0.65
Sargan Test	0.87	0.69	0.32	0.14	0.30
Second order Autocorrelation Test	0.97	0.72	0.76	0.10	0.04*
Countries	8	11	5	22	14
Observation	40	55	25	110	70

Table 7: Results for absolute convergence of stocks traded

Panel A

	All Countries	High Income	Middle Income	Low Income
Variable	Coefficient (P value)	Coefficient (P value)	Coefficient (P value)	Coefficient (P value)
Initial Per Capita	-0.11**	-0.3***	-0.07	-0.3***
	(0.03)	(0.00)	0.36	(0.009)
Sargan Test	0.12	0.005***	0.55	0.46
Second order Autocorrelation Test	0.07	0.7	0.25	0.33
Countries	115	37	58	20
Observation	570	185	286	99

Panel B

	Developing Countries	CIS Countries	OECD Countries
Variable	Coefficient (P value)	Coefficient (P value)	Coefficient (P value)
Initial Per Capita	-0.07	-0.14	-0.22***
	(0.35)	(0.32)	(0.01)
Sargan Test	0.4	0.99	0.0007***
Second order Autocorrelation Test	0.59	0.38	0.06
Countries	65	21	24
Observation	325	101	120

Panel C

	Arab States	East Asia and the Pacific	South Asia	Latin America and Caribbean	Sub-Saharan Africa
Variable	Coefficient (P value)	Coefficient (P value)	Coefficient (P value)	Coefficient (P value)	Coefficient (P value)
Initial Per Capita	-0.51***	0.1	-0.1	-0.13	-0.25**
	(0.002)	(0.32)	(0.59)	(0.28)	(0.03)
Sargan Test	0.23	0.32	0.94	0.44	0.26
Second order Autocorrelation Test	0.24	0.76	0.38	0.78	0.92
Countries	11	11	6	20	14
Observation	55	55	30	100	70

Table 8a: Results for conditional convergence of stocks traded

	All Countries Coefficient	High Income Coefficient	Middle Income Coefficient	Low Income Coefficient
Variable	P value	P value	P value	P value
Initial Per Capita	-0.12	-0.30	-0.09	-0.24
	0.01**	0.00***	0.24	0.063*
Inflation	0.0002	-0.02	-0.0001	0.0002
	0.32	0.47	0.91	0.46
Interest rate spread	-0.01	0.03	-0.01	-0.01
	0.18	0.33	0.33	0.41
Primary School (years)	-0.03	0.02	-0.09	0.07
	0.55	0.83	0.34	0.62
Secondary School (years)	-0.03	-0.03	-0.05	0.06
	0.45	0.51	0.39	0.35
Dom. Credit (Bank)	0.12	0.02	0.33	-0.34
	0.53	0.91	0.33	0.58
Dom. Credit (Private sector)	-0.28	-0.06	-0.62	0.61
	0.24	0.85	0.18	0.56
Trade	0.05	-0.02	0.17	0.13
	0.47	0.73	0.24	0.65
FDI	0.01	0.19	-2.88	0.51
	0.97	0.45	0.13	0.85
Capital formation	-1.36	-0.51	-1.41	3.21
	0.07*	0.72	0.28	0.10
Intercept	0.86	0.37	1.57	-1.72
	0.07*	0.57	0.10	0.065*
Sargan Test	0.15	0.01**	0.33	0.44
Second order Autocorrelation Test	0.33	0.45	0.36	0.84
Countries	102	32	54	16
Observation	507	160	267	80

Table 8b: Results for conditional convergence of stocks traded

Variable	Developing Countries Coefficient P value	CIS Countries Coefficient P value	OECD Countries Coefficient P value
Initial Per Capita	-0.11	-0.25	-0.34
	0.10	0.12	0.00***
Inflation	0.0001	-0.0001	0.04
	0.66	0.88	0.45
Interest rate spread	-0.01	-0.005	0.03
	0.39	0.71	0.39
Primary School (years)	0.01	-0.63	-0.05
	0.94	0.073*	0.45
Secondary School (years)	-0.01	-0.21	-0.01
	0.86	0.11	0.85
Dom. Credit (Bank)	0.53	-3.60	0.25
	0.06	0.01	0.22
Dom. Credit (Private sector)	-0.81	1.56	0.03
	0.021**	0.39	0.90
Trade	0.17	0.65	-0.06
	0.038**	0.16	0.54
FDI	-2.54	-2.97	0.32
	0.16	0.33	0.27
Capital formation	-1.45	4.92	-7.16
	0.12	0.23	0.00***
Intercept	0.44	5.93	1.36
	0.50	0.028**	0.043**
Sargan Test	0.26	0.42	0.002***
Second order Autocorrelation Test	0.96	0.84	0.34
Countries	59	17	23
Observation	295	82	115

Table 8c: Results for conditional convergence of stocks traded

Variable	Arab States Coefficient P value	East Asia and the Pacific Coefficient P value	South Asia Coefficient P value	Latin America and Caribbean Coefficient P value	Sub-Saharan Africa Coefficient P value
Initial Per Capita	-0.59	-0.11	-0.31	-0.19	-0.35
	0.00***	0.33	0.14	0.13	0.00***
Inflation	-0.03	-0.06	0.08	-0.001	0.0004
	0.77	0.033**	0.048**	0.61	0.23
Interest rate spread	0.09	0.001	0.13	-0.02	-0.01
	0.19	0.94	0.26	0.14	0.20
Primary School (years)	-1.69	0.31		-0.07	0.02
	0.049**	0.35		0.79	0.94
Secondary School (years)	0.35	-0.32	0.85	0.00	-0.12
	0.09	0.36	0.14	0.99	0.52
Dom. Credit (Bank)	0.22	2.64	2.01	1.46	0.30
	0.85	0.04	0.59	0.054*	0.44
Dom. Credit (Private sector)	0.08	-3.62	3.43	-1.38	-0.44
	0.97	0.025**	0.49	0.11	0.44
Trade	-0.49	0.62	2.84	-0.02	-0.31
	0.60	0.032**	0.026**	0.94	0.14
FDI	-0.31	-3.31	-18.78	-0.61	6.42
	0.95	0.35	0.51	0.88	0.12
Capital formation	-6.29	2.50	-16.37	-4.31	1.49
	0.17	0.55	0.029**	0.11	0.46
Intercept	7.40	1.34	-9.74	1.43	1.44
	0.10	0.71	0.11	0.55	0.26
Sargan Test	0.39	0.49	0.42	0.28	0.65
Second order Autocorrelation Test	0.17	0.47	0.43	0.91	0.54
Countries	8	11	5	20	13
Observation	40	55	25	100	65