Capital Market and Business Cycle Volatility

Tharavanij, Piyapas

Monash University, Dept. of Economics

9 September 2007

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Piyapas Tharavanij[1]
Monash University

October 2007

Abstract

This paper investigates cross-country evidence on how capital markets affect business cycle volatilities. In contrast to the large and growing literature of finance and growth, empirical work on the relationship between finance, particularly capital markets, and volatility has been relatively scarce, though theoretically, more developed capital markets should lead to lower macroeconomic volatilities. Results are generated using panel estimation technique with data from 44 countries covering the years 1975 through 2004. The major finding is that countries with more developed capital markets have smoother economic fluctuations. The results hold under various estimation methods and after controlling for other relevant variables, country specific effects, and plausible endogeneity problems.

JEL: C33, E32, E44, G00, G21

Keywords: business cycle, capital market, financial development, financial structure, panel data, market-based, bank-based

[1] Department of Economics, Faculty of Business & Economics, Monash University.
E-mail:piyapas.tharavanij@buseco.monash.edu.au.
The author would like to thank Prof.Dietrich Fausten and Assoc. Prof. Mark Harris for invaluable suggestion and encouragement.

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1. Introduction

" Given the close link between the financial sector and household and firm balance sheets, a key question is how these differences in financial systems affect macroeconomic behaviour. ... Yet few empirical studies to date have analysed the effect of different financial structure on business cycle behaviour -attention has mostly focused on the role of overall financial development for growth performance."

World Economic Outlook, September 2006

In contrast to the large and growing literature on the impact of finance and growth [e.g. Demirguc-kunt and Levine (2001)], theoretical and empirical work on the relationship between finance and business cycles or macroeconomic volatilities has been relatively scarce, and even fewer papers on the effects of capital markets on various aspects of business cycle. This gap in the current research is quite surprising given the importance of business cycles in the study of macroeconomics, and the fact that economies with lower macroeconomic volatility are associated with faster growth [Ramey and Ramey (1994)]. To fill this gap, this paper examines empirical relationships between capital markets and macroeconomic variability, controlling for the level of financial intermediation or more commonly known as financial development.

The paper finds that output and investment volatilities are negatively related to measures of capital market development after controlling for other relevant variables. In addition, there are also some evidences that capital market development also lower consumption volatility. Empirical results support the theoretical prediction that capital market development would lead to lower volatility.

The organization of this paper is as follows. Section 2 provides literature review. Section 3 discusses measurement issues. Section 4 discusses data construction and data description. Section 5 provides methodology. Section 6 presents estimation results. Section 7 discusses robustness issues. Lastly, section 8 concludes.

2. Related Literature

The standard neoclassical theory assumes that financial systems function efficiently, and as a result, financial factors are often abstracted from the analyses. However, more recent work has established relationships between the working of financial system and macroeconomic volatility. Key functions of a financial system, according to Merton and Bodie (2004), are to facilitate capital formation and efficient allocation of risk bearing, and to allow agents to manage risks effectively. These functions are performed both through intermediated channel, such as financial intermediaries (e.g. banks), and non-intermediated channel or capital markets, such as bond, equity and derivative markets. As such, a whole financial system is composed of both financial intermediaries, and capital markets. Capital markets, as one of the key component in a financial system, play a crucial role in the relationship between the well functioning of the whole financial system and macroeconomic variability.

Explanations of the connection between financial system and volatility are based prominently on the phenomena of "financial market imperfections". The early work is based primarily on information asymmetry. The “balance sheet view” [Bernanke and Gertler (1995), Bernanke et al. (1998)] postulates that nominal and real shocks to the economy are amplified by a “financial accelerator.” Basically, the fall in a firm’s net worth resulting from an initial shock (say, from a monetary contraction) increases agency costs by worsening the potential conflicts of interest between borrowers and lenders. This leads subsequently to higher external financing

premiums, which in turn magnify the fluctuations in borrowing, spending and investment. Greenwald and Stiglitz (1993) show that because of information asymmetry, which lead to breakdowns in financial markets, particularly the market for equity [Myers and Majluf (1984)], firms would optimally act in a risk-averse manner to the possibility of bankruptcy. Under this circumstance, the level and distribution of net worth among firms has real macroeconomic implications as firms adjust their production and investment in response to increases in uncertainty or changes in distribution of firm equity.

More recent theories focus on other kinds of imperfections. Aghion et al. (1999) show theoretically that combining financial market imperfections with unequal access to investment opportunities across individuals can generate endogenous and permanent fluctuations in aggregate GDP, investment, and interest rates. Acemoglu and Zilibotti (1997) argue that the presence of indivisible projects limits the degree of diversification that an economy can achieve in the early stages of development. The inability to diversify idiosyncratic risk, and the desire to avoid high risk investments, slow down capital accumulation and introduce large uncertainty into the growth process.

Greenspan (2000) argued that the most important buffer against severe output contractions is the development of alternative channels that enable financial systems under stress to maintain an adequate degree of financial intermediation. Larrain (2004) independently formalizes Greenspan's intuition and develops a theoretical model to shows that financial intermediation would reduce output volatility if the condition that constrains firm investment is dominantly adverse cash-flow shocks.

Development in capital markets, as part of the whole financial system, reduces the above financial market imperfections (i.e. by reducing asymmetric information

and agency cost through better disclosure, by providing better access to finance and investment for firms and investors through stock and bond issuances, and by providing diversification opportunities through mutual funds and stock trading), and also provide an alternative form of financing beside lending from banks or other financial intermediaries. As a result, capital market development would reduce volatility.

Furthermore, "financial structure" literature, which focus on the relative merits of a bank-based ("German-Japanese") financial system and a market-based ("Anglo-Saxon") financial system in promoting growth and stability [see Allen and Gale (2000)], also points to the beneficial effects of capital markets. If we interpret a market-based financial structure as a financial system with, not only financial intermediaries, but also well-functioning capital markets, then the literature postulates that capital markets have the effects on volatility not only because they are parts of the overall financial system as suggested by the above mentioned theories, but also because capital markets provide extra tools and mechanisms, not found through intermediated channel (e.g. bank lending), that would lower volatility.

Rajan and Zingales (2001) observe that “if there is one thing the arm’s-length system (market-based) can do better than the relationship-based (bank-based), it is to bear and manage macroeconomic risk.” They argue that due to low transparency and disclosure, assets in a bank-based system tend to be less liquid. Intermediaries (mainly banks) finance such assets by low cost demand deposit. This creates a maturity mismatch in the portfolios of intermediaries, and makes them subject to runs. They argue further that should a relationship-based system suffer adverse shocks then the flow of credit can quickly collapse.

They give the following reasons. First, there is a lot of specific knowledge embedded in relationships between failing intermediaries and their clients. Therefore, other healthy intermediaries cannot easily replace them in providing any further credit to debtors of the failing ones. Second, since property rights are not well established in non-transparent relationships, it becomes hard for depositors and investors to distinguish between healthy and failing parties. This could lead to financial contagion among intermediaries. In market-based systems, transparency and disclosure are required to give investors the confidence to invest directly in particular firms. This greater transparency improves the ability of a system to withstand shocks. Healthy firms can be distinguished from the terminally ill after a shock and can be dealt with differently. As a result, outside investors or intermediaries have the ability to invest and rescue the system from the consequences of failing financial intermediaries.

Haan et al. (1999) extend this idea by developing a formal model of the propagation of business cycle shocks, given the existence of long-term relationships between entrepreneurs and lenders, which are more prevalent in a bank-based system. Lenders may be constrained in their short-run access to liquidity, and when liquidity is low, relationships are subject to break-ups that lead to loss of joint surplus. In this way, feedbacks between aggregate investment and the structure of intermediation greatly magnify the effects of shocks.

Fecht (2004) developed a theoretical model which shows that moderately bank-dominated financial systems are fragile because fire sales of a single troubled bank can more readily cause asset-price deterioration that propels other banks into crisis. Conversely, fire sales by distressed banks are unlikely to cause a sudden drop in asset prices sufficiently large to trigger financial contagion in market-oriented financial systems. In market-based financial systems, financial markets are deep and

able to absorb fire sales with limited impact on prices. In contrast, in moderately bank-based financial systems banks depend on liquidity inflow from assets sales and are therefore more vulnerable to adverse price movements. Banks would face considerable difficulty in compensating for the shortfall of liquidity inflows.

In summary, capital market development would theoretically lead to lower macroeconomic volatility. The effect works through several channels as suggested by theories above. Unfortunately, existing empirical research focused only on the impact of financial intermediation (or financial development). Moreover, studies that include capital markets usually centre on a measure of capital market development relative to banking sector, namely "Financial Structure Index" [see Levine (2002)]. There is no study that actually uses any direct measure of development in capital markets. The existing studies only apply a financial structure dummy for a bank-based or market-based financial system.

Before we go into a review of empirical work, it is beneficial to familiarize with one of the most popular terms in the finance and growth literature [e.g. Beck et al. (2000b)], namely "Financial Development". The term itself conveys the idea that it is a measure of overall development in a whole financial system in performing its functions. However, it is not. It is actually a quantitative measure of how well financial intermediaries perform its function in terms of financing real investment or spending of both firms and households. For instances, one of the most popular measure of financial development is private credit over GDP ratio. It measures only development in "indirect financing" channel or intermediated part of a whole financial system. It does not capture any development in the capital market part of the system. This paper uses both measures of financial development and capital market development in the empirical analysis.

Empirical studies on the impact of financial development or capital market on macroeconomic variability provide only mixed support of the hypothesis that higher financial or capital market development leads to lower volatility. These empirical studies could be classified into five groups as the following.

The first group focuses on the overall effects of financial development on volatility. Denizer et al. (2000) estimated fixed effects regressions with panel data and found that countries with more developed financial sectors experience smaller fluctuations in real per capita output, consumption, and investment growth. Easterly et al. (2000) also found that financial development normally lowers volatility. However, they discovered that very large financial aggregates can also increase fluctuations as suggested in the banking and currency crisis literature [e.g., Kaminsky and Reinhart (1999)].

The second group provides evidences of different short run and long run effects of financial development. Loayza and Ranciere (2004) reconcile the apparent contradiction between the two strands of literature on the effects of financial intermediation on growth. The empirical growth literature has identified a positive effect of financial depth on growth. On the other hand, the banking and crisis literature finds that monetary aggregates such as domestic credit, which is also a measure of financial depth, are among the best predictors of crises. Loayza and Ranciere explain this paradox in terms of differences between short- and long-run impacts of credit expansion. They identify a beneficial long-run relationship between financial intermediation and output growth that co-exists with a mostly adverse short-run relationship. Lopez and Spiegel (2002) found a similar negative relationship between financial development and volatility in the long run. Tiryaki (2003) conducted panel regressions to explore the relationship between financial

development and volatility, both in the short run and long run. She found that though financial development leads to smoother fluctuations over long horizons, the link is not straightforward in the short run.

The third group traces the effects of financial development in mitigating adverse shocks. Aghion et al. (2005) examine how credit constraints affect the cyclical behaviour of productivity-enhancing investment and thereby, volatility and growth. They find that a lower degree of financial development is associated with stronger sensitivity of both the composition of investment (long-term vs. short-term investment) and mean growth to exogenous shocks, and a stronger effect of volatility on growth. Beck et al. (2003) use the volatility of the terms of trade and inflation as proxy for real and monetary volatility, respectively. They find weak evidence that financial intermediaries dampen the effects of terms of trade volatility, and some evidence that financial intermediaries magnify the impact of inflation volatility in countries where firms have little or no access to external finance through capital markets. Loayza and Raddatz (2006) estimate the impact of terms of trade shocks on GDP and examine how this impact depends on domestic conditions, using semi structural vector auto-regressions. They find that while trade openness always increases the impact of a shock, the magnitude of that impact is considerably smaller in countries with high level of financial development. Similarly, increased financial openness in countries with low level of financial development may intensify the impact of external shocks. They also find that financial depth is strongly and negatively correlated with the volatility of terms of trade shocks.

The fourth group provides evidences of the effect of financial development at the industry level and also reveals the channels in which financial intermediation affects volatility. Raddatz (2003) estimated the effect of financial development on

volatility based on differences in sensitivity to financial conditions across industries. The results show that sectors with larger liquidity needs are more volatile and experience deeper crises in financially underdeveloped countries. The result suggests that changes in financial development can generate important differences in aggregate volatility. This finding also provides indirect support to the theory that development of financial markets reduces macroeconomic volatility because it increases the ability of intermediaries to provide liquidity during periods of distress. Interestingly, he found that the development of financial intermediaries is more important than the development of equity market for the reduction of volatility. Larrain (2004) found that more financially developed countries experience lower volatility of industrial output. Volatility is particularly reduced in those industries that are more dependent financially. This micro evidence at the industry-sectoral level confirms previous findings that financial development reduces output volatility. The results indicate that financial development relaxes financial constraints mainly through smoothing negative cash-flow shocks. Braun and Larrain (2005) found that industries that are more dependent on external finance are hit harder during recessions. In particular, more dependent industries are more strongly affected in recessions when located in countries with poor financial contractibility, and when their assets are softer, providing less security to financiers.

The last group investigates the effects of financial structure on volatility using a dummy for bank-based and market-based. Silva (2002) applied generalized method of moments technique on cross-sectional data set and found that countries with more developed financial systems had smoother business cycle fluctuations. Interestingly, dummy variables representing bank-based or market-based financial structure are not significant. Phumiwasana (2003) empirically investigated relationships between

financial structure, volatility, and economic growth. Using panel regressions, he found evidences that bank-based financial system increases the growth volatility among developed countries, while decreases growth volatility among developing countries.

3. Measurement Issues

Financial Development

Ideally, one would like measures of financial development, which indicate the degree to which the financial system ameliorates information asymmetry and facilitates the mobilization and efficient allocation of capital. Particularly, one would prefer indicators that capture the effectiveness with which financial systems research firms and identify profitable investment, exert corporate control, facilitate risk management, mobilize saving, and ease transaction [Merton and Bodie (2004)]. Unfortunately, no such measures are available. As a result, one must rely on several proxies of financial development that existing empirical work shows are robustly related to economic growth or other components of aggregate output.

The most commonly used measure of financial development [e.g. Levine and King (1993), Denizer, et al. (2000)] is "Private Credit", defined as the ratio of domestic credit extended to the private sector by financial intermediaries to GDP. More specifically, domestic credit to private sector refers to financial resources provided to the private sector, such as through loans, purchases of nonequity securities, and trade credits and other accounts receivable, that establish a claim for repayment. This measure captures the amount of credit channelled through financial intermediaries to the private sector. Beck, et al. (2000b) show that Private Credit is a good predictor of economic growth and the positive correlation between the two is not due to reverse causality.

The alternative measure is the "Liquidity Ratio", defined as the ratio of liquid liabilities (usually M3) to GDP. Levine and King (1993) introduce this variable under the name "Financial Depth" to proxy for the overall size of the formal financial intermediary sector relative to economic activity. However, such monetary aggregates do not differentiate between the liabilities of various financial institutions, and may not be closely related to financial services such as risk management and information processing [Levine and King (1993)].

This study uses "Private Credit" as a primary measure of financial development. However, it also employs the "Liquidity Ratio" as an alternative measure for robustness check.

Capital Market Development

Measures of capital market development can be broadly classified into two categories: absolute and relative measures. An absolute measure identifies the level of capital market development itself without reference to other developments in the financial system. Alternatively, a relative measure attempts to measure the importance of direct financing via capital markets relative to indirect financing via financial intermediaries, particularly banks. These measures were first developed to classify financial systems as bank-based or market-based systems [Levine (2002)]. Given that these relative measures compare different components of the financial system, they can be used as measures of financial structure.

Absolute measures of capital market development usually involve the size and liquidity of stock markets and/or bond markets [Beck and Levine (2002) called it "stock market development"]. Most cross-country studies use only stock market data because bond market data are usually not available for emerging economies. The standard measure is the "Turnover Ratio", defined as the value of shares traded on

domestic exchanges divided by the total value of listed shares. Basically, it indicates the trading volume of the stock market relative to its size. One advantage of this measure is that it is relatively immune to business cycle and asset price fluctuation because prices appear both in the numerator and the denominator. An alternative measure is "Value Traded", defined as the value of the trades of domestic shares on domestic exchanges divided by GDP. It measures trading relative to the size of the economy. Since value traded is the product of quantity and price, this indicator could rise just from favourable expectation of the future without any increase in transactions activity. Turnover ratio does not suffer from this shortcoming. The other alternative measure is "Capitalization Ratio", defined as the total stock market capitalization over GDP. This measure suffers the same weakness as "Value Traded". This paper uses "Turnover Ratio" as an absolute measure of capital market development and uses "Value Traded" and "Capitalization Ratio" as alternative measures for robustness checks.

Relative measures of capital market development gauge the development of capital markets relative to that of financial intermediaries, particularly the banking sector. In the literature they are known as measures of "Financial Structure", indicating whether the financial system is market-based or bank-based. Since there is no single accepted definition of financial structure, Beck et al. (2001) construct several indicators where higher values indicate that a financial system is more market-based. They aggregate these indicators into a single financial structure index. The first indicator is Structure-Activity, which measures stock market activity relative to that of banks. It is defined as the log of the ratio of Value Traded (defined as “value of total shares traded on the stock market divided by GDP”) over Bank Credit (defined as “the claims of the banking sector on the private sector as a share of GDP”).The

second indicator is Structure-Size, which compares the sizes of the stock market and the banking sector. Specifically, it is defined as the log of the ratio of Market Capitalization and Bank Credit. Market Capitalization is defined as "the value of listed shares divided by GDP." Bank Credit represents the claims of the banking sector on the private sector as a share of GDP. Compared to Private Credit, this measure focuses on the commercial banking sector only, excluding the claims of non-bank financial intermediaries. Levine (2002) also proposed another indicator, Structure-Efficiency, defined as the log of the value traded ratio multiplied by overhead costs. Overhead costs equal the overhead costs of the banking system relative to banking system assets.

The aggregate measure of financial structure is the Structure-Aggregate index which combines the three previous measures. Specifically, it is the first principal component of Structure-Activity, Structure-Size and Structure-Efficiency. In previous studies [e.g. Levine (2002)], countries with a Structure-Aggregate index higher or equal to the sample mean are classified as having a market-based financial structure. Conversely, countries with an index lower than the sample mean are classified as having a bank-based financial structure.

This study uses the "Structure-Aggregate index" as a relative measure of capital market development. However, the structure-aggregate index was constructed as the first principal component of structure-activity and structure-size indices only. The reason is that data required to construct the structure-efficiency index are not available for a number of countries and periods.

The "Financial Structure Aggregate Index" is used mainly for robustness check, and more importantly for a comparison purpose with an absolute measure of capital market development, turnover ratio. By using the index as a relative measure

of capital market development, the applied methodology here related financial structure and growth literature with this study. The interpretation of results in this study should not be that a country should pursue any particular form of "financial structure" (bank-based or market-based), but rather whether a country also need well-developed capital markets, and not only financial intermediaries, to achieve more stable financial system and lower volatilities.

Business Cycle Volatility

There are two standard measures of business cycle volatility of output, namely standard deviation of growth rates of real GDP per capita, and standard deviation of business cycle components (filtered components) of a similar variable. In the first approach, growth rate is calculated by taking log difference. The second approach [e.g. Tiryaki (2003)] focuses on the magnitude of business cycle as a measure of macro-variability. The business cycle components are estimated using filtering technique [e.g. Hodrik-Prescott filter, Bakter-King filter]. This method is widely used among macroeconomist to smooth out business cycle.

This paper applied both approaches in measuring business cycle volatility. The filtering technique applied is Chistiano-Fitzgerald (CF) band-pass filters, which extract cyclical variations that last 2 to 8 years. Cyclical fluctuations in this frequency are widely considered to be associated with the business cycle [Haug and Dewald (2004)]. The applied filter was suggested by Christiano and Fitzgerald (2003). This filter uses a non-symmetric moving average with changing weights. Every observation of a time series is filtered using the full sample. Another popular filter is the Hodrick and Prescott (1997) filter. This filter amplifies the cyclical component and downplays the high frequency noise, but it still passes much of the high-frequency noise outside the business cycle frequency [Stock and Watson (1998)]. The

alternative band-pass filter that could also extract fluctuation from the 2 to 8 years frequency is Baxter and King (1995) filter. This filter is a symmetric centered moving average, where the weights are chosen to minimize the squared difference between the optimal and approximately optimal filters. The drawback of this filter, however, is that there would be loss of data at the beginning and ending of the series.

For components of aggregate output, this paper use standard deviation of gross capital formation growth rate and standard deviation of household consumption growth rate as measures of investment and consumption volatility respectively.

3. Data

The panel covers annual data of 44 countries from 1975 to 2004. Variable description and name list of countries in the sample classified by income level are in Appendix A and in Appendix B respectively. The annual data are transformed into six five-year-span panel. Period 1 covers the years 1975-1979, period 2 covers 1980-1984, period 3 covers 1985-1989, period 4 covers 1990-1994, period 5 covers 1995-1999, and finally period 6 covers 2000-2004.

The transformation method is usually just the average, but for variables that measure volatilities (such as growth volatility, or volatility of changes in terms of trade); the transformation involves the calculation of standard deviation of that variable within that five-year period. Moreover, for robustness check, measures of financial development, capital market development, and income level are also transformed by using the initial values within the period.

The transformed variables are based on available annual data. Where the original annual data set shows missing data in certain years the transformations have been calculated if there are at least three valid data points for a given five-year time span. That criterion implies that more than 50% of observations for a given time-span

are valid. Otherwise, the data are considered missing for that particular observation in the panel.[2]

Table 1 shows business cycle volatilities across countries. Economic performance differs widely. This is true not only with growth rate but also with growth rate volatility and business cycle component volatility. Growth volatilities vary widely from very volatile of 10.2% to almost steady of 0.3%. High income countries tend to have lower both growth volatility and business cycle volatility.

Table 2 shows capital market development among countries from last period in the panel (year 2000-2004). Higher income countries tend to have more financial development, measured by private credit ratio. In addition, higher income countries also tend to have more market-based financial structure, measured by Financial Structure index. Interestingly, turnover ratio, as a measure of capital market development, does not have a stable relationship with income.

Table 3 and 4 provide descriptive statistics and correlations, respectively. Please note that many variables are already in log form (see Appendix A for variable description). Both measures of business cycle volatility, namely growth volatility (g-vol) and business cycle component volatility (b-vol) are highly positively correlated with correlation of 0.82. Both, investment volatility (i-vol) and consumption volatility (c-vol) are positively correlated with growth volatility (g-vol) with correlations of 0.45 and 0.40 respectively. Interestingly, both investment and consumption volatility are relatively highly correlated with correlation of 0.68.

[2] For example, the first five-year period runs from 1975-1979. If there are, say, four annual observations for variable X_1 covering the years 1976-1979, then the transformation of those data into the panel is performed by averaging their values. However, if the observations on X_1 cover only less than three years in any relevant five-year interval, say 1978-1979, then the relevant data point in the panel is listed as "n.a." (not available). This practice avoids loosing too many data points in the panel construction while the transformed data are still representative of the corresponding years.

All volatilities (g-vol, b-vol, i-vol, c-vol) are negatively correlated with financial development (credit), income (gdp), and capital market development (turnover), and market-based financial structure (struc). This implies that countries with higher financial development, more advanced capital market, and higher income tend to have lower growth volatility and lower business cycle component variations.

Capital market development (turnover) is positively correlated with financial development (credit), and income (gdp). This means that countries with higher financial development and higher income tend to have more advanced capital market.

Income (gdp) and financial development (credit) is positively correlated. The correlation is 0.58. This means that countries with high income tend to have more developed financial system.

4. Methodology

The estimated model is a reduced-form equation relating volatility, financial development, and capital market development.

$$\sigma_{it} = \beta_0 + \beta_1.FD_{it} + \beta_2.FS_{it} + \beta_3.X_{it} + \varepsilon_{it}$$

σ_{it} is a measure of volatility. Depending on the specification, it could be log of standard deviation (sd.) of growth rate of output (g-vol), investment (i-vol), or consumption (c-vol), or sd. of CF-filtered log of output (b-vol). FD is a measure of financial development, namely log of private credit ratio (credit). FS is a measure of capital market development. An absolute and a relative measure would be log of turnover ratio (turnover) and financial structure-aggregate index (struc), respectively. X is a vector of standard controlled variables [see e.g. Lopez and Spiegel (2002), Beck, et al. (2003)]

The above reduced-form equation would be estimated by panel estimation; including pooled, random effects and fixed effects with robust variance [see e.g. Greene (2003) pp.314-318]. Furthermore, to take into account possible reverse causalities and endogeneity problems of financial development or capital market development, initial value of suspected variables instead of the average values of each sub-period will also be used in the estimation. In addition, instrumental variable estimation would be performed for robustness checks. Instruments for financial development are time trend, legal origin and creditor's protection index [La-Porta et al. (1998)]. In case of panel instrumental variable estimation, instruments are time trend, creditor's protection index, and human capital index. Controlled variables (X) include the following.

Income Level [log of real gdp per capita (gdp)]

The level of income is included to control for the fact that developing countries tend to experience much more volatility than developed countries [Easterly, et al. (2000)]

Openness [log of openness ratio (openness)]

The effect of trade openness on volatility is ambiguous. On one hand, reductions of barriers to trade may increase countries' susceptibility to external shocks. On the other hand, trade with other countries can reduce the impact of domestic shocks. This volume variable is measured by the share of trade (export + import) in GDP. Our analysis does not include any measure of financial openness since the empirical literature [e.g. Buch et al. (2005)] has not been able to establish a statistically significant link between financial openness and business cycle volatility.

Government Consumption Spending over GDP (gcon)

There is general consensus at least among Keynesian macroeconomists that government has a role in promoting economic stabilization. Fiscal policy is an effective tool to counter business cycles. The mean of government consumption spending over GDP is included to take this fact into account.

Standard Deviation of Changes in Real Effective Exchange Rate (sd-dreer)

One intensely debated topics of international macroeconomics is which exchange rate regime (fixed or floating) promotes greater stability of output. The answer depends on the type of shock that hits the economy. A fixed exchange rate is better if monetary shocks dominate, whereas floating is better if real shocks dominates [Karras and Song (1996)]. The standard measure of exchange-rate flexibility is the standard deviation of the real effective exchange rate.

Standard Deviation of Changes in Terms of Trade (sd-dtot)

The standard deviation of changes in the terms of trade is a proxy for the extent to which an economy is exposed to real shocks. Raddatz (2005) finds that among low-income countries, changes in commodity price are the most important external shocks. However, since changes in the terms of trade affect the economy through relative price movements of imported input and exported output, they only affect the tradable sector of an economy directly, whereas the non-tradable sector might be affected only indirectly. Therefore, countries with large non-tradable sectors will be relatively less affected by fluctuations in the terms of trade. This fact is controlled for by including an openness ratio (ratio of trade over GDP) in the analysis.

Instrumental variables are the following.

Legal Origin

Legal systems with European origin can be classified into four major families: the English Common Law and the French, German, and Scandinavian Civil Law countries. Civil Law has its root in Roman law, and uses primarily legal codes to resolve particular cases. Unlike Civil Law, the English legal system is based on the Common Law where judges primarily formed the law in the course of trying to resolve particular cases. La-Porta, et al. (1998) show that common law countries generally have the best, and French civil law countries the worst, legal protection of investors, with German and Scandinavian civil law countries located in the middle.

Since most countries have acquired their legal system through occupation and colonization, legal origin can be regarded as relatively exogenous. In addition, La-Porta, et al. (1998) have shown that the legal origin of a country materially influences the rights of its creditors and shareholders, its accounting standards, and the efficiency of contract enforcement. Furthermore, Levine et al. (1999) have shown that legal origin explains cross-country variations in the level of financial development.

Creditor's Protection

The creditor protection index shows how well a country protects the claims of secured creditors in the case of company restructuring or liquidation. It ranges from 0 to 4 and is composed of four dummy variables that indicate whether (1) the restructuring procedure imposes an automatic stay on assets that prevents secured creditors from taking possession of loan collateral; (2) secured creditors are ranked first in the case of liquidation; (3) management does stay in charge of the firm during restructuring, thereby enhancing creditors' power; and (4) management needs creditors' consent when filing for restructuring. Basically, higher values of Creditor

Protection mean that outside investors have more rights relative to the management and other stakeholders. This implies that outside investors should be more willing to provide external finance.

Human Capital

Human capital is measured by Barro and Lee (2000)'s educational attainment of the total population aged 25 and over. Outreville (1999) finds that human capital is an important factor that explains the level of financial development across countries. Unlike in this study, however, his study uses UNDP human development index as a measure of human capital.

Time trend

The level of financial intermediation in the economy is normally increasing with time as the economy grows. Moreover, technology in lending, monitoring, and doing financial transactions are also improved over time.

5. Estimation Results

Table 5 and 6 show estimation results of growth volatility (g-vol) using turnover ratio (turnover) and financial structure aggregate index (struc), respectively. In pooled estimation, both measures are negatively significant. This suggests that higher capital market development is associated with lower growth volatility. Interestingly, private credit (credit), a measure of financial development, and income level (gdp) are not significant, though still have negative signs as expected. These results still hold after controlling for random individual effects (in RE estimation). However, using Hausman test, we reject the null hypothesis of zero correlation of individual effects and other predictors (random effects assumption) in favour of fixed effects estimation, which does not rely on this assumption. In fixed effects estimation, we rejected the hypothesis of no individual effects, using F-statistic. Furthermore, previous results

still hold, and coefficients of turnover ratio (turnover) and structure index (struc) are nearly double. To avoid reverse causality, initial values of turnover ratio, financial structure index, private credit, and income level were used in fixed effects estimation (FEI). The results are still consistent with previous findings.

To take into account possible endogeneity of financial and capital market development, instrumental variable estimation (IV) were conducted. Turnover ratio (turnover) and structure index (struc) are still negatively significant and the coefficients are even more negative than those in pooled estimation. The last columns report results from fixed effects IV estimation (IVFE). Unlike in normal fixed effects, we cannot reject null hypothesis of no individual effects, using F-statistic. This validates previous results from IV estimation. Interestingly, both turnover and struc are not significant, though still have negative signs.

Among other explanatory variables, only trade openness ratio (openness) is consistently significant across various estimation methods. After controlling for country fixed effects, higher trade openness is associated with lower growth volatility.

Table 7 and 8 show estimation results of business cycle component volatility (b-vol) using turnover ratio (turnover) and financial structure aggregate index (struc), respectively. With turnover ratio (turnover) as an absolute measure of capital market development, results are broadly similar to previous cases of growth volatility. Turnover ratio is consistently significant with negative signs across different estimation methods except in fixed effects instrumental variables estimation (IVFE). Both Hausman and F statistics justify the use of fixed effects. Using Hausman statistic, we reject null hypothesis of zero correlation between individual effects and other predictors, and using F statistic, we reject null hypothesis of no individual effects.

In sharp contrast, structure index (struc) as a relative measure of capital market development, is not significant under most estimation methods except in fixed effects using initial value data (FEI) and instrumental variable estimation (IV). However, the signs are consistently negative.

Surprisingly, private credit (credit), a measure of financial development, is almost always not significant. Income level (gdp) is negatively significant in pooled, random effects, and IV estimation, but becomes insignificant with positive signs after we controlled for fixed effects.

Among other explanatory variables, trade openness ratio (openness) and real effective exchange rate volatility (sd-dreer) are consistently significant. Similar to the case of growth volatility, higher trade openness is associated with lower business cycle component volatility after controlling for country fixed effects. On the other hand, higher real exchange rate volatility is consistently associated with higher volatility of business cycle.

Table 9 and 10 show estimation results of investment volatility (i-growth) using turnover ratio (turnover) and financial structure aggregate index (struc), respectively. Both measures are negatively significant across all estimation methods. Using Chi2 statistics in random effects estimation, and F statistics in fixed effects estimation, we rejected null hypothesis of no individual effect. From Hausman statistics, we cannot reject hypothesis of zero correlation between individual effects and other predictors. In this case, both random and fixed effects estimators are consistent, but random effects estimator is also efficient. Interestingly, turnover ratio (turnover) and financial structure index (struc) are negatively significant even in fixed effects instrumental variable estimation (IVFE).

Private credit (credit), a measure of financial development, is negatively significant in both pooled and random effects estimation. However, though still has negative signs, it became insignificant once we controlled for possible endogeniety in IV estimation. Income level (gdp) is not significant in any estimation.

Among other explanatory variables, only real effective exchange rate volatility (sd-dreer) is consistently positively significant across various estimation methods. The results suggest that higher real exchange rate volatility is associated with higher investment volatility.

Table 11 and 12 show estimation results of consumption volatility (c-vol) using turnover ratio (turnover) and financial structure aggregate index (struc), respectively. Though, both measures are significant under certain estimation methods, there is no evidence of robust relationship. Income level (gdp) is negatively significant under most estimation methods. This result seems to suggest that rich countries have better ways to smooth out consumption variability. Private credit, a measure of financial development, is not significant under any estimation method. Other explanatory variables are also not consistently significant, except real exchange rate volatility (sd-dreer), which is positively significant when financial structure index (struc) is used as a measure of capital market development.

6. Robustness Check

For robustness check, estimations are also performed using alternative measures of financial and capital market development. More specifically, liquidity ratio (M3/GDP) is used instead of private credit ratio (private credit/GDP) to measure a degree of financial development. Value traded ratio (stock value traded/GDP) and market capitalization ratio (stock market capitalization/GDP) are used instead of turnover ratio (stock value traded/stock market capitalization) as a measure of capital

market development. The results, not reported here, are that major findings from previous sections do not materially change with alternative measures. In both growth volatility and investment volatility regressions, coefficients of value traded ratio and market capitalization ratio are consistently significant with negative sign. However, they are not significant in explaining consumption growth volatility, but this is the same result we found with turnover ratio and private credit ratio.

Other plausible relevant variables (e.g. standard deviation of inflation, average inflation rate, and investment ratio) are also included in the estimation, but have never been significant. Therefore, they are dropped from the estimation.

7. Policy Implications and Conclusion

The above econometric analysis supports theoretical prediction that capital market development reduces output, investment, and consumption volatilities. The coefficients of alternative measures of capital market development are significant in most specifications with negative signs. Nevertheless, the values of the coefficients are rather small, always less than unity. This raises the question whether the effect of capital market development on aggregate volatility is economically meaningful, even if it is statistically significant.

To investigate the above question, the simple calculation below use a coefficient of log of turnover ratio (turnover) from fixed effects estimation (FEI) of growth volatility in Table 5 as a benchmark. The coefficient is -0.16. The inter-quartile range of turnover ratio (in period 6: 2000-2004) is 49.36 (or 1.67 in terms of log difference). The effect of an inter-quartile improvement in turnover ratio is a reduction of 27% of growth volatility. The average growth volatility is 2.1%. Therefore, a decrease of 27% would mean a decrease of 0.50 percentage point in standard deviation of growth rate.

In summary, capital market does exert a statistically significant influence on volatility, and the magnitude of the decrease in volatility is quite large. However, when we measure the change in percentage point change, then the size of the effect seems to be quite small, approximately half a percentage point.

To conclude, this paper investigates the effect of capital market development on output, investment and consumption volatilities in forty-four countries using data from 1975 to 2004 period. The main result is that output, investment and consumption volatilities are negatively related to measures of capital market development after controlling for other relevant variables. Hence, the empirical findings corroborate the theoretical prediction that more advanced capital market is associated with lower volatilities.

Interestingly, econometric analysis here could not find robust negative relationship between financial development and output volatility as in some of the previous studies [e.g. Silva (2002), Tiryaki (2003)]. Nevertheless, the evidence here suggests that there is a significant negative relationship between financial development and investment volatility. This study also found that income level (gdp) has a relatively robust negative relationship with consumption volatility.

The next interesting question would be whether capital market development affects economic stability in some other ways. It may be the case that capital market development affects the likelihood of a recession occurring, or its depth. Moreover, little is known about the mechanism by which the deepening of capital markets affects aggregate volatility. These are interesting topics for future research.

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Table 1: Business Cycle Volatility (%) classified by Income Level.
(Data cover six 5-year time span from 1975-2004 for 44 countries)

	Standard deviation of growth rate (%)				Standard deviation of filtered log GDP p.c. (%)			
COUNTRY	Mean	Median	Max	Min	Mean	Median	Max	Min
High Income	**1.8**	**1.6**	**6.4**	**0.3**	**1.2**	**1.0**	**3.9**	**0.2**
Australia	1.8	1.4	4.1	0.7	1.1	1.0	2.4	0.4
Belgium	1.6	1.8	1.9	0.9	0.9	1.0	1.2	0.6
Canada	1.8	1.4	3.3	0.7	1.3	1.2	2.0	0.6
Denmark	1.8	2.0	2.4	0.3	1.0	1.1	1.4	0.5
Finland	1.9	1.6	3.0	1.1	1.3	1.3	2.1	0.4
France	1.0	1.1	1.5	0.5	0.7	0.7	0.8	0.5
Germany	1.2	1.1	2.7	0.6	1.0	1.0	1.4	0.5
Greece	1.8	1.8	2.9	0.6	1.1	1.1	2.3	0.2
Iceland	2.6	3.0	3.2	1.3	1.3	1.6	1.9	0.3
Ireland	3.0	3.0	3.7	2.0	1.8	1.9	2.3	1.4
Israel	2.5	2.3	4.5	1.2	1.7	1.9	2.5	0.5
Italy	1.1	1.1	1.8	0.4	0.7	0.7	1.1	0.4
Japan	1.3	1.5	2.0	0.6	0.8	0.9	1.3	0.2
Korea, South	2.7	1.8	6.0	1.2	1.9	1.7	3.9	0.8
Netherlands	1.6	1.6	2.0	1.2	1.0	0.9	2.0	0.5
New Zealand	2.1	1.9	3.3	0.8	1.1	1.0	2.1	0.6
Norway	1.4	1.3	2.2	1.0	1.0	0.9	1.7	0.5
Portugal	1.8	2.2	2.5	0.4	0.9	0.9	1.1	0.7
Singapore	3.9	3.8	6.4	0.8	2.5	2.9	3.3	1.4
Spain	1.4	1.3	2.2	0.8	0.6	0.6	1.1	0.2
Sweden	1.3	1.3	2.1	0.3	0.9	0.9	1.3	0.5
Switzerland	1.7	1.6	2.6	1.1	1.2	1.1	1.8	0.7
United Kingdom	1.2	1.0	2.2	0.5	1.0	1.1	1.2	0.6
United States	1.7	1.3	4.0	0.8	1.3	1.1	2.2	0.8
Upper Middle Income	**3.9**	**3.3**	**10.2**	**0.6**	**2.7**	**2.1**	**6.5**	**1.0**
Argentina	6.1	6.2	8.8	3.5	4.2	4.0	5.6	2.9
Brazil	3.2	2.8	5.4	1.6	1.9	1.6	3.8	1.1
Chile	4.3	3.7	7.4	2.7	2.7	1.9	5.7	1.6
Malaysia	3.2	2.9	7.2	0.6	2.3	2.1	4.6	1.1
Mexico	3.1	2.9	5.3	1.0	1.7	1.6	2.7	1.2
South Africa	2.0	1.7	3.9	0.8	1.7	1.7	2.1	1.0
Uruguay	4.7	3.6	9.1	1.9	3.3	2.9	5.4	2.2
Venezuela	4.9	4.3	10.2	2.2	3.4	3.2	6.5	1.9
Lower Middle Income	**3.4**	**2.6**	**7.9**	**0.7**	**2.2**	**2.1**	**5.8**	**0.3**
Columbia	1.8	1.6	3.6	0.7	1.0	0.9	2.1	0.3
Ecuador	2.6	2.6	3.6	1.6	1.6	1.6	2.0	0.9
Indonesia	4.1	2.6	7.9	2.1	2.8	1.9	5.5	1.2
Morocco	4.5	4.5	7.1	2.0	2.5	2.6	3.4	1.3
Philippines	3.3	2.5	5.8	2.0	2.6	2.5	3.8	1.2
Thailand	2.8	2.0	7.6	0.9	1.8	1.5	4.6	0.4
Turkey	4.8	4.7	5.9	3.6	2.9	2.7	3.7	2.3

Table 1 (continued)

	Standard deviation of growth rate (%)				Standard deviation of filtered log GDP p.c. (%)			
COUNTRY	Mean	Median	Max	Min	Mean	Median	Max	Min
Low Income	**3.2**	**2.6**	**9.0**	**0.4**	**2.2**	**1.8**	**5.7**	**0.4**
China	3.1	3.4	5.5	0.4	1.9	1.9	3.8	0.4
Cote d'Ivoire	2.9	2.6	6.5	0.7	2.4	2.5	4.3	0.5
India	2.4	2.1	5.6	1.2	1.8	1.6	3.4	0.8
Nigeria	5.3	4.5	9.0	3.2	3.4	3.3	5.7	1.4
Pakistan	2.1	1.9	3.1	1.6	1.5	1.6	2.1	0.9
All	**2.6**	**2.1**	**10.2**	**0.3**	**1.7**	**1.4**	**6.5**	**0.2**

Table 2: Capital Market Development among countries
(Data cover last panel period of year 2000-2004 for 44 countries)

COUNTRY	Private Credit Ratio	Turnover Ratio	Financial Structure Index
High Income	**113.6**	**91.9**	**1.3**
Australia	93.6	69.8	1.7
Belgium	76.4	21.3	0.8
Canada	81.0	65.1	1.8
Denmark	147.8	69.7	0.6
Finland	61.0	94.3	2.7
France	87.6	81.5	1.5
Germany	116.2	118.1	0.8
Greece	66.7	42.0	1.2
Iceland	125.0	57.6	1.0
Ireland	117.2	40.1	0.7
Israel	91.2	62.7	1.2
Italy	82.7	105.8	1.1
Japan	151.6	79.2	0.3
Korea, South	97.6	289.4	1.5
Netherlands	149.9	120.9	1.6
New Zealand	115.4	41.3	0.2
Norway	68.6	88.3	1.1
Portugal	146.7	55.0	0.3
Singapore	115.2	54.1	2.1
Spain	108.7	179.0	1.5
Sweden	91.7	112.0	1.9
Switzerland	158.4	86.2	2.1
United Kingdom	143.4	103.4	1.8
United States	232.4	169.7	1.3
Upper Middle Income	**57.3**	**22.1**	**0.9**
Argentina	16.3	6.5	1.0
Brazil	35.4	34.6	0.4
Chile	64.0	8.7	1.1
Malaysia	141.2	30.3	1.2
Mexico	17.3	27.4	0.7
South Africa	124.1	45.5	1.6
Uruguay	49.4	n.a.	n.a.
Venezuela	11.0	1.7	0.0

Table 2 (continued)

COUNTRY	Private Credit Ratio	Turnover Ratio	Financial Structure Index
Lower Middle Income	**39.0**	**75.0**	**0.2**
Columbia	24.5	4.0	-0.6
Ecuador	24.2	2.0	-1.3
Indonesia	20.4	229.5	1.0
Morocco	56.1	8.0	-0.3
Philippines	37.1	11.5	0.6
Thailand	101.4	96.8	0.8
Turkey	19.2	173.2	1.4
Low Income	**44.4**	**125.8**	**0.6**
China	134.8	100.1	0.4
Cote d'Ivoire	14.7	1.7	-0.4
India	31.9	145.1	1.4
Nigeria	15.4	10.5	0.5
Pakistan	25.3	371.7	1.2
All	**82.6**	**81.7**	**1.0**

Table 3: Descriptive Statistics

	Mean	Median	Maximum	Minimum	Std. Dev.	Observations
G-VOL	0.7	0.8	2.3	-1.3	0.7	270
B-VOL	0.3	0.3	1.9	-1.5	0.7	270
C-VOL	1.1	1.0	8.2	-0.9	1.0	247
I-VOL	2.3	2.2	5.6	-0.1	0.7	251
TURNOVER	3.2	3.5	5.9	-1.0	1.3	230
STRUC	0.0	0.2	2.7	-4.8	1.3	225
CREDIT	3.9	4.0	5.4	-0.1	0.8	269
GDP	9.1	9.4	10.5	6.5	1.0	270
OPENNESS	4.0	4.0	5.8	2.3	0.6	270
GCON	16.2	15.5	38.7	0.0	5.7	270
SD-DREER	7.6	5.3	47.7	0.5	7.3	222
SD-DTOT	7.0	4.6	44.6	0.6	6.9	242

Table 4: Selected pairwise correlations

	G-VOL	B-VOL	C-VOL	I-VOL	TURNOVER	STRUC	CREDIT	GDP	OPENNESS	GCON	SD-DREER	SD-DTOT
G-VOL	1.00											
B-VOL	0.82	1.00										
C-VOL	0.40	0.40	1.00									
I-VOL	0.45	0.45	0.68	1.00								
TURNOVER	-0.25	-0.27	-0.23	-0.40	1.00							
STRUC	-0.17	-0.15	-0.31	-0.27	0.57	1.00						
CREDIT	-0.37	-0.35	-0.32	-0.40	0.45	0.40	1.00					
GDP	-0.38	-0.43	-0.38	-0.27	0.37	0.37	0.58	1.00				
OPENNESS	-0.03	-0.04	-0.07	0.01	-0.01	0.34	0.23	0.24	1.00			
GCON	-0.33	-0.34	-0.21	-0.17	0.07	0.16	0.31	0.52	0.28	1.00		
SD-DREER	0.33	0.38	0.28	0.34	-0.30	-0.17	-0.33	-0.39	-0.17	-0.24	1.00	
SD-DTOT	0.20	0.23	0.21	0.23	-0.34	-0.38	-0.45	-0.50	-0.22	-0.36	0.46	1.00

Table 5: Growth Volatility - using absolute measure of capital market development

G-VOL	Pool	RE	FE	FEI	IV	IVFE
TURNOVER	-0.10***	-0.11***	-0.17**	-0.16**	-0.29**	-0.03
	(0.04)	(0.04)	(0.08)	(0.07)	(0.13)	(0.22)
CREDIT	-0.07	-0.04	0.12	0.08	0.26	-1.02
	(0.12)	(0.13)	(0.19)	(0.18)	(0.33)	(0.70)
GDP	-0.11	-0.13	0.39	0.61	-0.14	0.87
	(0.09)	(0.10)	(0.43)	(0.38)	(0.14)	(0.86)
OPENNESS	0.31***	0.28***	-0.63**	-0.70***	0.24***	-0.54
	(0.07)	(0.08)	(0.29)	(0.27)	(0.09)	(0.44)
GCON	-0.03***	-0.03***	0.03	0.03	-0.03***	0.03
	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.03)
SD-DREER	0.02***	0.02***	0.01	0.01	0.03***	0.05***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
SD-DTOT	-0.02*	-0.02*	-0.02	-0.01	-0.03**	-0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Observations	177.00	177.00	177.00	177.00	163.00	149.00
No. of countries	-	44.00	44.00	44.00	-	40.00
R2	0.30	0.03	0.12	0.14	0.23	0.00
F / Chi2	10.48***	53.43***	3.33***	3.78***	11.56***	177.64***
F_u / $Chi2_u$	-	0.35	1.74***	1.86***	-	1.04
Correlation(Xb, u_i)	-	-	-0.86	-0.91	-	-0.80
Hausman	-	31.35***	-	-	-	-
J stat	-		-	-	0.45	0.05

Note: robust standard error in parenthesis. * sig. at 10%, ** sig. at 5%, *** sig. at 1%
Pool= pooled estimation, RE = random effects, FE= fixed effects, FEI= fixed effects using initial value data of lturnover, lcredit and lgdp, IV= instrumental variable estimation (instruments: time trend, legal origin, creditor's protection index), IVFE= fixed effects instrumental estimation (instruments: time trend, creditor's protection index, human capital index)

R2 = R^2 or Within-R^2 [squared correlation between $(y_{it} - \overline{y}_i)$ and $(x_{it} - \overline{x}_i).\hat{\beta}$]
F / Chi2 = F or Chi2 statistics for testing sig. of all Xs except constant
F_u / $Chi2_u$ = F or Chi2 statistics for testing sig. of cross-sectional individual effects,
Corr(Xb,u_i)= correlation of predicted valued (Xb) and individual fixed effects (u_i)
Hausman = Hausman Chi2 statistics for testing of no-correlation between u_i and Xs
J stat = J statistics for GMM overeidentifying test

Table 6: Growth Volatility - using relative measure of capital market development

G-VOL	Pool	RE	FE	FEI	IV	IVFE
STRUC	-0.07**	-0.08**	-0.16**	-0.19***	-0.13*	-0.04
	(0.04)	(0.04)	(0.07)	(0.07)	(0.08)	(0.19)
CREDIT	-0.12	-0.09	0.01	-0.05	0.07	-1.05
	(0.12)	(0.13)	(0.19)	(0.19)	(0.30)	(0.72)
GDP	-0.11	-0.13	0.57	0.87**	-0.18	0.94
	(0.09)	(0.10)	(0.41)	(0.40)	(0.14)	(0.99)
OPENNESS	0.36***	0.34***	-0.53*	-0.52	0.39***	-0.50
	(0.08)	(0.09)	(0.30)	(0.33)	(0.07)	(0.49)
GCON	-0.03***	-0.02**	0.03	0.03	-0.03***	0.03
	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.03)
SD-DREER	0.03***	0.03***	0.02*	0.02*	0.03***	0.05***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
SD-DTOT	-0.02	-0.02*	-0.02	-0.02	-0.02**	-0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Observations	177.00	177.00	177.00	173.00	164.00	150.00
No. of countries	-	44.00	44.00	45.00	-	41.00
R2	0.29	0.03	0.12	0.13	0.29	0.00
F / Chi2	11.11***	56.41***	3.04***	2.87***	13.21***	182.97***
F_u / $Chi2_u$	-	0.45	1.80***	1.79***	-	1.09
Correlation(Xb, u_i)	-	-	-0.90	-0.93	-	-0.81
Hausman	-	32.99***	-	-	-	-
J stat	-	-	-	-	3.22	0.02

Note: robust standard error in parenthesis. * sig. at 10%, ** sig. at 5%, *** sig. at 1%
Pool= pooled estimation, RE = random effects, FE= fixed effects, FEI= fixed effects using initial value data of lturnover, lcredit and lgdp, IV= instrumental variable estimation (instruments: time trend, legal origin, creditor's protection index), IVFE= fixed effects instrumental estimation (instruments: time trend, creditor's protection index, human capital index)

R2 = R^2 or Within-R^2 [squared correlation between $(y_{it} - \overline{y}_i)$ and $(x_{it} - \overline{x}_i).\hat{\beta}$]
F / Chi2 = F or Chi2 statistics for testing sig. of all Xs except constant
F_u / $Chi2_u$ = F or Chi2 statistics for testing sig. of cross-sectional individual effects,
Corr(Xb,u_i)= correlation of predicted valued (Xb) and individual fixed effects (u_i)
Hausman = Hausman Chi2 statistics for testing of no-correlation between u_i and Xs
J stat = J statistics for GMM overeidentifying test

Table 7: Business Cycle Volatility - using absolute measure of capital market development

B-VOL	Pool	RE	FE	FEI	IV	IVFE
TURNOVER	-0.10***	-0.12***	-0.15***	-0.14***	-0.39***	-0.01
	(0.04)	(0.04)	(0.06)	(0.05)	(0.12)	(0.16)
CREDIT	0.02	0.10	0.15	0.10	0.73**	-0.07
	(0.11)	(0.12)	(0.15)	(0.13)	(0.37)	(0.51)
GDP	-0.15*	-0.22**	0.32	0.50*	-0.29**	0.00
	(0.08)	(0.11)	(0.34)	(0.29)	(0.15)	(0.62)
OPENNESS	0.26***	0.03	-1.02***	-1.07***	0.18*	-1.16***
	(0.08)	(0.13)	(0.28)	(0.27)	(0.10)	(0.32)
GCON	-0.02	0.00	0.05**	0.05**	-0.02	0.03
	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.03)
SD-DREER	0.03***	0.02***	0.02**	0.02**	0.03***	0.04***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
SD-DTOT	-0.01	-0.01	0.00	0.00	-0.02	-0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Observations	177.00	177.00	177.00	177.00	163.00	149.00
No. of countries	-	44.00	44.00	44.00	-	40.00
R2	0.31	0.10	0.24	0.25	-	0.28
F / Chi2	8.17***	32.03***	5.56***	5.77***	8.83***	78.75***
F_u / $Chi2_u$	-	7.98***	3.62***	3.81***	-	3.13***
Correlation(Xb, u_i)	-	-	-0.86	-0.89	-	-0.81
Hausman	-	22.00***	-	-	-	-
J stat	-	-	-	-	0.35	0.04

Note: robust standard error in parenthesis. * sig. at 10%, ** sig. at 5%, *** sig. at 1%
Pool= pooled estimation, RE = random effects, FE= fixed effects, FEI= fixed effects using initial value data of lturnover, lcredit and lgdp, IV= instrumental variable estimation (instruments: time trend, legal origin, creditor's protection index), IVFE= fixed effects instrumental estimation (instruments: time trend, creditor's protection index, human capital index)

R2 = R^2 or Within-R^2 [squared correlation between $(y_{it} - \overline{y}_i)$ and $(x_{it} - \overline{x}_i).\hat{\beta}$]
F / Chi2 = F or Chi2 statistics for testing sig. of all Xs except constant
F_u / $Chi2_u$ = F or Chi2 statistics for testing sig. of cross-sectional individual effects,
Corr(Xb,u_i)= correlation of predicted valued (Xb) and individual fixed effects (u_i)
Hausman = Hausman Chi2 statistics for testing of no-correlation between u_i and Xs
J stat = J statistics for GMM overeidentifying test

Table 8: Business Cycle Volatility - using relative measure of capital market development

B-VOL	Pool	RE	FE	FEI	IV	IVFE
STRUC	-0.03	-0.06	-0.09	-0.12**	-0.20**	-0.02
	(0.04)	(0.05)	(0.06)	(0.05)	(0.09)	(0.14)
CREDIT	-0.04	0.03	0.08	0.00	0.54	-0.08
	(0.12)	(0.13)	(0.15)	(0.13)	(0.36)	(0.52)
GDP	-0.17**	-0.24**	0.33	0.59*	-0.36**	0.04
	(0.09)	(0.12)	(0.33)	(0.31)	(0.16)	(0.71)
OPENNESS	0.29***	0.08	-1.01***	-0.97***	0.37***	-1.14***
	(0.09)	(0.13)	(0.30)	(0.33)	(0.09)	(0.36)
GCON	-0.01	0.00	0.05**	0.05**	-0.02	0.04
	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.03)
SD-DREER	0.03***	0.03***	0.02**	0.02**	0.04***	0.04***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
SD-DTOT	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Observations	177.00	177.00	177.00	173.00	164.00	150.00
No. of countries	-	44.00	44.00	45.00	-	41.00
R2	0.29	0.08	0.22	0.22	0.08	0.28
F / Chi2	8.20***	31.42***	4.25***	4.18***	9.49***	82.41***
F_u / $Chi2_u$	-	8.75***	3.64***	3.56***	-	3.42***
Correlation(Xb, u_i)	-	-	-0.88	-0.91	-	-0.81
Hausman	-	113.44***	-	-	-	-
J stat	-	-	-	-	4.07	0.03

Note: robust standard error in parenthesis. * sig. at 10%, ** sig. at 5%, *** sig. at 1%
Pool= pooled estimation, RE = random effects, FE= fixed effects, FEI= fixed effects using initial value data of lturnover, lcredit and lgdp, IV= instrumental variable estimation (instruments: time trend, legal origin, creditor's protection index), IVFE= fixed effects instrumental estimation (instruments: time trend, creditor's protection index, human capital index)

R2 = R^2 or Within-R^2 [squared correlation between $(y_{it} - \overline{y}_i)$ and $(x_{it} - \overline{x}_i).\hat{\beta}$]
F / Chi2 = F or Chi2 statistics for testing sig. of all Xs except constant
F_u / $Chi2_u$ = F or Chi2 statistics for testing sig. of cross-sectional individual effects,
Corr(Xb,u_i)= correlation of predicted valued (Xb) and individual fixed effects (u_i)
Hausman = Hausman Chi2 statistics for testing of no-correlation between u_i and Xs
J stat = J statistics for GMM overeidentifying test

Table 9: Investment Volatility - using absolute measure of capital market development

I-VOL	Pool	RE	FE	FEI	IV	IVFE
TURNOVER	-0.19***	-0.18***	-0.17***	-0.15***	-0.32***	-0.31*
	(0.05)	(0.05)	(0.06)	(0.06)	(0.11)	(0.17)
CREDIT	-0.28***	-0.20*	-0.13	-0.12	-0.03	-0.40
	(0.11)	(0.11)	(0.13)	(0.14)	(0.33)	(0.57)
GDP	0.11	-0.07	-0.36	-0.21	0.06	0.58
	(0.09)	(0.12)	(0.43)	(0.38)	(0.17)	(0.84)
OPENNESS	0.14	0.00	-0.09	-0.20	0.11	-0.45
	(0.12)	(0.16)	(0.31)	(0.31)	(0.11)	(0.38)
GCON	-0.02*	0.00	0.04	0.04	-0.03**	0.00
	(0.01)	(0.02)	(0.03)	(0.03)	(0.01)	(0.03)
SD-DREER	0.02***	0.02***	0.02**	0.02***	0.02**	0.03***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
SD-DTOT	0.00	0.00	0.00	0.00	0.00	-0.01
	(0.01)	-(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Observations	166.00	166.00	166.00	166.00	152.00	138.00
No. of countries	-	42.00	42.00	42.00	-	38.00
R2	0.30	0.18	0.21	0.19	0.32	0.22
F / Chi2	11.75***	51.67***	4.53***	3.84***	10.37***	2576.02***
F_u / $Chi2_u$	-	93.13***	4.78***	4.77***	-	3.37***
Correlation(Xb, u_i)	-	-	-0.27	-0.14	-	-0.43
Hausman	-	-1.32	-	-	-	-
J stat	-	-	-	-	3.35	0.56

Note: robust standard error in parenthesis. * sig. at 10%, ** sig. at 5%, *** sig. at 1%
Pool= pooled estimation, RE = random effects, FE= fixed effects, FEI= fixed effects using initial value data of lturnover, lcredit and lgdp, IV= instrumental variable estimation (instruments: time trend, legal origin, creditor's protection index), IVFE= fixed effects instrumental estimation (instruments: time trend, creditor's protection index, human capital index)

R2 = R^2 or Within-R^2 [squared correlation between $(y_{it} - \overline{y}_i)$ and $(x_{it} - \overline{x}_i).\hat{\beta}$]
F / Chi2 = F or Chi2 statistics for testing sig. of all Xs except constant
F_u / $Chi2_u$ = F or Chi2 statistics for testing sig. of cross-sectional individual effects,
Corr(Xb,u_i)= correlation of predicted valued (Xb) and individual fixed effects (u_i)
Hausman = Hausman Chi2 statistics for testing of no-correlation between u_i and Xs
J stat = J statistics for GMM overeidentifying test

Table 10: Investment Volatility - using relative measure of capital market development

I-VOL	Pool	RE	FE	FEI	IV	IVFE
STRUC	-0.13 *	-0.12 *	-0.11 *	-0.15 ***	-0.26 ***	-0.31 *
	(0.07)	(0.06)	(0.06)	(0.06)	(0.08)	(0.17)
CREDIT	-0.37 ***	-0.29 ***	-0.23 *	-0.23	-0.04	-0.55
	(0.10)	(0.11)	(0.14)	(0.15)	(0.32)	(0.62)
GDP	0.09	-0.09	-0.31	0.04	-0.01	1.00
	(0.10)	(0.13)	(0.43)	(0.42)	(0.17)	(1.03)
OPENNESS	0.22 *	0.06	-0.06	-0.16	0.27 **	-0.14
	(0.12)	(0.17)	(0.33)	(0.36)	(0.12)	(0.44)
GCON	-0.01	0.01	0.04	0.05	-0.02	0.03
	(0.01)	(0.02)	(0.03)	(0.03)	(0.01)	(0.03)
SD-DREER	0.03 ***	0.02 ***	0.02 ***	0.03 ***	0.03 ***	0.04 ***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
SD-DTOT	0.00	0.00	-0.01	-0.01	0.00	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Observations	166.00	166.00	166.00	161.00	153.00	139.00
No. of countries	-	42.00	42.00	42.00	-	39.00
R2	0.27	0.17	0.19	0.19	0.21	0.12
F / Chi2	8.75 ***	41.89 ***	4.10 ***	4.64 ***	9.40 ***	2328.14 ***
F_u / $Chi2_u$	-	88.15 ***	4.84 ***	4.32 ***	-	3.22 ***
Correlation(Xb, u_i)	-	-	-0.19	-0.14	-	-0.72
Hausman	-	8.21	-	-	-	-
J stat	-	-	-	-	2.05	0.32

Note: robust standard error in parenthesis. * sig. at 10%, ** sig. at 5%, *** sig. at 1%
Pool= pooled estimation, RE = random effects, FE= fixed effects, FEI= fixed effects using initial value data of lturnover, lcredit and lgdp, IV= instrumental variable estimation (instruments: time trend, legal origin, creditor's protection index), IVFE= fixed effects instrumental estimation (instruments: time trend, creditor's protection index, human capital index)

R2 = R^2 or Within-R^2 [squared correlation between $(y_{it} - \overline{y}_i)$ and $(x_{it} - \overline{x}_i).\hat{\beta}$]
F / Chi2 = F or Chi2 statistics for testing sig. of all Xs except constant
F_u / $Chi2_u$ = F or Chi2 statistics for testing sig. of cross-sectional individual effects,
Corr(Xb,u_i)= correlation of predicted valued (Xb) and individual fixed effects (u_i)
Hausman = Hausman Chi2 statistics for testing of no-correlation between u_i and Xs
J stat = J statistics for GMM overeidentifying test

Table 11: Consumption Volatility - using absolute measure of capital market development

C-VOL	Pool	RE	FE	FEI	IV	IVFE
TURNOVER	-0.09	-0.13 **	-0.11	-0.04	-0.35 **	-0.48 ***
	(0.06)	(0.06)	(0.08)	(0.07)	(0.18)	(0.18)
CREDIT	-0.17	0.07	0.33	0.24	0.10	0.39
	(0.12)	(0.12)	(0.21)	(0.22)	(0.45)	(0.62)
GDP	-0.25 **	-0.48 ***	-1.74 ***	-1.44 **	-0.27	-0.54
	(0.11)	(0.17)	(0.71)	(0.66)	(0.24)	(0.92)
OPENNESS	0.19	0.05	0.51	0.21	0.17	0.16
	(0.11)	(0.17)	(0.42)	(0.41)	(0.13)	(0.41)
GCON	-0.01	0.01	0.01	0.02	-0.02	-0.03
	(0.02)	(0.02)	(0.04)	(0.03)	(0.02)	(0.03)
SD-DREER	0.02 ***	0.02 *	0.01	0.01	0.01	0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
SD-DTOT	-0.01	-0.01	-0.01	-0.01	-0.02	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Observations	166.00	166.00	166.00	166.00	152.00	138.00
No. of countries	-	42.00	42.00	42.00	-	38.00
R2	0.19	0.15	0.19	0.15	0.16	0.12
F / Chi2	10.46 ***	33.72 ***	3.68 ***	2.57 **	12.43 ***	439.50 ***
F_u / $Chi2_u$	-	169.30 ***	7.56 ***	7.14 ***	-	6.58 ***
Correlation(Xb, u_i)	-	-	-0.81	-0.70	-	-0.45
Hausman	-	4.53	-	-	-	-
J stat	-	-	-	-	3.64	0.23

Note: robust standard error in parenthesis. * sig. at 10%, ** sig. at 5%, *** sig. at 1%
Pool= pooled estimation, RE = random effects, FE= fixed effects, FEI= fixed effects using initial value data of lturnover, lcredit and lgdp, IV= instrumental variable estimation (instruments: time trend, legal origin, creditor's protection index), IVFE= fixed effects instrumental estimation (instruments: time trend, creditor's protection index, human capital index)

R2 = R^2 or Within-R^2 [squared correlation between $(y_{it} - \overline{y}_i)$ and $(x_{it} - \overline{x}_i).\hat{\beta}$]
F / Chi2 = F or Chi2 statistics for testing sig. of all Xs except constant
F_u / $Chi2_u$ = F or Chi2 statistics for testing sig. of cross-sectional individual effects,
Corr(Xb,u_i)= correlation of predicted valued (Xb) and individual fixed effects (u_i)
Hausman = Hausman Chi2 statistics for testing of no-correlation between u_i and Xs
J stat = J statistics for GMM overeidentifying test

Table 12: Consumption Volatility - using relative measure of capital market development

C-VOL	Pool	RE	FE	FEI	IV	IVFE
STRUC	-0.20 *	-0.16	-0.11	-0.08	-0.21 **	-0.46 **
	(0.11)	(0.10)	(0.08)	(0.07)	(0.11)	(0.19)
CREDIT	-0.18	0.00	0.25	0.19	0.21	0.17
	(0.11)	(0.12)	(0.20)	(0.23)	(0.42)	(0.68)
GDP	-0.20	-0.43 **	-1.61 ***	-1.32 **	-0.41 *	0.04
	(0.14)	(0.19)	(0.61)	(0.68)	-(0.22)	(1.13)
OPENNESS	0.30 ***	0.18	0.57	0.39	0.29 **	0.62
	(0.12)	(0.19)	(0.46)	(0.44)	(0.12)	(0.48)
GCON	-0.01	0.01	0.01	0.02	-0.01	0.02
	(0.02)	(0.02)	(0.04)	(0.03)	(0.02)	(0.04)
SD-DREER	0.03 ***	0.02 **	0.01	0.02 ***	0.03 ***	0.03 **
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
SD-DTOT	-0.02	-0.01	-0.01	-0.01	-0.02	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Observations	166.00	166.00	166.00	161.00	153.00	139.00
No. of countries	-	42.00	42.00	42.00	-	39.00
R2	0.22	0.15	0.19	0.19	0.21	0.00
F / Chi2	11.04 ***	33.75 ***	3.25 ***	3.77 ***	13.93 ***	385.87 ***
F_u / $Chi2_u$	-	157.02 ***	7.09 ***	6.77 ***	-	5.49 ***
Correlation(Xb, u_i)	-	-	-0.77	-0.65	-	-0.32
Hausman	-	6.01	-	-	-	-
J stat	-	-	-	-	5.00 *	0.42

Note: robust standard error in parenthesis. * sig. at 10%, ** sig. at 5%, *** sig. at 1%
Pool= pooled estimation, RE = random effects, FE= fixed effects, FEI= fixed effects using initial value data of lturnover, lcredit and lgdp, IV= instrumental variable estimation (instruments: time trend, legal origin, creditor's protection index), IVFE= fixed effects instrumental estimation (instruments: time trend, creditor's protection index, human capital index)

R2 = R^2 or Within-R^2 [squared correlation between $(y_{it} - \overline{y}_i)$ and $(x_{it} - \overline{x}_i).\hat{\beta}$]
F / Chi2 = F or Chi2 statistics for testing sig. of all Xs except constant
F_u / $Chi2_u$ = F or Chi2 statistics for testing sig. of cross-sectional individual effects,
Corr(Xb,u_i)= correlation of predicted valued (Xb) and individual fixed effects (u_i)
Hausman = Hausman Chi2 statistics for testing of no-correlation between u_i and Xs
J stat = J statistics for GMM overeidentifying test

Appendix A: Variables

Variables	Description	Sources
g-vol	log (sd. of growth rate of gdp per capita)	calculated from World Development Indicator (WDI)
b-vol	log (sd. of business cycle component of gdp per capita)	calculated from WDI
c-vol	log (sd. of household consumption growth rate)	calculated from WDI
i-vol	log (sd. of gross capital formation growth rate)	calculated from WDI
turnover	log (turnover ratio) = log (value of shares traded / GDP)	Beck et al. (2000a)
struc	financial structure- aggregate index	calculated from Beck, et al. (2000a)
credit	log (private credit ratio) = log (private credit / GDP)	WDI
gdp	log (gdp per capita)	WDI
openness	log (openness ratio) = log ([export + import] / GDP)	WDI
gcon	government consumption over gdp ratio	WDI
sd-dreer	sd. of changes in real effective exchange rate	calculated from International Financial Statistics (IFS)
sd-dtot	sd. of changes in terms of trade	calculated from (IFS)

Appendix B: Countries covered (44) classified by Income Level

High Income (24): Australia Belgium Canada Denmark Finland France Germany Greece Iceland Ireland Israel Italy Japan Korea Netherlands New_Zealand Norway Portugal Singapore Spain Sweden Switzerland United_Kingdom United_States

Upper Middle Income (8): Argentina Brazil Chile Malaysia Mexico South_Africa Uruguay Venezuela

Lower Middle Income (7): Columbia Ecuador Indonesia Morocco Philippines Thailand Turkey

Low Income (5): Bangladesh Cote_d'lvoire India Nigeria Pakistan China