

# Stock Market Effects of Emerging Markets

## Financial Liberalization

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### Abstract

We investigate stock market effects of liberalizations in emerging markets financial systems. Liberalization covers two types of policies: increasing the openness of the financial system and relaxing government control on banks. Generally, we find significant evidence that financial openness is positively associated with a decrease in the aggregate cost of equity and an increase of stock market volatility. There is no statistically significant evidence to suggest that banking sector liberalization affects the cost of equity and the stock market volatility. We also find strong evidence that both bank liberalization and financial openness increase the stock return covariance with the world market.

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Key words: financial liberalization cost of equity, volatility, financial integration.

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## **1. Introduction**

Emerging stock markets have been characterized as: having higher expected returns (Stulz 1999, Henry 2000, Bekaert and Harvey 2000), higher volatility (Bekaert and Harvey 1997), a low correlation with developed market returns (Harvey 1995) and a higher degree of predictability as compared to developed financial markets (Harvey 1995 and Claessens et al 1995). In fact, Beim and Calomiris (2001) argue that equity values and therefore expected returns display a binomial nature, since the success of firms in emerging markets is dependent upon the success of economic reforms many countries have been experiencing in recent decades. Among these economic reforms, the effects of financial liberalization on stock markets are particularly important for policy makers endeavouring to develop efficient financial systems and to manage risk.

Financial liberalization usually involves the domestic banking sector (McKinnon 1973; Shaw 1973; Henry 2003), stock market, and national capital account. In this paper, we look at these different aspects and define financial liberalization as removing government repression on the banking system, allowing foreign ownership of equity, and the facilitation and encouragement of international capital flows. In other words, liberalization is about relaxing government control and increasing the openness of the financial system.

Financial liberalization, particularly stock market liberalization that allows foreign equity investment, affects emerging stock markets through a number of channels.

First, the cost of equity decreases. In completely segmented stock market and in the absence of exchange risk, the CAPM of Sharp (1964) and Linter (1965) suggest expected return at country aggregate level is determined by price of risk and volatility. When a market is integrated into the world market after effective liberalization, the expected return at the country aggregate level is determined by the price of risk and covariance of the local market with the world market. Assuming risk aversion does not change, the expected return and therefore the cost of equity should fall with liberalization.

Second, volatility increases in the short term. Markets may become informationally more efficient after liberalization, leading to higher volatility as prices quickly react to relevant information. In addition, hot speculative capital may induce excess volatility. In the long run, the gradual development and diversification of the market should eventually lead to lower volatility.

Third, but not least important, the return covariance with the world (systematic risk in World CAPM) should increase. Prior to financial openness, marginal investors are domestic investors holding domestic portfolios, perhaps not well diversified. Stock markets are segmented and

prices react to domestic information, the covariance of returns with world stock market is usually low. After financial openness, marginal investors (both domestic and foreign) hold global portfolios that are well diversified. Stock markets gradually integrate into the world market, and prices react to world information and events. The covariance of return with world market returns increases.

This paper contributes to the literature in several ways. First, we develop aggregate measures of financial liberalization based on a large number of indicators, relating to the banking system, stock market, and capital flows recorded on national capital accounts. We use the first principal component of selected variables as an index measure. Second, our financial openness measures are continuous variables based on quantitative information. These measures together with other economic data collected allow us to treat financial liberalization and other types of economic reforms (as control variables) in the same way. This contrasts with the use of a dummy variable for liberalization dates in the event study approach. Third, our definition of financial liberalization is more general than the existing literature that focuses only on stock market liberalization. We are able to test both the separate and the combined effects of different forms of financial liberalization. Our procedures include and look beyond what usually involved in the related literature; particularly, the impact of domestic bank liberalization on stock market is a relatively unexplored issue.

Our sample includes 35 major emerging markets from 1976 onwards, see table 1 panel A. Given that there are a large number of missing values and many economic variables involved are only available annually, the number of observations in the empirical tests is fairly limited. Nevertheless, our findings in general are significant and robust.

Generally, we find significant evidence to suggest that financial openness is positively associated with a decrease in the aggregate cost of equity and an increase in the stock market volatility. Consistent with Bekaert and Harvey (2000), we use changes of dividend yield on IFC global index proxy for changes of aggregate cost of equity at country level. We do not find any statistically significant evidence that suggests banking sector liberalization affects the cost of equity and stock market volatility. We also find strong evidence that both bank liberalization and financial openness increase the stock return covariance with the world market. After controlling for economic integrating (trade openness) and other factors, the return covariance reflects the degree of stock market integration. Overall, we find that stock market variables (dividend yield, volatility, and covariance) are more sensitive to changes of financial liberalization measures, when model parameters are estimated using an instrumental variable procedure.

The remainder of the paper is as follows. Section 2 reviews the related literature. Section 3 introduces our measures (indicators) of financial liberalization, and gives a brief description of our aggregate index

measures. Section 4 discusses the empirical models and estimating methods. Section 5 discusses our results in details. Section 6 concludes.

## **2. Literature Review**

Bekaert (1995) defines financial liberalization as the lowering of investment barriers, and argue that economic reforms other than financial liberalization (such as trade liberalization) have effects on equity prices mainly through their effects on cash flows, however financial liberalization affects price levels mainly through discount rates. Directly using stock market correlations as a measure of integration is problematic since stock prices are likely to be affected by all types of economic reforms. In other words, it is important to control for cash flow effects of reforms other than financial liberalization (Dumas, Harvey and Ruiz 2003).

Effective liberalization leads to market integration into the world portfolio. Bekaert and Harvey (1995) suggest that the cost of equity capital should fall when a market moves from a segmented state to integrated state. It is not obvious from finance theory whether volatility should increase or decrease when markets are opened. In the long run, the gradual development and diversification of the market should lead to lower volatility. When stock markets gradually integrate into the world market, prices react to world information. The covariance of returns with world market returns increases. See paper 1 for a detailed discussion.

Using Edison and Warnock (2001) measure of equity market liberalization, De Jong, De Roon (2002) show that the expected returns in 30 emerging markets depend both on the level of segmentation of the emerging market itself and on the regional segmentation level. They also find that there is significant time-variation in the betas relative to the world portfolio because of the level of integration. They do not find a clear pattern between volatility and segmentation.

Bekaert and Harvey (2000) define liberalization dates as official regulatory changes, the introduction of depositary receipts and country funds, and structural breaks in equity capital flows to the emerging markets. They show that the cost of equity capital decreases after capital market liberalization with the effect varying between 5 and 75 basis points. This decrease in the cost of equity is captured by the decrease in dividend yield.

Bekaert, Harvey, Lumsdaine (2002) offer an improved approach that results in market liberalization dates, with confidence intervals, for 20 countries. They find that integration brings about or is accompanied by an equity market that is significantly larger and more liquid than before, and stock returns that are more volatile and more correlated with world market returns than before. Integration is also associated with a lower cost of capital, an improved credit rating, a real exchange rate appreciation, and increased real economic growth.

Kaminsky, Schmukler (2002) construct a new comprehensive chronology of financial liberalization in 28 countries for the period January 1973-June 1999. It captures various aspects of liberalization, namely the deregulation of the capital account, the domestic financial sector, and the stock market. The evidence from emerging markets, with larger booms and crashes in the immediate aftermath of liberalization, provides some support to the findings of the crisis literature of excessive financial cycles following liberalization.

Kim and Singal (2000) provide market opening dates in 20 emerging markets. They find stock returns increase immediately after market opening but fall subsequently. There is no accompanying increase in volatility of stock returns. Jain-Chandra (2002) uses a firm-level panel data set on sixteen liberalizing countries, and the liberalization dates of Kim and Singal (2000). After controlling for size and growth of local market capitalization, liberalization leads to enhanced liquidity.

Typically, in the event study approach, the authors perform panel regressions of dependent variables (for instance, GDP growth rate and cost of capital) on a liberalization dummy and some continuous control variable proxy for other economic reforms. Stock market liberalization is part of a general process that involves substantial macroeconomic reforms such as inflation stabilization and trade liberalization. Henry (2003) argues that the asymmetric treatment (dummy versus continuous

variables) of the economic reforms potentially makes empirical conclusions unreliable.

A few studies also provide firm-level evidence that is consistent with findings using aggregate data. Errunza and Miller (2000) use a sample of 126 firms with ADR issues from 32 countries including both emerging markets and developed markets. They present evidence on the impact of liberalization on the cost of capital. After controlling for the impact of market and other confounding effects, 42.2 % of the reduction in the cost of capital is attributable to the ADR introduction.

Chari and Henry (2001) using firm-level data find that when countries open their stock markets to foreign investors, firms that become eligible for purchase by foreigners are repriced according to the difference in the covariance of their returns with the local and world market. In contrast, the repricing of firms that remain non-investable to foreign investors bears no significant relationship to differences in local and world covariances.

Bae, Chan, Ng (2002) find a positive relation between return volatility and the foreign investability of individual stocks, even after controlling for country, industry, firm size, and turnover. Highly investable emerging market portfolios are subject to more world market exposure than a non-investable portfolio.

### 3. Measures of Financial Liberalization

#### Individual Measures (indicators) of Financial Liberalization

Banking system liberalization is measured by:

1. *Bank liquid reserves to bank assets ratio*: This ratio measures central bank reserve requirement. When pursued with limits, such requirements can benefit banks and the public. The redeposit usually pays no interest, it provides revenue to the government by imposing reserve requirements, therefore reduces the amount of interest-bearing debt the government must issue. Zero-interest reserve requirements thus constitute an implicit tax on banks. Annual data is obtained from the World Bank online database (see appendix B for an introduction to the database).

2. *Private Credit by Deposit Money Banks and Other Financial Institutions to GDP*: This equals claims on the private sector by deposit money banks and other non-bank financial institutions divided by GDP, data is available annually from the financial development and structure database<sup>2</sup>. This measure isolates credit issued to the private sector as opposed to credit issued to governments and public enterprises. Furthermore, it concentrates on credit issued by intermediaries other than the central bank. It is a measure of the intensity of government interference in bank

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<sup>2</sup><http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:20696167~pagePK:64214825~piPK:64214943~theSitePK:469382,00.html>

lending decisions. There are other measures of domestic banking liberalization, such as real interest rate, but detailed data for our sample emerging markets are not available.

Liberalization (openness) of the stock market is measured by:

1. *Market capitalization of IFC Investable index to IFC Global index*; 2. *Number of firms in IFC Investable index to IFC Global index*. Data obtained from Standard & Poor's Emerging Markets Data Base (EMDB). The first foreign investability ratio computed with market capitalization was developed by Edison, Warnock (2001), and is widely used in the stock market liberalization literature as a proxy variable.

Liberalization of capital flows controls (openness) is measured with:

1. *Gross foreign direct investment to GDP*: Gross foreign direct investment is the sum of the absolute values of inflows and outflows of foreign direct investment recorded in the balance of payments financial account. It includes equity capital, reinvestment of earnings, other long-term capital, and short-term capital. The indicator is calculated as a ratio to GDP. Annual data is obtained from World Bank online database.

2. *Gross private capital flows to GDP*: Gross private capital flows are the sum of the absolute values of direct, portfolio, and other investment inflows and outflows recorded in the balance of payments financial

account, excluding changes in the assets and liabilities of monetary authorities and general government. The indicator is calculated as a ratio to GDP in U.S. dollars. Annual data obtained from the World Bank online database.

### Index Measures of Financial Liberalization

Descriptive statistics and pairwise correlations of the individual measures (indicators) are reported in table 1 panel B and C. Similar to previous papers, our index measures of financial liberalization are developed using principal component analysis (PCA). WE use the first principal component as index measure of financial liberalization.

The first principal component index measure of financial liberalization is reported in panel D of table 1. First we conduct PCA and score *FL* as the first principal component of all 6 liberalization indicators. *FL* captures 42% (proportion) of the total variance of 6 indicators. Eigenvectors of the first principal component are also reported, they are the weights on individual standardized measures when scoring the first principal component, and also reflect the sign of correlations to the underlying latent variable *financial liberalization*. The eigenvector of *FL* suggests that the bank reserve ratio is negatively related to financial liberalization, and that all other indicators are positively related to financial liberalization. To increase the number of observations obtained as the first principal component, we then drop capital flows measures, and focus on banking

sector and stock market, this gives *FL2* as our second index measure of financial liberalization. *FL2* captures 48% of total variations of 4 liberalization indicators. We also construct *BL* with 2 banking sector indicators as bank liberalization index, *FO* with 4 openness indicators as financial openness index, and *SMO* with 2 stock market indicators as stock market openness (liberalization) index. These 3 indices capture 72%, 53%, and 75% of total variations of the 3 groups of indicators involved, respectively. First principal component of 2 variables is effectively the average of them after being standardized.

### Other Variables

Other variables used in this study include the following:

*Country Risk*: measured by the natural log value of International Country Risk Guide's (ICRG) country risk composite score. *Trade openness*: measured by import plus export as percentage of GDP, computed based on data from World Bank. *GDP Growth rate and GDP per capita* (real constant 2000 US\$), data are in U.S. dollars obtained from World Bank. *Stock market capitalization to GDP*: is measured by the market capitalization of IFC Global index of S&P EMDB as percentage of GDP, and it is a measure of stock market development. *Inflation*: annual percentage rate of inflation based on GDP deflator.

#### 4. Panel Data Models and Methods

Consistent with Bekaert and Harvey (2000), changes in the average cost of equity in an emerging market are measured with changes of aggregate dividend yield on its IFC global index, after we control for growth of the economy and other factors including trade openness, ICRG country risk ratings, stock market capitalization, and inflation rate. We also include a time trend in the model to control for the spurious effects of trending variables in the model.

The following model is used to test the effects of liberalization on the cost of equity:

$$DY_{it} = \alpha_i + \beta LIB_{it} + \eta Trade_{it} + \nu ICRG_{it} + \phi GDPG_{it} + \lambda SMC_{it} + \omega INF_{i,t} + \delta t + \xi_{it} \quad (4.1).$$

$DY_{it}$  is Dividend yield, monthly average for emerging market we in year t.  $\alpha_i$  captures unobserved country effects, controls for unobserved heterogeneity. It differs between countries and remains fixed over time.  $LIB_{it}$  is index measures of financial liberalization. Control variables here include:  $Trade_{it}$  (Import plus Export as a percentage of GDP),  $ICRG_{it}$  (Natural Logarithms of International Country Risk Guide's (ICRG) country risk composite score),  $GDPG_{it}$  (GDP growth rate),  $SMC_{it}$  (Stock market

capitalization to GDP), and  $INF_{it}$ : Inflation rate<sup>3</sup>. A trend term  $t$  has been introduced to allow for a linear shift of the intercept over time.  $\xi_{it}$  is a disturbance term assumed to satisfy the Gauss–Markov conditions.

We also employ a fixed-effects model for testing liberalization effects on stock market volatility<sup>4</sup> and return covariance with world.

$$SD_{it} = \alpha_i + \beta LIB_{it} + \eta Trade_{it} + \nu ICRG_{it} + \phi GDPG_{it} + \lambda SMC_{it} + \omega INF_{it} + \xi_{it} \quad (4.2)$$

$$COV_{it} = \alpha_i + \beta LIB_{it} + \eta Trade_{it} + \nu PCGDP_{it} + \lambda SMC_{it} + \delta t + \xi_{it} \quad (4.3)$$

Here  $SD_{it}$  is the standard deviation of total returns for emerging market we in US dollars, based on 24 consecutive months data to the end of year  $t$ .  $COV_{it}$  is the covariance of total returns for emerging market we in US dollar with the world portfolio returns, based on 24 consecutive months data to the end of year  $t$ .  $PCGDP_{it}$  is natural logarithms of real per capita GDP.

We first estimate model coefficients using the within-group estimator. Country means are subtracted from the equations to eliminate the fixed

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<sup>3</sup> Inflation rate less than -20% or greater than 200% are replaced with -20% or 200% respectively (16 changes made in total), we then take natural logarithms of 100+Inflation.

<sup>4</sup> Our preliminary tests suggest that volatility does not have a significant trend.

effects. The within-group estimator assumes explanatory variables are correlated with unobserved group effects  $\alpha_i$ , and for this estimator to be unbiased, explanatory variables needs to be uncorrelated with  $\xi_{it}$  in all periods, or strictly exogenous. In particular, it is assumed that  $LIB_{it}$  are strictly exogenous variables.

Endogeneity problems may arise because of measurement error or an omitted variable in the model. We use instrumental variables methods to extract only the variation in the endogenous variable that is uncorrelated with the error term, consistent estimators will be obtained if we have appropriate instruments. This is the Two-Stage Least Squares (2SLS) estimator. The first stage regresses the endogenous variable  $LIB_{it}$  against its instruments and exogenous variables to obtain the fitted values; the second stage uses the fitted values of the endogenous variable (the fitted values are uncorrelated with the error term)  $\hat{LIB}_{it}$  as  $LIB_{it}$  in the models. We use natural logarithms of real per capita GDP ( $PCGDP_{it}$ ) as instrument for  $LIB_{it}$  in the cost of equity and volatility models, and use  $ICRG_{it}$  and  $INF_{it}$  as instruments for  $LIB_{it}$  in the covariance model. Our preliminary tests suggest country risk ratings and inflation have insignificant partial effect on covariance; We thus dropped them in the covariance model and use them as instruments for liberalization. Alternative instruments are difficult to identify for the volatility and covariance models.

## 5. Empirical Results

We will discuss empirical results in this section. All variables in the regression models except time are standardized to have a mean of zero and a standard deviation of one, so that slope coefficients on different explanatory variables are comparable. Effects of financial liberalization on country level aggregate cost of equity are reported in table 2, 3, 4. First principal component index measures of financial liberalization yield expected results. Generally, we find significant evidence suggesting that financial openness is positively associated with a decrease of cost of equity, and no significant evidence that suggests banking sector liberalization or the removal of government repression on banks affects the aggregate cost of equity.

Tables 5, 6, 7 report results regarding stock market volatility (total risk) measured as the standard deviation over 24 months of US dollar returns. Under the static model specification, the results suggest financial liberalization is associated with increased volatility. This suggests stock market liberalization increases volatility in the short term. Again we find no significant evidence to support the hypothesis that domestic bank liberalization affects stock market volatility. We then examine the covariance of the local stock market with a world stock market index. It is the systematic risk in a World CAPM model, based on 24 months returns both in US dollars. After controlling for economic integrating (trade openness) and other factors, the return covariance reflects the degree of

stock market integration [Bekaert (1995); Dumas, Harvey and Ruiz (2003)]. Test results are reported in table 8, 9, and 10. Evidence that financial liberalization increases the covariance with world market is strong and significant using either bank liberalization or financial openness indices.

We shall now discuss these results in more details.

### Cost of Equity

As already stated, the change in the cost of equity is measured by the change of dividend yield. Table 2 reports the within-group estimates of the slope coefficients together with their t-statistics. The dependent variable is dividend yield on IFC global index in US dollars. The financial liberalization we examine in table 2 concerns all aspects of the financial system, including the banking sector, the stock market, and in some cases, capital flows. The first two columns of the table show the results of the fixed effects model which includes a time trend, and in which we assume all explanatory variables are strictly exogenous. P-values associated with group effects tests are all zero, suggesting heterogeneity is highly significant in the sample and pooled OLS model is inappropriate. The first column shows that financial liberalization  $FL$  is negatively related to dividend yield, and significant at 1% level. In other words, the cost of equity decreases with higher level of financial liberalization.

The partial effect can be interpreted as follows: one unit standard deviation increase in the financial liberalization index  $FL$  corresponds to 0.52 standard deviation decrease of dividend yield (and thus the cost of equity). If we exclude the indicators of capital flows liberalization in PCA we have  $FL2$  as the second financial system liberalization measure. Although regression with  $FL2$  yield imply the same negative link between liberalization and dividend yield, the result is no longer significant, with the slope coefficient on  $FL2$  being much smaller. Our later results suggest that the disappearance of significance may be caused by endogeneity in the model.

The final two columns of table 2 report instrumental variable estimates, where real per capita GDP is used as instrument for financial system liberalization indices. We apply two-step least squares estimators approach to deal with potential endogenous problems caused by measurement error of financial liberalization and omitted variables. Within-group estimators are again used to eliminate heterogeneity. The slope coefficient of  $FL$  in column 4 is -0.83, and is highly significant. In column 4, the slope coefficient of index measure  $FL2$  is negative and significant at 5% level. Dividend yield, and therefore the aggregate cost of equity, is very sensitive to changes in the level of financial system liberalization as measured by  $FL2$ . The regressions suggest that when  $FL2$  increases by a unit of its standard deviation aggregate dividend yield will decrease by 1.38 unit of its standard deviation.

The control variables in the model are standard in the literature. GDP growth rate controls for growth effect on aggregate dividend yield, therefore changes of dividend yield largely reflect changes of the cost of equity. Consistent with theory and related work, WE find significant and negative effects of country risk ratings (higher rating means lower risk), stock market capitalization to GDP (measure of stock market development), and inflation on aggregate cost of equity.

The results in Table 3 on banking sector liberalization do not suggest any significant relationships between domestic bank liberalization and the cost of equity. This is in part what is to be expected. Financial openness increases available financial resources and provides diversification benefit for all firms. In contrast, domestic bank liberalization may have different impact on different sectors. Removal of government repression on one hand increases available financing for private sector firms, reduce the cost of borrowing, and since equity is an alternative (not necessarily a major) source of financing, the cost of equity should fall as well. On the other hand, many emerging stock markets have a large public sector, and indeed some emerging markets are dominated by public sector firms that are inefficient and where corporate governance is weak, China is such an example. The removal of government repression on banks reduces directed lending to public sector firms. When these firms turn to a more efficient stock market for equity financing, the cost of equity is higher than under government protection. As a result, the combined effect of bank liberalization on aggregate cost of equity is insignificant.

Table 4 deals with a different form of financial liberalization, that of financial openness. The first 3 columns are based on a within-group fixed-effects model regressions using different measures of financial openness, these are followed by estimates using instrumental variable procedures in the remaining columns. Heterogeneity is highly significant in all model specifications. The first two columns suggest a negative and significant relationship between financial openness and the cost of equity. Yet contrary to expectations, the sensitivity of dividend yield to stock market openness measure *SMO* (-0.18) is less than in the case of the more general index *FO* (-0.44).

We also use a single liberalization indicator *SMIMC*, stock market foreign investability ratio (IFC investable index capitalizations divided by global index). Our results are comparable to related works that involve the same measure of stock market liberalization [De Jong, De Roon (2002); Henry (2000)]. Consistent with existing work, we also find stock market liberalization measured with *SMIMC* is significantly (1%) and negatively related to the cost of equity. Instrumental variable estimators yield more plausible results (columns 4-6). *FO* and *SMO* index measures produce consistent and significant result. The coefficients in the final column regression using liberalization measure *SMIMC* again shows a highly significant and negative relationship between stock market investability and cost of equity.

Control variables in table 4 all have expected signs where they are significant, and it appears that country risk, market capitalization, and inflation are important determinants of cross-country differences in the cost of equity. Trade openness and GDP growth generally have insignificant impact on cost of equity. Generally, the slope coefficients suggest financial liberalization is an important factor that determines differences in the country level aggregate cost of equity.

### Stock Market Volatility

Regression results associated with liberalization effect on volatility are reported in table 5, 6, and 7. In table 5 we look at general measures of financial system liberalization, and then followed by bank liberalization in table 6 and financial openness in table 7. Results in the first 2 columns of table 5 generally suggest financial system liberalization is positively associated with stock market volatility, and this is 1% significant with financial liberalization index *FL*, but insignificant with *FL2*. Volatility is more sensitive to changes in financial system liberalization with the instrumental variable estimators reported in columns 3 and 4. Financial liberalization indices are instrumented by real per capita GDP. The coefficients on *FL* and *FL2* are both positive and significant at 5% level. We would expect that stock market investability ratios to have a strong impact on volatility, and therefore it is also expected that slope of *FL2* (0.70) is greater than of *FL* (0.53), given the different compositions of these indices.

Bank liberalization also appears to have a statistically insignificant impact on stock market volatility as is evidenced in table 6. We next focus on financial openness, and the test results are reported in table 7. The positive relationship between financial openness and volatility is significant and robust to different measures of financial openness. Within-group estimates and the corresponding t-statistics in Columns 1 and 2 of this table suggest that volatility is affected by both the general index measure of financial openness *FO* and the stock market investability index *SMO*. Results in column 3 with *SMIMC* as the financial openness measure is comparable with those of other authors that use the same measure of stock market liberalization [for instance, Bae, Chan, and Ng (2002) who provide firm level evidence]. Under a static model specification, our results suggest that stock market investability has a positive impact on the volatility in the short term. Instrumental variable estimates in columns 4-6 are consistent with the first 3 columns. The coefficients suggest that the stock market volatility increases by approximately 0.48 to 0.64 units of its standard deviations if financial openness increases by one unit of its standard deviation. Both slope coefficients are significant at 5% level.

The signs of the control variables in table 7 are as expected, and their impact on volatility is highly significant with the exception of GDP growth rate. Trade openness, measured as import plus export as a percentage of GDP, has a highly significant positive effect on stock market volatility. A

possible explanation is that emerging countries exports are dominated by labour intensive products or natural resources, and export industries are not well diversified. As a result, trade openness increases a country's exposure to changing demand and prices of the world particularly developed countries. This increases risk of cash flows to export related industries. Volatility therefore increases at the aggregate country level.

Country risk ratings, and particularly political risk ratings, are widely used as special risk measures as substitute for volatility in emerging markets where returns are not normally distributed, since they reflect the fact that emerging stock market performance is related to political condition and success of economic reforms. It also reflects the "downside risk". A higher rating means lower country risk, and apparently this should lead to a higher volatility of stock market returns. The development of stock markets, measured as the capitalization to GDP, is negatively related to volatility. As stock markets get larger and more efficient, firms benefit from diversification and improved risk management, country level total risk decreases.

Inflation is well known as a risk factor, increase of inflation in emerging market especially hyper inflation affects not only cost of capital but also cash flows of firms and therefore the volatility of stock market. The coefficients suggest financial openness to be one of the major determinants of differences in stock market volatility.

### Covariance with World Market

The empirical results in table 8, 9, and 10 strongly suggest liberalization of both banking sector and stock market increase equity return covariance with the world. Table 8 uses financial system liberalization indices *FL* and *FL2*. The within-group estimates of slope coefficient on *FL*, and *FL2* are 1.01, 0.73 respectively, both statistically significant (1%). The next 2 regressions allow financial liberalization indices to be endogenous, and we use ICRG country risk ratings and inflation rate as instruments to estimate parameters of the fixed effects model. Slope coefficient on the most general principal component index measure *FL* is 1.00 and highly significant. This suggests covariance with the world market will increase by the same unit of standard deviation as financial liberalization increases. The number of observations increases when *FL2* is used as financial system liberalization measure. The slope coefficients on liberalization are 2.19, with the expected sign and are highly significant. It is reasonable that the slope of *FL2* is greater than *FL*, since stock market investability ratios are more important elements in the first principal component *FL2*. Overall, table 8 strongly suggests that the covariance with the world market returns increases when financial systems in emerging economies are more liberalized.

To the best of the author's knowledge, table 9 provides some empirical evidence to the issue that has been ignored in the literature. The slope coefficients on bank liberalization in both regressions have the expected

positive sign and are highly significant, although their values differ substantially. The significant slope coefficients on explanatory variables suggest the effect of bank liberalization on the return covariance with the world market is important and substantial. In other words, domestic bank liberalization also promotes stock market integration. It is not obvious why this effect exists. One possible explanation is that the removal of government repression on banks gives a positive sign and adds credibility that the government in an emerging economy is committed to consistent policy changes targeted at integrating its economy into the world. Such types of policy changes encourage cross border equity investment and capital flows, and global information becomes more and more important for equity investors. Another explanation is that bank liberalization is a substitute for other forms of liberalization.

Finally we look at the impact of financial openness on stock return covariances with the world market. The results are reported in table 10. Group effects or heterogeneity are insignificant in two of the six regressions. As in previous tables, the first 3 columns report regressions where financial openness is assumed to be exogenous. The impacts of index measures *FO* and *SMO* on return covariance with the world are both positive and significant. The slope coefficients suggest one standard deviation increase of financial openness corresponds to a 0.50 or 0.80 standard deviation increase in return covariance respectively. The model in column 3 model uses Edison and Warnock (2001) measure of financial liberalization *SMIMC*. Our result is consistent with De Jong and De Roon

(2002) that use the same liberalization measure and the event study approach findings of Bekaert and Harvey (2000), that liberalization increases stock market return covariance with the world. When allowing financial openness indices to be endogenous, we use ICRG country risk ratings and inflation rate as instruments to estimate parameters. Results in columns 4-6 provide robust evidence that is consistent with previous findings.

Trade openness and stock market capitalization to GDP appear to be a consistently significant determinant of stock return covariance with the world in all three tables. The positive signs on trade openness are expected as increased international trade implies cash flows are more sensitive to world information, thus price of stocks. Yet why the signs on stock market capitalization to GDP are negative is not clear. The partial effect suggests larger stock markets (relative to GDP) are less integrated into the world. Perhaps it is true in our sample that larger stock markets have higher foreign investment restrictions or prices react to domestic information. Nevertheless, our results provide robust evidence that financial openness is a major determinant of stock market covariance with the world, and therefore also of financial integration.

## **6. Conclusion**

In this paper we investigate the effects of three forms of financial liberalization on emerging stock market, namely domestic bank, stock

market, and capital flows (recorded on national capital account) liberalization. Our sample includes 35 emerging markets during 1976 to 2002. Developed markets are not included basically because the settings require information on stock market foreign investability that changes significantly over time and emerging markets are ideal for this. Given that many of variables involved are economic variables with only annual observations the number of observations in the regressions is quite small compared to firm level studies. We estimate a group of fixed effects static panel data models with within-group estimators. We also allow financial liberalization to be endogenous and apply instrumental variable procedures. Real per capital GDP, ICRG country risk ratings, and inflation rate are used as instruments for financial liberalization where appropriate.

We conduct principal component analysis on selected groups of indicators and score the first principal component as financial liberalization index. This method of constructing aggregate index measures of financial liberalization allows me to test both the separate and the combined impact of different forms of financial liberalization. Our results suggest that financial openness, defined as stock market and capital flows liberalization in the context of this paper, is associated with a decrease of aggregate country level cost of capital and an increase of stock market volatility. We found no statistically significant evidence suggesting bank liberalization affects cost of equity and volatility of stock markets. It is possible that the removal of government repression on banking system has a different impact on different types of firms, for

example public versus private sector firms. This may make the combined effect on aggregate stock index insignificant. The positive impact on stock market return covariance with the world is strong for both financial openness and domestic bank liberalization. It is unclear why bank liberalization increases covariance with the world, and one possible explanation is equity investors see this as a signal of consistent economic reforms that encourages international diversification.

A common difficulty for empirical research in this area is that given short history of emerging stock markets and annual frequency of data on economic variables, the power of empirical tests is limited<sup>5</sup>. How much confidence one may have with the findings relies on robustness of test results to different approaches and further investigation. Nevertheless, We are still able to conclude some significant findings that are consistent with theory and related work. Hopefully improvements may be made in the future with more frequent economic time series and longer histories of stock market data.

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<sup>5</sup> Our attempt to test stock market effects with dynamic panel data model fail to pick up significance in most cases, due to small sample size. Results are not reported.

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**Table 1: Measures of Financial Liberalization**

Panel A: Sample emerging markets

| List of Sample Emerging Markets |           |             |                    |               |
|---------------------------------|-----------|-------------|--------------------|---------------|
| Argentina                       | Egypt     | Korea, Rep. | Peru               | South Africa  |
| Bahrain                         | Greece    | Malaysia    | Philippines        | Sri Lanka     |
| Brazil                          | Hungary   | Mexico      | Poland             | Taiwan, China |
| Chile                           | India     | Morocco     | Portugal           | Thailand      |
| China                           | Indonesia | Nigeria     | Russian Federation | Turkey        |
| Colombia                        | Israel    | Oman        | Saudi Arabia       | Venezuela     |
| Czech Republic                  | Jordan    | Pakistan    | Slovak Republic    | Zimbabwe      |

Panel B: Summary of financial liberalization measures (indicators)

| Variable | Obs | Mean  | Std. Dev. | Min   | Max  |
|----------|-----|-------|-----------|-------|------|
| br       | 718 | 2.32  | 0.81      | 0.26  | 4.61 |
| pc       | 814 | 4.08  | 0.70      | 2     | 5.69 |
| smimc    | 355 | 65.93 | 29.96     | 3.11  | 100  |
| smin     | 355 | 62.69 | 29.25     | 7.62  | 100  |
| fdi      | 532 | 0.00  | 1.24      | -4.61 | 4.02 |
| pcf      | 557 | 1.86  | 0.93      | -1    | 4.49 |

*br*, natural logarithms of bank reserve ratios; *pc*, natural logarithms of Private Credit by Deposit Money Banks and Other Financial Institutions to GDP; *smimc*, stock market investability ratios, Market capitalization of IFC Investable index to IFC Global index; *smin*, stock market investability ratios, number of firms in IFC Investable index to IFC Global index; *fdi*, natural logarithms of gross foreign direct investment to GDP; *pcf*, natural logarithms of gross private capital flows to GDP.

Panel C: Pairwise correlations of financial liberalization measures

|       | br      | pc      | smimc  | smin   | fdi    | pcf    |
|-------|---------|---------|--------|--------|--------|--------|
| br    | 1.0000  |         |        |        |        |        |
| pc    | -0.4351 | 1.0000  |        |        |        |        |
| smimc | -0.0653 | -0.1644 | 1.0000 |        |        |        |
| smin  | -0.4643 | 0.1590  | 0.4939 | 1.0000 |        |        |
| fdi   | -0.1531 | 0.3053  | 0.3035 | 0.2486 | 1.0000 |        |
| pcf   | -0.0525 | 0.3022  | 0.2076 | 0.2913 | 0.5570 | 1.0000 |

Panel D: Aggregate index measures using principal component analysis

| First Principal Component<br>Index Measures | Proportion | Bank<br>Reserve<br>Ratio | Private<br>Credit | Stock<br>Market<br>Inv.(MC) | Stock<br>Market Inv.<br>(NUM) | Foreign<br>Direct<br>Investment | Private<br>Capital<br>Flows |
|---|------------|--------------------------|-------------------|-----------------------------|-------------------------------|---------------------------------|-----------------------------|
| Financial Liberalization (FL)               | 0.42       | -0.37                    | 0.38              | 0.32                        | 0.47                          | 0.47                            | 0.43                        |
| Financial Liberalization 2 (FL2)            | 0.48       | -0.51                    | 0.43              | 0.38                        | 0.63                          |                                 |                             |
| Bank Liberalization (BL)                    | 0.72       | -0.71                    | 0.71              |                             |                               |                                 |                             |
| Financial Openness (FO)                     | 0.53       |                          |                   | 0.47                        | 0.48                          | 0.53                            | 0.52                        |
| Stock Market Openness (SMO)                 | 0.75       |                          |                   | 0.71                        | 0.71                          |                                 |                             |

In panel D, we report our First Principal Component index measures of financial liberalization scored after conducting PCA with chosen variables. Proportion: the proportion of total variance of the group of variables in PCA. The numbers under individual measures (indicators) are eigenvectors of the first principal component, and are basically the weights on each standardized variable when scoring the first principal component.

**Table 2: Effects of Financial Liberalization on Cost of Equity<sup>6</sup>**

| Dep. Var.- Dividend Yield<br>Liberalization Index measures | Fixed-effects (WG)           |                           | Fixed-effects IV                                       |                             |
|--|------------------------------|---------------------------|--|-----------------------------|
|  | FL                           | FL2                       | FL   | FL2                         |
| Financial System Liberalization                            | <b>-0.5163***</b><br>(-4.10) | <b>-0.0778</b><br>(-0.88) | <b>-0.8311***</b><br>(-2.85)                           | <b>-1.3828**</b><br>(-2.13) |
| Trade  | -0.1009<br>(-1.16)           | 0.0542<br>(0.73)          | -0.1648<br>(-1.60)                                     | -0.0021<br>(-0.02)          |
| ICRG (Country Risk)  | -0.4616***<br>(-4.93)        | -0.1338*<br>(-1.85)       | -0.5463***<br>(-4.60)                                  | -0.1879*<br>(-1.73)         |
| GDP Growth   | 0.0169<br>(0.30)             | -0.0577<br>(-1.16)        | 0.0096<br>(0.17)                                       | -0.2092**<br>(-2.02)        |
| Stock Market Cap. To GDP                                   | -0.5796***<br>(-4.49)        | -0.8049***<br>(-7.52)     | -0.4431***<br>(-2.55)                                  | -0.2692<br>(-0.89)          |
| Inflation  | -0.3253***<br>(-7.02)        | -0.2690***<br>(-6.69)     | -0.3756***<br>(-5.95)                                  | -0.4420***<br>(-4.31)       |
| t (Year 1,2,3,...)   | 0.0938***<br>(5.31)          | 0.0274**<br>(2.15)        | 0.1207***<br>(4.20)                                    | 0.0856***<br>(2.53)         |
| No. of Obs.  | 176                          | 219                       | 176  | 219                         |
| No. of Groups  | 12                           | 15                        | 12   | 15                          |
| P-value, group effects F test                              | 0.000                        | 0.000                     | 0.000  | 0.000                       |
| Instrumented<br>Instruments                                |                              |                           | Financial System Liberalization<br>Real Per Capita GDP |                             |

Fixed-effects panel data model:

$$DY_{it} = \alpha_i + \beta LIB_{it} + \eta Trade_{it} + \nu ICRG_{it} + \phi GDPG_{it} + \lambda SMC_{it} + \omega INF_{it} + \delta t + \xi_{it} \quad (4.1)$$

$DY_{it}$  is Dividend yield, monthly average for emerging market we in year t;  $\alpha_i$  captures unobserved country effects.;  $LIB_{it}$  here is the index measures of financial system liberalization ( $FL$  in column 1 and 3,  $FL2$  in column 2 and 4);  $Trade_{it}$  is Import plus Export as a percentage of GDP;  $ICRG_{it}$  is Natural Logarithms of ICRG country risk composite score;  $GDPG_{it}$  is GDP growth rate,  $SMC_{it}$  is Stock market capitalization to GDP;  $INF_{it}$  : Inflation rate<sup>7</sup>. A trend term  $t$  has been introduced to allow for a shift of the intercept over time.  $\xi_{it}$  is a disturbance term assumed to satisfy the Gauss–Markov conditions.

<sup>6</sup> \*\*\* indicate 1% significant, \*\* indicate 5% significant, \* indicate 10% significant. The numbers in brackets are t-statistics.

<sup>7</sup> Inflation rate less than -20 or greater than 200 is replaced with -20 or 200 respectively (16 changes made in total), we then take natural logarithms of 100+Inflation.

| <b>Table 3: Effects of Banking System Liberalization on Cost of Equity</b> |                                  |                                |
|--|----------------------------------|--------------------------------|
| Dep. Var.- Dividend Yield  | Fixed-effects (WG)               | Fixed-effects IV               |
| Bank Liberalization (BL)   | <b>-0.0474</b><br><b>(-0.60)</b> | <b>0.8179</b><br><b>(0.77)</b> |
| Trade  | 0.2040**<br>(2.36)               | -0.0367<br>(-0.12)             |
| ICRG (Country Risk)  | 0.1307<br>(1.58)                 | 0.1868<br>(1.55)               |
| GDP Growth   | -0.0912*<br>(-1.66)              | 0.1032<br>(0.42)               |
| Stock Market Cap. To GDP   | -1.2092***<br>(-10.10)           | -1.7141***<br>(-2.69)          |
| Inflation  | -0.3967***<br>(-8.27)            | -0.1664<br>(-0.58)             |
| t (Year 1,2,3,...)   | -0.0039<br>(-0.30)               | 0.0409<br>(0.71)               |
| No. of Obs.  | 313                              | 313                            |
| No. of Groups  | 16                               | 16                             |
| P-value, group effects F test  | 0.000                            | 0.000                          |
| Instrumented   |                                  | Bank Liberalization            |
| Instruments  |                                  | Real Per Capita GDP            |

Fixed-effects panel data model:

$$DY_{it} = \alpha_i + \beta LIB_{it} + \eta Trade_{it} + \nu ICRG_{it} + \phi GDPG_{it} + \lambda SMC_{it} + \omega INF_{i,t} + \delta t + \xi_{it} \quad (4.1)$$

$LIB_{it}$  in this table is the index measure of bank liberalization  $BL$ , the first principal component of bank reserve ratio and private credit.

| <b>Table 4: Effects of Capital Market Liberalization on Cost of Equity</b> |                              |                              |                              |                               |                             |                              |
|--|------------------------------|------------------------------|------------------------------|-------------------------------|-----------------------------|------------------------------|
| Dep. Var.- Dividend Yield<br>Liberalization Index measures                 | Fixed-effects (WG)           |                              |                              | Fixed-effects IV              |                             |                              |
|  | FO                           | SMO                          | SMIMC                        | FO                            | SMO                         | SMIMC                        |
| Capital Market Liberalization  | <b>-0.4415***</b><br>(-4.38) | <b>-0.1828***</b><br>(-2.67) | <b>-0.2427***</b><br>(-4.07) | <b>-0.9458***</b><br>(-2.72)  | <b>-1.0216**</b><br>(-2.36) | <b>-0.5798***</b><br>(-2.97) |
| Trade  | -0.1341<br>(-1.52)           | 0.0092<br>(0.12)             | 0.0023<br>(0.03)             | -0.2919**<br>(-2.08)          | -0.2127<br>(-1.41)          | -0.0746<br>(-0.84)           |
| ICRG (Country Risk)  | -0.4291***<br>(-4.76)        | -0.1461**<br>(-2.04)         | -0.1576**<br>(-2.25)         | -0.5507***<br>(-4.39)         | -0.2174**<br>(-2.14)        | -0.1953***<br>(-2.50)        |
| GDP Growth   | 0.0502<br>(0.91)             | -0.0522<br>(-1.09)           | -0.0640<br>(-1.36)           | 0.0745<br>(1.21)              | -0.0686<br>(-1.07)          | -0.0854*<br>(-1.64)          |
| Stock Market Cap. To GDP   | -0.6349***<br>(-5.19)        | -0.7859***<br>(-7.79)        | -0.8737***<br>(-8.98)        | -0.4424**<br>(-2.42)          | -0.5521***<br>(-3.09)       | -0.9248***<br>(-8.52)        |
| Inflation  | -0.3165***<br>(-7.07)        | -0.2829<br>(-7.29)           | -0.2942***<br>(-7.74)        | -0.4007***<br>(-5.47)         | -0.3943***<br>(-5.17)       | -0.3435***<br>(-7.00)        |
| t (Year 1,2,3,...)   | 0.1002***<br>(5.54)          | 0.0410***<br>(3.04)          | 0.0538***<br>(3.91)          | 0.1579***<br>(3.71)           | 0.1194***<br>(2.75)         | -0.0952***<br>(3.52)         |
| No. of Obs.  | 176                          | 219                          | 219                          | 176                           | 219                         | 219                          |
| No. of Groups  | 12                           | 15                           | 15                           | 12                            | 15                          | 15                           |
| P-value, group effects F test  | 0.000                        | 0.000                        | 0.000                        | 0.000                         | 0.000                       | 0.000                        |
| Instrumented   |                              |                              |                              | Capital Market Liberalization |                             |                              |
| Instruments  |                              |                              |                              | Real Per Capita GDP           |                             |                              |

Fixed-effects panel data model:  $DY_{it} = \alpha_i + \beta LIB_{it} + \eta Trade_{it} + \nu ICRG_{it} + \phi GDPG_{it} + \lambda SMC_{it} + \omega INF_{it} + \delta t + \xi_{it}$  (4.1).  $LIB_{it}$  in column 1 and 4 is financial openness  $FO$ , in column 2 and 5 is stock market openness  $SMO$ , in column 3 and 6 is stock market investability ratio  $SMIMC$ .

**Table 5: Effects of Financial Liberalization on Volatility**

| Dep. Var.- Standard Deviation<br>Liberalization Index measures | Fixed-effects (WG)                |                                | Fixed-effects IV                                       |                                  |
|--|-----------------------------------|--------------------------------|--|----------------------------------|
|  | FL                                | FL2                            | FL   | FL2                              |
| Financial System Liberalization                                | <b>0.4387***</b><br><b>(3.00)</b> | <b>0.1953</b><br><b>(1.53)</b> | <b>0.5273**</b><br><b>(2.16)</b>                       | <b>0.7010**</b><br><b>(2.07)</b> |
| Trade  | 1.1292***<br>(4.76)               | 0.8552***<br>(5.18)            | 1.1329***<br>(4.76)                                    | 0.7946***<br>(4.42)              |
| ICRG (Country Risk)  | -0.3137**<br>(-2.23)              | -0.2951**<br>(-2.57)           | -0.3160**<br>(-2.24)                                   | -0.3605***<br>(-2.80)            |
| GDP Growth   | 0.0909<br>(1.04)                  | -0.0427<br>(-0.66)             | 0.1143<br>(1.13)                                       | 0.0415<br>(0.48)                 |
| Stock Market Cap. To GDP                                       | -0.4064**<br>(-2.00)              | -0.2436<br>(-1.62)             | -0.4567**<br>(-1.97)                                   | -0.4830**<br>(-2.23)             |
| Inflation  | 0.5376***<br>(8.23)               | 0.4613***<br>(8.71)            | 0.5602***<br>(6.81)                                    | 0.5418***<br>(7.23)              |
| No. of Obs.  | 104                               | 131                            | 104  | 131                              |
| No. of Groups  | 7                                 | 9                              | 7  | 9                                |
| P-value, group effects F test                                  | 0.000                             | 0.000                          | 0.000  | 0.000                            |
| Instrumented<br>Instruments                                    |                                   |                                | Financial System Liberalization<br>Real Per Capita GDP |                                  |

Fixed-effects panel data model:

$$SD_{it} = \alpha_i + \beta LIB_{it} + \eta Trade_{it} + \nu ICRG_{it} + \phi GDPG_{it} + \lambda SMC_{it} + \omega INF_{it} + \xi_{it} \quad (4.2)$$

$SD_{it}$  is standard deviation of total returns for emerging market we in US dollar, calculated with 24 consecutive months data to the end of year t.  $\alpha_i$  captures unobserved country effects.;  $LIB_{it}$  here is the index measures of financial system liberalization ( $FL$  in column 1 and 3,  $FL2$  in column 2 and 4);  $Trade_{it}$  is Import plus Export as a percentage of GDP;  $ICRG_{it}$  is Natural Logarithms of ICRG country risk composite score;  $GDPG_{it}$  is GDP growth rate,  $SMC_{it}$  is Stock market capitalization to GDP;  $INF_{it}$ : Inflation rate<sup>8</sup>.  $\xi_{it}$  is a disturbance term assumed to satisfy the Gauss–Markov conditions.

<sup>8</sup> Inflation rate less than -20 or greater than 200 is replaced with -20 or 200 respectively (16 changes made in total), we then take natural logarithms of 100+Inflation.

| <b>Table 6: Effects of Banking System Liberalization on Volatility</b> |                                  |                                  |
|--|----------------------------------|----------------------------------|
| Dep. Var.- Standard Deviation  | Fixed-effects (WG)               | Fixed-effects IV                 |
| Bank Liberalization  | <b>-0.0567</b><br><b>(-0.47)</b> | <b>-7.1881</b><br><b>(-0.90)</b> |
| Trade  | 0.5423***<br>(3.51)              | 3.6404<br>(1.03)                 |
| ICRG (Country Risk)  | -0.0847<br>(-0.87)               | -0.2285<br>(-0.46)               |
| GDP Growth   | -0.1091*<br>(-1.88)              | -0.8963<br>(-0.98)               |
| Stock Market Cap. To GDP   | 0.0630<br>(0.55)                 | 1.0127<br>(0.85)                 |
| Inflation  | 0.4321***<br>(8.71)              | -0.8273<br>(-0.58)               |
| No. of Obs.  | 179                              | 179                              |
| No. of Groups  | 9                                | 9                                |
| P-value, group effects F test  | 0.000                            | 0.642                            |
| Instrumented   |                                  | Bank Liberalization              |
| Instruments  |                                  | Real Per Capita GDP              |

Fixed-effects panel data model:

$$SD_{it} = \alpha_i + \beta LIB_{it} + \eta Trade_{it} + \nu ICRG_{it} + \phi GDPG_{it} + \lambda SMC_{it} + \omega INF_{it} + \xi_{it} \quad (4.2)$$

$LIB_{it}$  in this table is the index measure of bank liberalization  $BL$ , the first principal component of bank reserve ratio and private credit.

| <b>Table 7: Effects of Capital Market Liberalization on Volatility</b> |                            |                            |                            |                               |                           |                           |
|--|----------------------------|----------------------------|----------------------------|-------------------------------|---------------------------|---------------------------|
| Dep. Var.- Standard Deviation<br>Liberalization Index measures         | Fixed-effects (WG)         |                            |                            | Fixed-effects IV              |                           |                           |
|  | FO                         | SMO                        | SMIMC                      | FO                            | SMO                       | SMIMC                     |
| Capital Market Liberalization  | <b>0.4657***</b><br>(4.11) | <b>0.2375***</b><br>(2.82) | <b>0.3027***</b><br>(4.35) | <b>0.4799**</b><br>(2.25)     | <b>0.6420**</b><br>(2.06) | <b>0.4237**</b><br>(2.33) |
| Trade  | 1.2167***<br>(5.29)        | 0.8491***<br>(5.28)        | 0.7517***<br>(4.80)        | 1.2199***<br>(5.23)           | 0.7989***<br>(4.44)       | 0.7010***<br>(4.04)       |
| ICRG (Country Risk)  | -0.3329**<br>(-2.46)       | -0.2977***<br>(-2.67)      | -0.3085***<br>(-2.89)      | -0.3338***<br>(-2.46)         | -0.3452***<br>(-2.72)     | -0.3240***<br>(-2.94)     |
| GDP Growth   | 0.1138<br>(1.38)           | -0.0369<br>(-0.60)         | 0.0064<br>(0.11)           | 0.1180<br>(1.20)              | 0.0284<br>(0.34)          | 0.0390<br>(0.51)          |
| Stock Market Cap. To GDP   | -0.4621**<br>(-2.40)       | -0.3002**<br>(-2.08)       | -0.2381*<br>(-1.83)        | -0.4713**<br>(-2.08)          | -0.5541**<br>(-2.27)      | -0.2728**<br>(-1.94)      |
| Inflation  | 0.5705***<br>(9.13)        | 0.4782***<br>(9.42)        | 0.5053***<br>(10.32)       | 0.5749***<br>(6.83)           | 0.5598***<br>(6.85)       | 0.5353***<br>(8.26)       |
| No. of Obs.  | 104                        | 131                        | 131                        | 104                           | 131                       | 131                       |
| No. of Groups  | 7                          | 9                          | 9                          | 7                             | 9                         | 9                         |
| P-value, group effects F test  | 0.000                      | 0.000                      | 0.000                      | 0.000                         | 0.000                     | 0.000                     |
| Instrumented   |                            |                            |                            | Capital Market Liberalization |                           |                           |
| Instruments  |                            |                            |                            | Real Per Capita GDP           |                           |                           |

Fixed-effects panel data model:  $SD_{it} = \alpha_i + \beta LIB_{it} + \eta Trade_{it} + \nu ICRG_{it} + \phi GDPG_{it} + \lambda SMC_{it} + \omega INF_{it} + \xi_{it}$  (4.2).  $LIB_{it}$  in column 1 and 4 is financial openness  $FO$ , in column 2 and 5 is stock market openness  $SMO$ , in column 3 and 6 is stock market investability ratio  $SMIMC$ .

**Table 8: Effects of Financial Liberalization on Covariance with World Market**

| Dep. Var.- Cov. with World<br>Liberalization Index measures | Fixed-effects (WG)                |                                  | Fixed-effects IV  |                                   |
|---|-----------------------------------|----------------------------------|---|-----------------------------------|
|   | FL                                | FL2                              | FL  | FL2                               |
| Financial System Liberalization                             | <b>1.0117***</b><br><b>(4.20)</b> | <b>0.7257**</b><br><b>(2.33)</b> | <b>1.0000***</b><br><b>(2.73)</b>                         | <b>2.1851***</b><br><b>(2.48)</b> |
| Trade   | 1.4492***<br>(4.27)               | 1.0994**<br>(2.20)               | 1.4422***<br>(3.83)                                       | 1.1769**<br>(2.43)                |
| Real Per Capita GDP   | -1.3474*<br>(-1.69)               | 0.6495<br>(0.29)                 | -1.3469*<br>(-1.68)                                       | -1.2356<br>(-1.08)                |
| Stock Market Cap. To GDP                                    | -0.5645***<br>(-2.62)             | -0.8471**<br>(-2.17)             | -0.5656***<br>(-2.60)                                     | -1.2421***<br>(-3.78)             |
| t (Year 1,2,3,...)  | 0.0539<br>(1.05)                  | 0.1289*<br>(1.94)                | 0.0558<br>(0.82)  | 0.0005<br>(0.01)                  |
| No. of Obs.   | 104                               | 122                              | 104   | 131                               |
| No. of Groups   | 7                                 | 9                                | 7   | 9                                 |
| P-value, group effects F test                               | 0.000                             | 0.310                            | 0.000   | 0.000                             |
| Instrumented<br>Instruments                                 |                                   |                                  | Financial System Liberalization<br>County Risk, Inflation |                                   |

Fixed-effects panel data model:

$$COV_{it} = \alpha_i + \beta LIB_{it} + \eta Trade_{it} + \nu PCGDP_{it} + \lambda SMC_{it} + \delta t + \xi_{it} \quad (4.3)$$

$COV_{it}$  is covariance of total returns for emerging market we in US dollar with the world portfolio returns, calculated with 24 consecutive months data to the end of year t.  $\alpha_i$  captures unobserved country effects.;  $LIB_{it}$  here is the index measures of financial system liberalization ( $FL$  in column 1 and 3,  $FL2$  in column 2 and 4);  $Trade_{it}$  is Import plus Export as a percentage of GDP;  $PCGDP_{it}$  is natural logarithms of real per capita GDP.  $SMC_{it}$  is Stock market capitalization to GDP; A trend term  $t$  has been introduced to allow for a shift of the intercept over time.  $\xi_{it}$  is a disturbance term assumed to satisfy the Gauss–Markov conditions.

**Table 9: Effects of Banking System Liberalization on Covariance with World Market**

| Dep. Var.- Cov. with World    | Fixed-effects (WG)         | Fixed-effects IV           |
|-------------------------------|----------------------------|----------------------------|
| Bank Liberalization (BL)      | <b>0.3231***</b><br>(2.96) | <b>1.5014***</b><br>(3.98) |
| Trade                         | 0.5593***<br>(3.13)        | -0.0720<br>(-0.28)         |
| Real Per Capita GDP           | 0.5556*<br>(1.72)          | 0.9409**<br>(2.02)         |
| Stock Market Cap. To GDP      | -0.3325**<br>(-2.14)       | -1.0032***<br>(-5.05)      |
| t (Year 1,2,3,...)            | 0.0712***<br>(4.85)        | 0.1247***<br>(5.09)        |
| No. of Obs.                   | 213                        | 179                        |
| No. of Groups                 | 9                          | 9                          |
| P-value, group effects F test | 0.000                      | 0.000                      |
| Instrumented                  |                            | Bank Liberalization        |
| Instruments                   |                            | County Risk, Inflation     |

Fixed-effects panel data model:

$$COV_{it} = \alpha_i + \beta LIB_{it} + \eta Trade_{it} + \nu PCGDP_{it} + \lambda SMC_{it} + \delta t + \xi_{it} \quad (4.3)$$

$LIB_{it}$  in this table is the index measure of bank liberalization  $BL$ , the first principal component of bank reserve ratio and private credit.

| <b>Table 10: Effects of Capital Market Liberalization on Covariance with World Market</b> |                           |                            |                            |                               |                          |                           |
|---|---------------------------|----------------------------|----------------------------|-------------------------------|--------------------------|---------------------------|
| Dep. Var.- Cov. with World Liberalization Index measures                                  | Fixed-effects (WG)        |                            |                            | Fixed-effects IV              |                          |                           |
|   | FO                        | SMO                        | SMIMC                      | FO                            | SMO                      | SMIMC                     |
| Capital Market Liberalization   | <b>0.5037**</b><br>(2.25) | <b>0.7961***</b><br>(2.74) | <b>0.6462***</b><br>(2.66) | <b>0.9837***</b><br>(2.55)    | <b>2.3826*</b><br>(1.43) | <b>2.0005**</b><br>(1.96) |
| Trade   | 1.3250***<br>(3.41)       | 1.1022**<br>(2.19)         | 1.0023**<br>(1.99)         | 1.7727***<br>(3.60)           | 1.8672*<br>(1.85)        | 1.4135**<br>(2.04)        |
| Real Per Capita GDP   | -1.1181<br>(-1.31)        | 1.2416<br>(0.56)           | 2.1074<br>(1.00)           | -0.9351<br>(-1.06)            | 0.5535<br>(0.39)         | -0.4644<br>(-0.35)        |
| Stock Market Cap. To GDP  | -0.5834***<br>(-2.53)     | -0.9860**<br>(-2.42)       | -0.7244*<br>(-1.84)        | -0.5080**<br>(-2.11)          | -0.9685**<br>(-2.44)     | 0.1464<br>(0.24)          |
| t (Year 1,2,3,...)  | 0.1092**<br>(1.83)        | 0.0960<br>(1.34)           | 0.0779<br>(1.07)           | 0.0076<br>(0.09)              | -0.1881<br>(-0.80)       | -0.1966<br>(-0.96)        |
| No. of Obs.   | 104                       | 122                        | 122                        | 104                           | 131                      | 131                       |
| No. of Groups   | 7                         | 9                          | 9                          | 7                             | 9                        | 9                         |
| P-value, group effects F test   | 0.000                     | 0.345                      | 0.129                      | 0.000                         | 0.001                    | 0.000                     |
| Instrumented  |                           |                            |                            | Capital Market Liberalization |                          |                           |
| Instruments   |                           |                            |                            | County Risk, Inflation        |                          |                           |

Fixed-effects panel data model:  $COV_{it} = \alpha_i + \beta LIB_{it} + \eta Trade_{it} + \nu PCGDP_{it} + \lambda SMC_{it} + \delta t + \xi_{it}$  (4.3).  $LIB_{it}$  in column 1 and 4 is financial openness  $FO$ , in column 2 and 5 is stock market openness  $SMO$ , in column 3 and 6 is stock market investability ratio  $SMIMC$ .