# The Impact of Creditor Protection on Stock Prices in the Presence of Credit Crunches

**by**

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**A Tobin q model of investment is used to show that stronger creditor protection increases the expected level, and lowers the variance, of stock prices, in the presence of credit crunches. There are two main channels through which creditor protection enhances the performance of the stock market: (1) The credit-constrained stock price increases with better protection of creditors; (2) The probability of a credit crunch leading to a binding credit constraint falls, with strong protection of creditors.**

**The paper tests the predictions of the model by using cross--country panel regressions of stock market**

**returns, in 40 countries, over the period from 1984 to 2004, at an annual frequency.**

**Estimated probabilities of aggregate liquidity shocks are used to forecast credit crunches. We find broad empirical support for the prediction of the model that creditor protection increases the expected level of the stock market price level, and reduces its volatility, both directly, and indirectly by lowering the probability of credit crunches.**

# Credit risk diverges across Euro-zone

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It is difficult to set one interest rate for 15 countries with economies that are diverging in terms of growth, public finances and credit worthiness.Consensus forecasts estimate that Italian growth this year will be 0.4 per cent compared with 2.2 per cent in Germany. Spain and Ireland are also more exposed to the threat of recession because of the collapse in property prices, while Greece and Portugal have large current account deficits.Investor fears for the credit risk of eurozone countries with weaker economies has increased sharply this month. Since June 5, 2008, when Jean-Claude Trichet, European Central Bank president, stepped up warnings on inflation, the cost to insure German debt against default has risen by €1,000 to €6,000 for €10m of debt. In contrast, the cost to insure Greek debt has risen €16,000 to €51,000. It has risen €15,000 for Italy, €14,000 for Portugal, €13,000 for Spain and €10,000 for Ireland.

German and French CDS prices have been relatively steady on views that the Eurozone's two biggest economies will hold up better in a tougher climate. CDS prices for the UK, which is outside the Eurozone, have been steady in spite of fears for the country's housing market. Greek, Italian, Spanish, Portuguese and Irish 10-year bond yields have also widened sharply against Germany in the past month.

# Recent events: link between liquidity and stock prices

Brunnermeier & Pedersen (2008) documented this link systematically

# Institutions shown to be important for financial markets



## Related literature

- ✔ La Porta et al. (1997), Levine (2004), Djankov et al. (2006): countries with poor creditor protection have smaller debt markets
- ✔ Burger & Warnock (2006): countries with strong creditor rights have more developed local bond markets and rely less on foreign–currency bonds
- ✔ Galindo & Micco (2005): strong creditor rights can reduce the volatility of the credit market (we agree)
- ✔ La Porta et al. (2000), Bae & Goyal (2003): creditor protection lowers borrowing costs and increases firm value
- ✔ Claessens et al. (2001): creditor protection reduces cash–flow risk, operating income variability, and leverage

Little study of the effects on stock prices

▷ Morck et al. (2000) find that stock prices are more likely to co–move in poor economies

# Stock indexes are correlated with creditor protection



## EMPIRICAL OBSERVATION

- ✔ An improvement in creditor protection from low to high in a developing country would increase a level of the stock market index by 1.5 standard deviations
- ✔ The same change for a developed country would not have much of an effect

This is consistent with Mendoza (2006)

- ✔ An improvement in creditor protection from low to high in a developing country would lower stock return volatility by 0.8 of the standard deviation
- ✔ The same change for a developed country would lower the stock return volatility by a quarter of the standard deviation

# Model

# 1 A Tobin q Model of Stock Prices

## 1.1 I. The Friction-Free Regime

$$Y_t = A_t K_t^{1-\rho}, \tag{1}$$

$$\ln(A_{t+1}) = \gamma \ln(A_t) + \varepsilon_{t+1}, \tag{2}$$

.

$$Z_t = I_t \left(1 + \frac{1}{2}\frac{1}{v}\frac{I_t}{K_t}\right), \tag{3}$$

$$L_t = E_t \left[\Sigma_{s=1}^{\infty} \frac{1}{(1+r)^s} \left(A_t K_{t+s}^{1-\rho} - Z_{t+s} + Q_{t+s}\left(K_{t+s} + I_{t+s} - K_{t+s+1}\right)\right)\right]. \tag{4}$$

$$Q_t = \frac{1}{1+r}\left(E_t\left[R_{t+1}\right] + \frac{1}{2}\frac{1}{v}\left(\frac{I_{t+1}}{K_{t+1}}\right)^2 + E_t\left[Q_{t+1}\right]\right), \tag{5}$$

$$\mathbf{R}_{t+1} = (1-\rho)\,\mathbf{A}_{t+1}\mathbf{K}_{t+1}^{-\rho}. \tag{6}$$

$$P_t = \frac{\tilde{L}_t}{K_{t+1}} \tag{7}$$

$$\bar{\mathbf{A}} = \mathbf{1},\ \bar{\mathbf{K}} = \left(\frac{1-\rho}{r}\right)^{1/\rho},\ \text{and}\ \bar{\mathbf{Q}} = \bar{\mathbf{P}} = \mathbf{1}. \tag{8}$$

$$P_t = Q_t = \frac{(1-\rho)\left(1+\rho\ln\bar{K}+\gamma a_t+\rho\left(v-k_t\right)\right)\bar{K}+E_t\left[Q_{t+1}\right]}{\left(1+r+v\rho\left(1-\rho\right)\bar{K}\right)}\ , \tag{9}$$

$$\mathbf{P}_t = \mathbf{B}_0 + \mathbf{B}_1\mathbf{a}_t + \mathbf{B}_2\mathbf{k}_t. \tag{10}$$

$$\begin{aligned} B_0 &= \frac{(1-\rho)\left(1+v\rho+\rho\ln\bar{K}\right)\bar{K}-vB_2}{r+v\rho(1-\rho)\bar{K}-vB_2} \\ B_1 &= \frac{\gamma(1-\rho)\bar{K}}{1+r-\gamma-vB_2+v(1-\rho)\rho\bar{K}} \\ B_2 &= \frac{\left(Kv\rho-Kv\rho^2+r\right)-\sqrt{\left(Kv\rho-Kv\rho^2+r\right)^2+4v(K\rho-K\rho^2)}}{2v} \end{aligned} \tag{11}$$

$$\mathbf{I}_{t0} = \mathbf{v}\mathbf{K}_t\left(B_0+B_1a_t+B_2k_t-1\right). \tag{12}$$

## 1.2 The Credit-Constrained Regime

$$\mathbf{I}_s = \boldsymbol{\omega}\mathbf{K}_s - \mathbf{W}_s \text{ for all } \mathbf{s} \geq \mathbf{t}. \tag{13}$$

### 1.2.1 Derivation of the credit-constrained stock price

$$\hat{L}_t = \max E_t \left[ \Sigma_{s=1}^{\infty} \frac{1}{(1+r)^s} \left( A_{t+s} K_{t+s}^{1-\rho} - Z_{t+s} \right) \right]. \tag{14}$$

$$\begin{aligned} P_t &= \frac{\hat{L}_t}{K_{t+1}} \\ &= \frac{1}{1+r} E_t \left( A_{t+1} K_{t+1}^{-\rho} - \frac{Z_{t+1}}{K_{t+1}} + \frac{K_{t+2}}{(1+r) K_{t+1}} P_{t+1} \right). \end{aligned} \tag{15}$$

$$\mathbf{K}_{t+s+1} = (1+\omega) \mathbf{K}_{t+s} + \mathbf{W}_t, \text{ for all } \mathbf{s} = \mathbf{0}, \mathbf{1}, \mathbf{2}, ... \tag{16}$$

$$\hat{P}_t = \frac{1}{1+r} E_t \left( \bar{K} \left( 1 + \rho \ln \left( \bar{K} \right) + a_{t+1} - \rho k_{t+1} \right) - \omega \left( 1 + \frac{\omega}{2v} \right) + \frac{1+\omega}{1+r} \hat{P}_{t+1} \right). \tag{17}$$

$$\hat{P}_t = C_0 + C_1 a_t + C_2 k_t. \tag{18}$$

$$\begin{array}{c} \mathbf{C}_0 = \frac{(1+r)\left( \bar{K}\left( \rho \ln \bar{K} - \rho \ln(\omega+1) + 1 \right) - \omega \left( \frac{1}{2v}\omega + 1 \right) - \bar{K}\rho(\ln(\omega+1)) \frac{\omega+1}{r^2+2r-\omega} \right)}{r^2+2r-\omega} \\ \mathbf{C}_1 = \frac{\gamma(1+r)\bar{K}}{1-\gamma-\gamma\omega+2r+r^2} \\ \mathbf{C}_2 = -\frac{\rho(1+r)\bar{K}}{r^2+2r-\omega}. \end{array} \tag{19}$$

## 1.3 The Effect of Liquidity Crises on the Stock Price

$$\mathbf{E}\left[ P_t; a_t, k_t, \omega \right] = \Pr\left( U_t = 0 \right) \mathbf{P}_{t,unconstrained} + \Pr\left( U_t = 1 \right) \ \mathbf{P}_{t,constrained} \tag{20}$$

$$\Pr\left( U_t = 1 \right) = \Pr\left( I_{t0} > \omega K_t - W_t \right). \tag{21}$$

$$\frac{\partial E\left[P_t; a_t, k_t, \omega\right]}{\partial \omega} = \frac{\partial \Pr\left(U_t = 0\right)}{\partial \omega}[P_{t,unconstrained} - \ P_{t,constrained}] + \frac{\partial (P_{t,constrained})}{\partial \omega}(1 - \Pr\left(U_t = 0\right)). \tag{22}$$

**Proposition 1: The expected stock price rises, if the creditor protection becomes stronger, through two channels: (1) The probability of credit crunches diminishes; (2) The market value of the firm rises in the credit-constrained regime.**

## 1.4 The Effect of Liquidity Crises on Variance of the Stock Returns

**:**

$$\mathbf{Var}\left[P_t\right] = \mathbf{E}\left[Var\left[P_t|U_t\right]\right] + \mathbf{Var}\left[E\left[P_t|U_t\right]\right], \tag{23}$$

$$\begin{aligned} & E\left[Var\left[P_t|U_t\right]\right] \\ & = \Pr\left(U_t = 0\right) Var\left[P_{t,unconstrained}|U_t = 0\right] + \Pr\left(U_t = 1\right) Var\left[P_{t,constrained}|U_t = 1\right]. \end{aligned} \tag{24}$$

$Var[\varepsilon_t] = 0$) **imlies**

$$\begin{aligned} Var[P_t] &= Var[E[P_t|U_t]] \\ &= \Pr(U_t = 1)(1 - \Pr(U_t = 1))(P_{t,unconstrained} - P_{t,constrained})^2 \end{aligned} \tag{25}$$

$$\begin{aligned} \frac{\partial Var[P_t]}{\partial \omega} &= (1 - 2\Pr(U_t = 1))(P_{t,unconstrained} - P_{t,constrained})^2 \frac{\partial \Pr(U_t = 1)}{\partial \omega} \\ &+ \Pr(U_t = 1)(1 - \Pr(U_t = 1)) \frac{\partial (P_{t,unconstrained} - P_{t,constrained})^2}{\partial \omega} \end{aligned} \tag{26}$$

**Proposition 2: Upon strengthening the creditor protection, the variance of stock returns declines, through two channels: (1) The difference between the stock prices, in the constrained regime and the unconstrained regime, decreases with better protection of creditors; and (2) The probability of credit crunches declines with strong protection..**

# Model with productivity shocks and cost of adjustment



## Model setup

- ✔ Small open economy is producing a single aggregate tradable good
- ✔ $Y_t = A_t K_t^{1-\rho}$, $\ln(A_{t+1}) = \gamma \ln(A_t) + \varepsilon_{t+1}$, $\varepsilon_{t+1} \in$ i.i.d. uniform $[-1, 1]$
- ✔ Gross investment $Z_t = I_t \left(1 + \frac{1}{2}\frac{1}{v}\frac{I_t}{K_t}\right)$, where $I_t = K_{t+1} - K_t$
- ✔ Firm's Lagrangian

$$L = E\left[\Sigma_{t=0}^{\infty} \underbrace{\frac{1}{(1+r)}}_{world\ int.\ rate}^{t} \left(A_t K_t^{1-\rho} - Z_t + \underbrace{q_t}_{Tobin's\ q} (K_t + I_t - K_{t+1})\right)\right]$$

Based on Krugman (1998) Frenkel & Razin (1996, Ch.7)

# Find analytical solution for Tobin's q



## BENCHMARK SOLUTION

- ✔ FOC $(I_t)$: $1 + \frac{1}{v}\frac{I_t}{K_t} = q_t$, which yields $k_{t+1} = k_t + v\left(q_t - 1\right)$
- ✔ FOC $(K_{t+1})$: $q_t = \frac{1}{1+r}\left(E_t\left[R_{t+1}\right] + \frac{1}{2}\frac{1}{v}\left(\frac{I_{t+1}}{K_{t+1}}\right)^2 + E_t\left[q_{t+1}\right]\right)$
- ✔ $R_{t+1}$ is the $t+1$ capital rental rate
- ✔ Given perfect competition on capital markets $R_{t+1} = (1-\rho)\, A_{t+1} K_{t+1}^{-\rho}$
- ✔ After some algebra we guess $q_t = B_0 + B_1 a_t + B_2 k_t$ and

$$E_t q_{t+1} = B_0 + B_1\left(\gamma a_t\right) + B_2\left(k_t + v\left(q_t - 1\right)\right)$$

and solve for

$$B_0 = \frac{-\pi - \rho v + v B_2}{-r - \rho v + v B_2}, \qquad B_1 = \frac{\gamma}{1 + r + \rho v - v B_2 - \gamma},$$

$$B_2 = \frac{r + \rho v - \sqrt{\left(r + \rho v\right)^2 + 4\rho v}}{2v}.$$

# Introducing liquidity shocks and creditor protection



## CREDIT CONSTRAINED MODEL

- ✔ Assume that credit constraint is $I_t \leq \overbrace{\omega}^{cred.prot.} \underbrace{K_t}_{collateral} - \overbrace{W_t}^{liq.shock}$
- ✔ Assume that liquidity shock is permanent, for simplicity
- ✔ Add this new constraint to the Lagrangian, with the multiplier $\lambda_t$
- ✔ New FOC $(I_t)$: $1 + \frac{1}{v}\frac{I_t}{K_t} = q_t + \lambda_t$
- ✔ FOC $(K_{t+1})$:

$$q_t = \frac{1}{1+r}\left(E_t\left[R_{t+1}\right] + \frac{1}{2}\frac{1}{v}\left(\frac{I_{t+1}}{K_{t+1}}\right)^2 + E_t\left[q_{t+1}\right] - \omega E_t\left[\lambda_{t+1}\right]\right)$$

Similar to Bernanke and Gertler (1989), Hart and Moore (1994), Kiyotaki and Moore (1997), and Mendoza (2006a,b)

# Credit constrained q is lower than unconstrained



## Credit constrained model

- ✔ New $q'_t = B'_0 + B'_1 a_t + B'_2 k_t$
- ✔ New coefficients for q are

$$B'_0 = \frac{\left(\omega^2 - r\omega - v\rho - rv\rho\right)\ln\left(1+\omega\right) + v\left(r-\omega\right)\left(\pi-\omega\right)}{v\left(r-\omega\right)^2},$$

$$B'_1 = \frac{\gamma}{1+r-\gamma-\gamma\omega}, \qquad B'_2 = \frac{\rho}{\omega - r}.$$

- ✔ Can show that

$$q_{t,unconstr.} = B_0 + B_1 a_t + B_2 k_t > q'_{t,constr.} = B'_0 + B'_1 a_t + B'_2 k_t$$

# Stronger credit protection raises expected stock return



**Proposition 1**: *Upon strengthening the creditor protection, the expected return in the stock market rises, for two reasons:*
*(1) the credit-crunch value of the Tobin-q rises; and*
*(2) the probability of a credit crunch falls.*

PROOF

$$E\left[q_t; a_t, k_t, \omega\right] = \Pr\left(U_t = 0\right)\left(B_0 + B_1 a_t + B_2 k_t\right) + \left(1 - \Pr\left(U_t = 0\right)\right)\left(B_0' + B_1' a_t + B_2' k_t\right)$$

$$\frac{\partial E\left[q_t; a_t, k_t, \omega\right]}{\partial \omega} = \frac{\partial \Pr\left(U_t = 0\right)}{\partial \omega}\left[q_t - q_t'\right] + \frac{\partial (q_t')}{\partial \omega}\left(1 - \Pr\left(U_t = 0\right)\right)$$

$\partial E\left[q_t; a_t, k_t, \omega\right] / \partial \omega$ is positive because

$\frac{\partial \Pr(U_t = 0)}{\partial \omega} > 0$, $\left[q - q'\right] > 0$, and $\frac{\partial (B_0' + B_1' a_t + B_2' k_t)}{\partial \omega} > 0$

# Stronger credit protection lowers stock return volatility



**Proposition 2**: *Upon strengthening the creditor protection, the expected volatility in the stock market declines, for two reasons: (1) the difference of the Tobin-q across constrained and unconstrained regimes decreases; and (2) the probability of a credit crunch falls.*

PROOF

Assuming that $\varepsilon_t$ and $W_t$ are independent, then

$$Var\left[q_t\right] = E\left[Var\left[q_t|U_t\right]\right] + Var\left[E\left[q_t|U_t\right]\right],$$

after some algebra,

$$Var\left[q_t\right] = \Pr\left(U_t = 1\right)\left(1 - \Pr\left(U_t = 1\right)\right)\left(\bar{q}_t - \bar{q}_t'\right)^2$$

$$\frac{\partial Var\left[q_t\right]}{\partial \omega} = \left(1 - 2\Pr\left(U_t = 1\right)\right)\left(\bar{q}_t - \bar{q}_t'\right)^2 \frac{\partial \Pr\left(U_t = 1\right)}{\partial \omega} + \Pr\left(U_t = 1\right)\left(1 - \Pr\left(U_t = 1\right)\right)\frac{\partial\left(\bar{q}_t - \bar{q}_t'\right)^2}{\partial \omega}$$

*Note: results generalize for oscillating $W$ instead of a permanent shock to $W$.*

# SUMMARY OF MODEL PREDICTIONS

Creditor protection affects asset prices through
the probability and the severity of the credit constraint.

With better creditor protection,
credit constraint binds less frequently
and the amount of credit available in the binding state is higher,
because collateral is more valuable.

As a result, better creditor protection
increases the level and lowers the volatility of stock prices.

We will refer to the situation of binding credit constraint as 'credit crunch' or 'liquidity crisis'

# Tests

# Predicted Prob.(liquidity crisis) proxies for credit crunch



## First stage: Prob.(liquidity crisis)

- ✔ I(liquidity crisis) $= 1$ if real interest rate changes by more than 8.42 percentage points in one year (5% tail)
  - ✘ Alternative: 4.28 percentage points in one year (10% tail)
  - ✘ All ‘famous’ crises are captured
  - ✘ Short–lived episodes are not captured

## First stage: Prob.(liquidity crisis)

### List of liquidity crises in the sample

| Country | Years of financial crisis |
|---|---|
| Argentina | 1984, 1987, 1988, 1989, 1990, 1992, 1993[a], 1994[a], 2001, 2004[a] |
| Australia | 1984[a], 1989[a] |
| Brazil | 1987, 1988, 1989, 1990, 1992, 1993, 1994, 1996, 1997[a], 1998[a] |
| Chile | 1984[a], 1987[a], 1989 |
| China | 1990[a], 1995[a], 1996[a] |
| Colombia | 1998 |
| Egypt | 1985[a], 1990[a], 1992[a], 1996[a] |
| Greece | 1987[a], 1988[a] |
| Hong Kong | 1999[a] |
| India | 1984[a], 1989[a], 1995[a] |
| Indonesia | 1984[a], 1997 |
| Israel | 1984, 1986, 1987, 1992[a], 2003[a] |
| Korea | 1989[a] |
| Mexico | 1984, 1985, 1989, 1995, 1998 |
| Peru | 1991, 1992, 1993, 1995[a], 1999[a] |
| Philippines | 1985, 1986, 1992, 1997[a] |
| Portugal | 1985[a], 1991[a] |
| South Africa | 1984[a], 1988[a] |
| Spain | 1987[a] |
| Sweden | 1992 |
| Thailand | 1997[a] |
| Turkey | 1990, 1991, 1994, 1996, 1998[a], 1999, 2001, 2003[a] |

[a] No liquidity crisis by our strict definition

## First stage: Prob.(liquidity crisis)

- ✔ I(liquidity crisis) $= 1$ if real interest rate changes by more than 8.42 percentage points in one year
- ✔ Estimate predicted probability of the crisis as follows:

$$\text{I(crisis)}_{it} = \begin{cases} 1 & \text{if } y_{it} > 0 \\ 0 & \text{if } y_{it} \leq 0 \end{cases},$$

where $y_{it} = X'_{it}\beta + \varepsilon_{it}$.

- ✔ Estimate by probit
- ✔ $X$ includes the proxy for the degree of creditor protection

# La Porta et al. index proxies for creditor protection



## Measure of creditor protection

- ✔ La Porta et al. (1998) creditor rights $(CR)$ index ranges from 0 to 4 (higher $\Leftrightarrow$ better protection)
  - ✘ creditor consent or minimum dividends to file for reorganization
  - ✘ no automatic stay on assets
  - ✘ seniority of secured creditors
  - ✘ debtor does not retain the administration pending the resolution
- ✔ For regression analysis lump $CR = 0, 1, 2$ and $CR = 3, 4$ into $CRH = 0, 1$, and indicator of creditor rights index being high

## MEASURE OF CREDITOR PROTECTION

### The distribution of countries over creditor right index

| | Developing | Developed |
|---|---|---|
| CR=0 | Colombia, Mexico, Peru, Philippines | France |
| CR=1 | Argentina, Brazil | Australia, Canada, Finland, Greece, Ireland, Portugal, Switzerland |
| CR=2 | Chile, Turkey | Belgium, Italy, Japan, Netherlands, Norway, Spain, Sweden |
| CR=3 | Korea, South Africa, Thailand | Austria, Denmark, Germany, New Zealand |
| CR=4 | China, Egypt, Hong Kong, India, Indonesia, Israel, Malaysia, Pakistan, Singapore | United Kingdom |

# *Better creditor protection ⇒ liq. crisis less likely*



## First stage: Prob.(liquidity crisis)

- ✔ Find

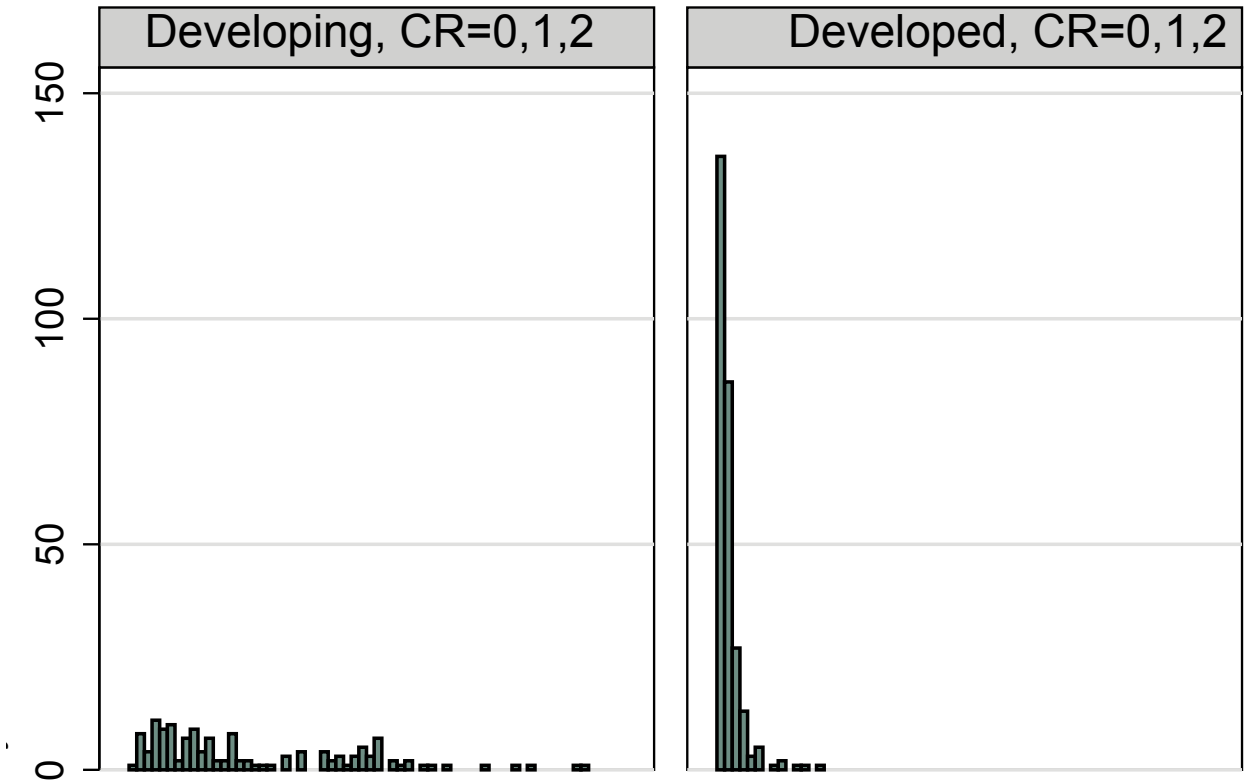
$$\Pr(cr.) = 1.20 - 1.10 * CRH - 0.03 * POL - 0.02 * CAP + 0.04 * CONT + 0.77 * cr._{-1}$$

where $POL$ is the ICRG political stability index,
$CAP$ is Edwards (2000) *de jure* financial account openness,
$CONT$ is a lagged indicator of sudden stop in any country of the sample

- ✔ McFadden's $R^2 = 0.31$, 714 pooled observations
- ✔ Use predicted probability of liquidity crisis $(PLC)$ as a proxy of the tightness of credit constraint in the second stage

## First stage: Prob.(liquidity crisis)

The frequency distribution of predicted probability of liquidity crisis

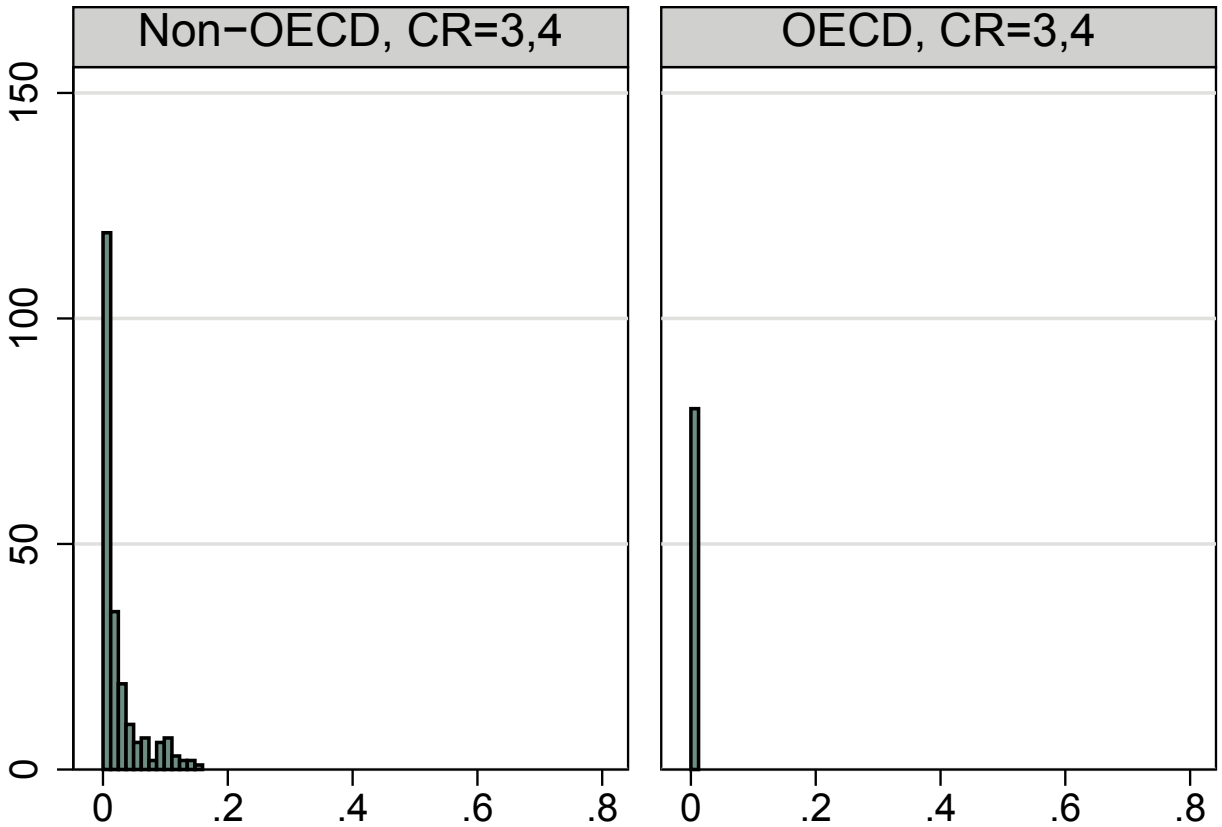


# *Better creditor protection ⇒ liq. crisis less likely*



## First stage: Prob.(liquidity crisis)

The frequency distribution of predicted probability of liquidity crisis



# Aggregate stock market index proxies for q



## Measures of level and volatility of Q

- ✔ Aggregate stock market indexes from Global Financial Data
- ✔ Each of them in three forms:
  $q_a = nominal, q_b = nominal/CPI, q_c = nominal * ER/CPI^{US}$
- ✔ Calculate return as $x_t = \log(q_t) - \log(q_{t-1})$
- ✔ Use both $q$ and $x$ in levels or logs as proxy for q (country fixed effects absorb differences in scale)
- ✔ Calculate volatility in three ways: Officer, Non-overlapping S.D., Range
- ✔ Use volatility in levels and logs as proxy for $\sigma$ = Var(q)

# Only retain control variables that matter in the 2nd stage



## Second stage specification

- ✔ Estimate second stage as

$$q_{it} = \rho * \ln(q_{it-1}) + \alpha_i + \gamma * PLC_{it+1} + Z'_{it}\delta + \eta_{it}$$

$$\sigma_{it} = \rho \ln(\sigma_{it-1}) + \alpha_i + \gamma_1 * PLC_{it+1} + \gamma_2 * (PLC_{it+1} * CRH_i) + Z'_{it}\delta + \eta_{it}$$

- ✔ Use iterated FGLS that allows for autocorrelation in errors, with lagged dependent variable and country fixed effects
- ✔ Control for per capita GDP growth in level regression
- ✔ Control for per capita GDP growth, number of firms listed, fin. account openness in the volatility regression
- ✔ Note 1: Arellano–Bond dynamic GMM yields similar results
- ✔ Note 2: no remaining auto–correlation in errors

# Exclusion restrictions pass informal tests



## TESTING EXCLUSION RESTRICTIONS

- ✔ The 2-stage system can be identified by functional form
- ✔ Functional form–based identification is weak and not robust
- ✔ Excluded from second stage: lag of crisis indicator, lag of contagion indicator
- ✔ Lagged variables should not affect stock index, which should be forward–looking
- ✔ We test the exclusion restrictions informally by running regressions on excluded variables

# Exclusion restrictions pass informal tests



## TESTING EXCLUSION RESTRICTIONS

## Informal tests of exclusion restrictions

| | Stock price level | | | Stock price volatility | | |
|---|---|---|---|---|---|---|
| | Full Sample | Developing | Developed | Full Sample | Developing | Developed |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Lagged $y$ | 0.818*** | 0.830*** | 0.798*** | 0.347*** | 0.356*** | 0.292*** |
| GDP growth | 0.443*** | 0.673*** | 0.228** | -0.571*** | -0.878*** | -0.056 |
| Firms listed | | | | 0.008 | -0.054 | 0.082 |
| ICRG | -0.003 | -0.005** | 0.003 | 0.000 | -0.002 | 0.007 |
| Cap. contr. | -0.001 | -0.002 | -0.001 | -0.004*** | -0.003** | -0.003 |
| Lag cr. | 0.095 | 0.078 | 0.188 | 0.097 | 0.092 | 0.249 |
| Lag CONT | 0.012*** | 0.017*** | 0.009** | 0.002 | 0.008 | -0.005 |
| Obs. | 693 | 348 | 345 | 679 | 344 | 335 |
| Countries | 40 | 20 | 20 | 40 | 20 | 20 |
| Log lik. | -72.8 | -104.2 | 39.4 | -274 | -145 | -120 |
| Com. AR(1) | -0.023 | -0.099 | 0.049 | -0.035 | -0.036 | -0.013 |

Iterated FGSL.
Dependent variable is log of stock price level (columns (1)-(3)) and volatility (columns (4)-(6)).
Country fixed effects are included
* significant at 10%; ** significant at 5%; ***significant at 1%

# 2nd stage results are consistent with model predictions



## Second stage results: level

| | Full Sample (1) | Developing (2) | Developed (3) | Full Sample (4) | Developing (5) | Developed (6) |
|---|---|---|---|---|---|---|
| Lagged dependent variable | 0.777*** | 0.770*** | 0.773*** | 0.757*** | 0.728*** | 0.760*** |
| | (0.016) | (0.022) | (0.022) | (0.018) | (0.028) | (0.023) |
| Growth rate of GDP per capita | 0.346*** | 0.643*** | 0.116 | 0.324*** | 0.609*** | 0.118 |
| | (0.084) | (0.133) | (0.108) | (0.084) | (0.132) | (0.108) |
| Lead predicted crisis probability | | | | -0.529** | -0.585** | -1.696 |
| | | | | (0.233) | (0.251) | (1.279) |
| Observations | 656 | 329 | 327 | 656 | 329 | 327 |
| Countries | 40 | 20 | 20 | 40 | 20 | 20 |
| Log likelihood | -64 | -104 | 44 | -64 | -102 | 45 |
| Common AR(1) | -0.03 | -0.11 | 0.05 | -0.01 | -0.07 | 0.06 |

Iterated FGSL. Standard errors in parentheses
Dependent variable is log of stock return volatility.
Country fixed effects are included

# 2nd stage results are consistent with model predictions



## Second stage results: volatility

| | Full Sample (1) | Developing (2) | Developed (3) | Full Sample (4) | Developing (5) | Developed (6) |
|---|---|---|---|---|---|---|
| Lagged dependent variable | 0.362*** (0.035) | 0.399*** (0.045) | 0.274*** (0.054) | 0.328*** (0.036) | 0.357*** (0.047) | 0.262*** (0.055) |
| Growth rate of GDP per capita | -0.564*** (0.111) | -0.849*** (0.136) | -0.060 (0.187) | -0.453*** (0.114) | -0.758*** (0.142) | 0.025 (0.186) |
| Log (# firms listed on the stock mkt.) | 0.019 (0.040) | -0.059 (0.047) | 0.117* (0.071) | 0.071* (0.041) | 0.004 (0.049) | 0.193** (0.075) |
| Financial account openness | -0.003*** (0.001) | -0.003** (0.002) | -0.003 (0.002) | -0.003** (0.001) | -0.002 (0.002) | -0.003 (0.002) |
| Lead predicted crisis probability (PLC) | | | | 0.427** (0.218) | 0.375* (0.229) | 2.492 (1.995) |
| Observations | 680 | 345 | 335 | 646 | 328 | 318 |
| Countries | 40 | 20 | 20 | 40 | 20 | 20 |
| Log likelihood | -276 | -148 | -121 | -259 | -140 | -111 |
| Common AR(1) | -0.04 | -0.04 | -0.007 | -0.04 | -0.05 | -0.02 |

Iterated FGLS. Standard errors in parentheses
Dependent variable is log of stock return volatility.
Country fixed effects are included

# These results are robust



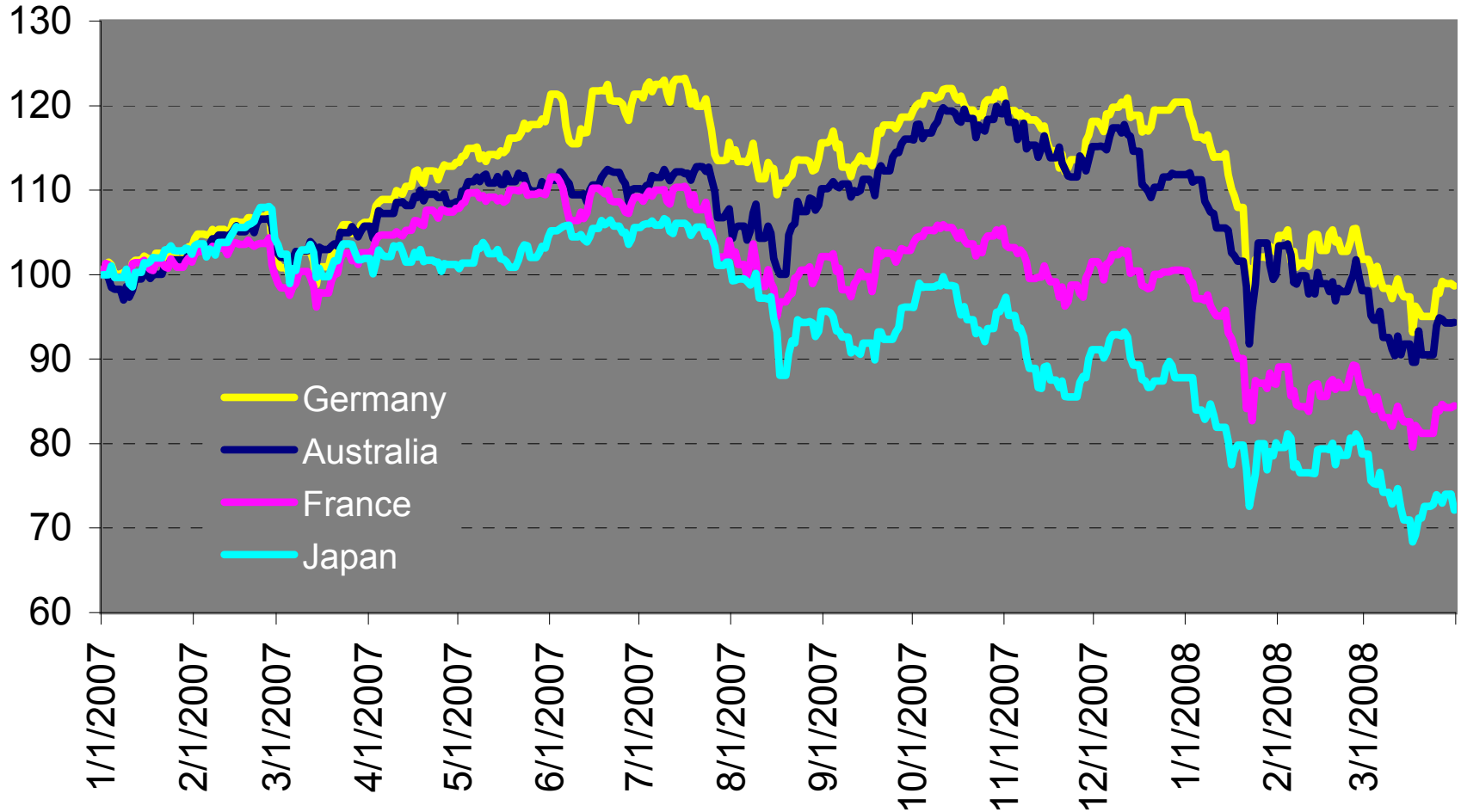
## Additional robustness tests

- ✔ Additional controls have no effect, except for the sovereign credit rating, which is highly correlated (0.79) with the growth of GDP per capita
- ✔ Two or three lags of dependent variable in the first stage: coefficients on PLC increase in magnitude
- ✔ Less strict definition of liquidity crises: coefficients on PLC get smaller, but story is the same
- ✔ Logit instead of Probit in the first stage: no difference
- ✔ Developed country dummy in the first stage: no difference
- ✔ Raw index for creditor protection: our results are mostly driven by the $CR = 4$ countries
- ✔ No lagged dependent variable in the second stage: larger PLC coefficient, $AR(1) = 0.2$
- ✔ Arellano–Bond dynamic panel for the second stage: no qualitative differences
- ✔ GMM for the second stage using predicted probability as instrument for I(cr.), with and without country fixed effects: no qualitative differences
- ✔ Adding year fixed effects in the second stage: smaller PLC coefficients
- ✔ Classify countries into OECD and non–OECD instead of our classification (affects Mexico, Turkey, Korea): results are the same

# Conclusion

- ✔ Creditor protection not only increases the level of the stock market in the environment of credit constraints, but also lowers its volatility
- ✔ This relationship is visible at the aggregate level for both developed and developing countries
- ✔ Recent events are also consistent with our findings:
  While Germany $(CR = 3)$ was the country most affected by the liquidity crisis, the stock market volatility increase was less pronounced in Germany than it was in France $(CR = 0)$ , Australia $(CR = 1)$ , or Japan $(CR = 2)$

# STOCK MARKET INDEXES



## Appendix 2. Data sources

In the regressions that are reported we used the data series constructed from the variables listed below. In our robustness tests we used a host of additional control variables that were obtained mostly from the IFS and the Global Financial Data.

| Variable | Units | Frequency | Source |
|---|---|---|---|
| Creditor rights index | Index 0-4 | cross-section | La Porta, et al. (1998) |
| Composite stock market close | Index | monthly (eop) | Global Financial Data |
| Exchange rate against U.S. dollar | n.c./U.S.dollar | monthly (eop) | Global Financial Data |
| U.S. CPI | Index | monthly (eop) | Global Financial Data |
| Bank credit to private sector | millions of n.c. | annual | IFS, line 22d |
| Deposit rate | percent | annual/monthly (eop) | IFS, line 60l |
| Money market rate | percent | annual/monthly (eop) | IFS, line 60b |
| Inflation rate | percent | annual/monthly | IFS, line 64..x |
| GDP in U.S. dollars | millions of USD | annual | Global Financial Data |
| Population | thousands of people | annual | Global Financial Data |
| *De jure* financial account openness | Index 0-100 | annual | Edwards (2006) |
| Index of political stability | Index 0-100 | annual | ICRG |
| Index of *de jure* capital controls | Index | annual | Edwards (2006) |
| Systemic sudden stop | Binary | annual | Calvo et al. (2006) |
| Companies listed on stock markets | units | annual | Global Financial Data |

Figure 1: The distribution of countries over creditor rights index (CR)

| | Developing | Developed |
|---|---|---|
| CR=0 | Colombia, Mexico, Peru, Philippines | France |
| CR=1 | Argentina, Brazil | Australia, Canada, Finland, Greece, Ireland, Portugal, Switzerland |
| CR=2 | Chile, Turkey | Belgium, Italy, Japan, Netherlands, Norway, Spain, Sweden |
| CR=3 | Korea, South Africa, Thailand | Austria, Denmark, Germany, New Zealand |
| CR=4 | China, Egypt, Hong Kong, India, Indonesia, Israel, Malaysia, Pakistan, Singapore | United Kingdom |

Figure 2: The distribution of predicted probability of liquidity crisis: quantity approach

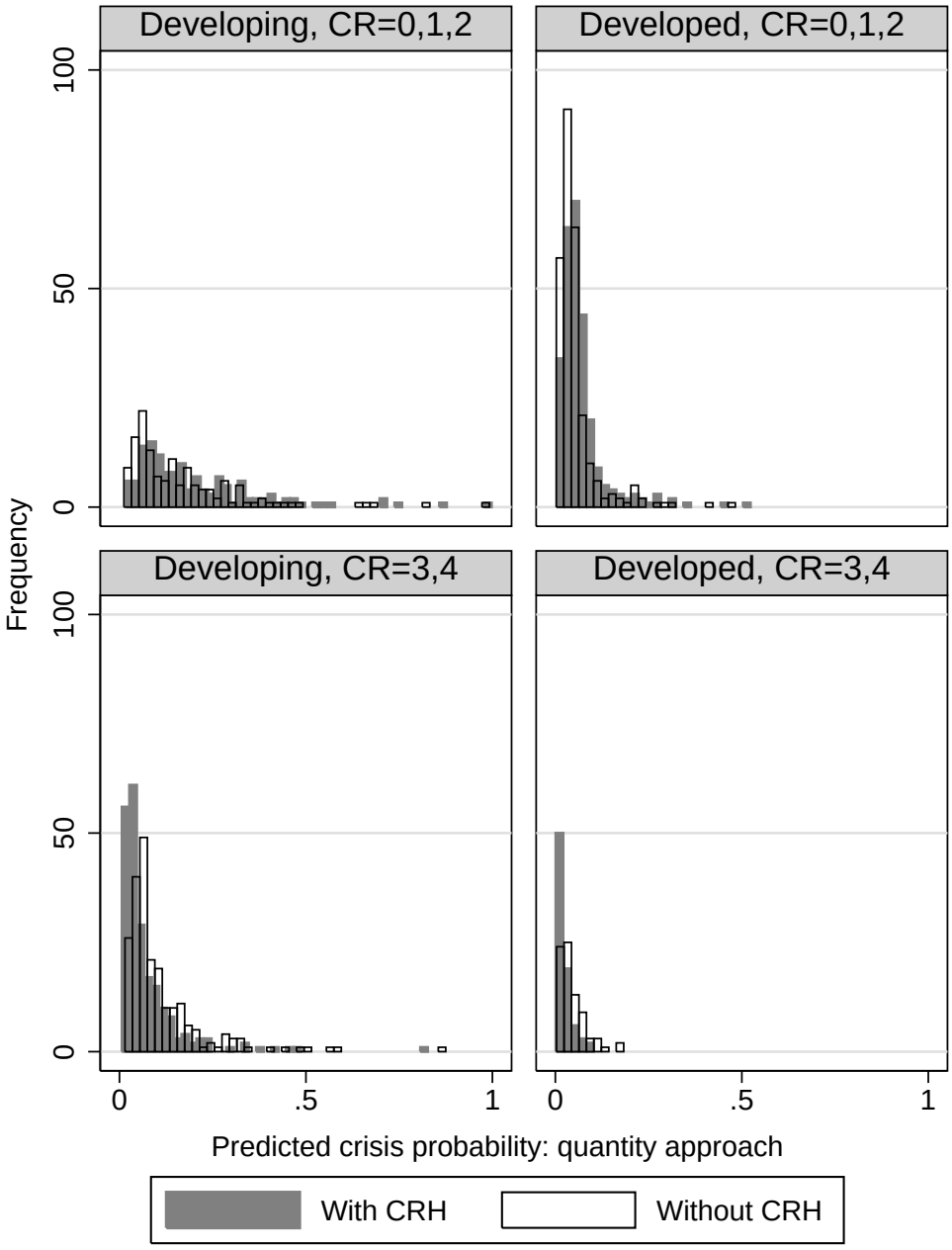


Figure 3: The distribution of predicted probability of liquidity crisis: price approach

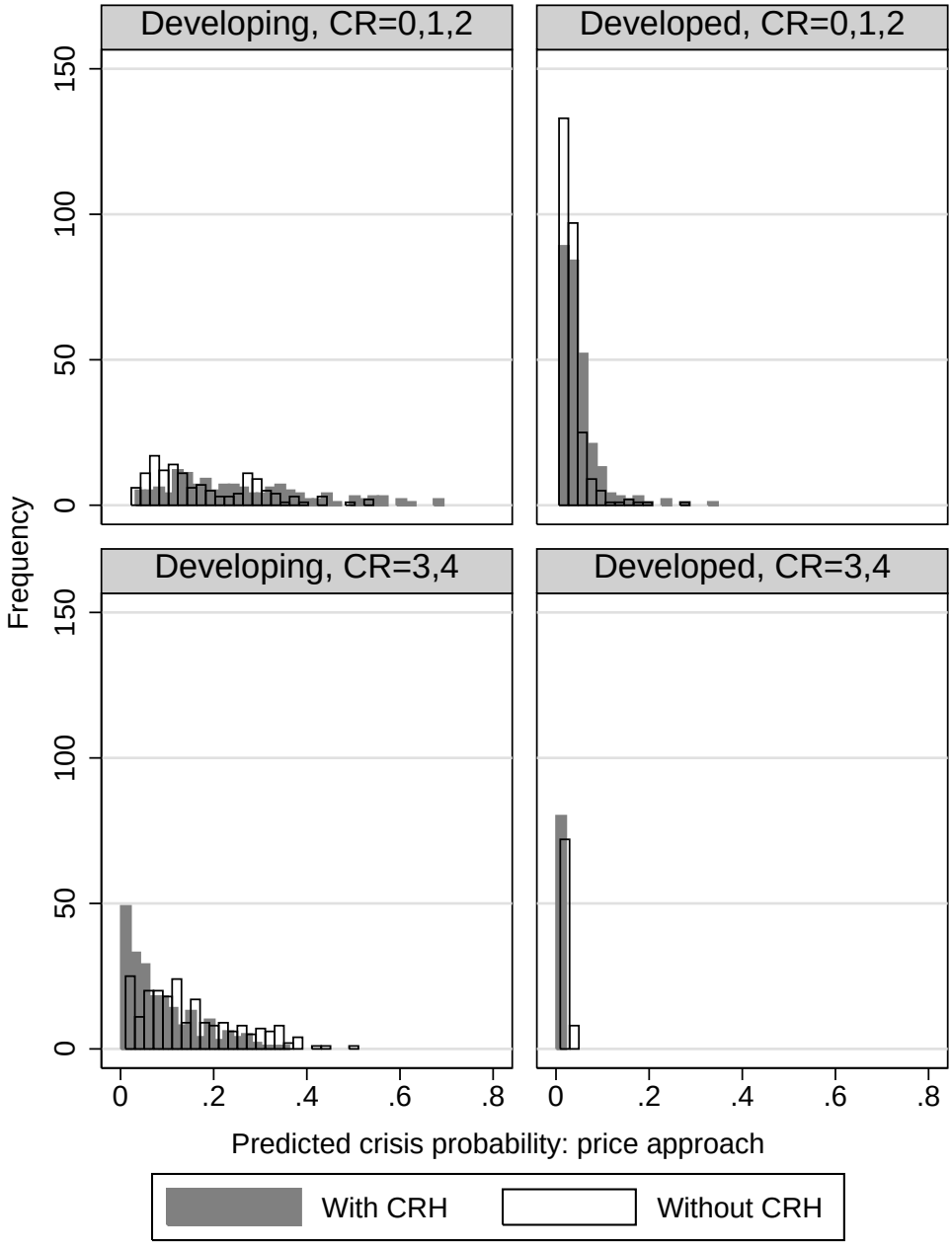


Table 1: List of liquidity crises in the sample

| Country | Years of financial crisis | |
|---|---|---|
| | Quantity definition | Price definition |
| Argentina | 1988[a], 1990, 2001-2003 | 1984, 1987-1990, 1992, 1993-1994[a], 2001, 2004[a] |
| Brazil | 1989, 1990, 1998 | 1987-1990, 1992-1994, 1996, 1997-1998[a] |
| Chile | 1985[a], 1990[a] | 1984[a], 1987[a], 1989 |
| China | 1988[a] | 1990[a], 1995[a], 1996[a] |
| Colombia | 1998[a], 1999, 2000 | 1998 |
| Denmark | 1991, 1993, 1994[a] | |
| Egypt | 1989[a], 1991 | 1985[a], 1990[a], 1992[a], 1996[a] |
| Finland | 1992[a], 1993, 1994 | |
| France | 1993[a] | |
| Greece | 1987[a], 1990[a], 1993[a] | 1987[a], 1988[a] |
| Hong Kong | 1991, 1999[a] | 1999[a] |
| India | 1991[a] | 1984[a], 1989[a], 1995[a] |
| Indonesia | 1998, 1999 | 1984[a], 1997 |
| Ireland | 1991[a] | |
| Japan | 2001, 2002[a] | |
| Malaysia | 1990, 1998[a] | |
| Mexico | 1985[a], 1986, 1987[a], 1995-1996, 1998-1999[a], 2001 | 1984, 1985, 1989, 1995, 1998 |
| Pakistan | 1990[a] | |
| Peru | 1989, 2000[a], 2003[a] | 1991, 1992, 1993, 1995[a], 1999[a] |
| Philippines | 1984-1986, 1991[a], 1998, 1999[a], 2001[a] | 1985, 1986, 1992, 1997[a] |
| Portugal | 1985[a] | 1985[a], 1991[a] |
| Singapore | 2002[a] | |
| South Africa | 1986[a], 2002 | 1984[a], 1988[a] |
| Spain | 1984[a] | 1987[a] |
| Sweden | 1991[a], 1993, 1994[a] | 1992 |
| Thailand | 1998-2000, 2001[a] | 1997[a] |
| Turkey | 1988, 1994, 1998[a], 1999, 2001 | 1990, 1991, 1994, 1996, 1998[a], 1999, 2001, 2003[a] |

[a] No liquidity crisis by on a more strict definition.
Countries that did not have crises: Australia, Austria, Belgium, Canada, Germany, Italy, Israel, Korea, Netherlands, New Zealand, Norway, Switzerland, United Kingdom.

Table 2: Informal tests of exclusion restrictions

| | Stock price level | | | | Stock price volatility | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Lagged dependent | 0.75*** | 0.99*** | -0.10*** | 0.008 | -0.063*** | -0.060*** | 0.28*** | 0.44*** |
| variable | (0.023) | (0.006) | (0.018) | (0.010) | (0.020) | (0.021) | (0.036) | (0.033) |
| Growth rate of | 0.17** | 0.13* | -0.28** | -0.21 | 0.31*** | 0.20** | -0.43*** | -0.43*** |
| GDP per capita | (0.068) | (0.072) | (0.118) | (0.128) | (0.075) | (0.083) | (0.115) | (0.124) |
| ICRG political | 0.000 | -0.004*** | -0.002 | -0.003 | 0.006*** | -0.000 | -0.004 | -0.002 |
| risk index | (0.002) | (0.001) | (0.003) | (0.002) | (0.002) | (0.003) | (0.002) | (0.002) |
| Capital controls | | | -0.000 | -0.003** | 0.008*** | 0.006*** | -0.001 | -0.002** |
| (de jure) | | | (0.002) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Log(# of publicly | | | | | 0.32*** | 0.63*** | -0.032 | -0.011 |
| listed firms) | | | | | (0.039) | (0.044) | (0.043) | (0.018) |
| Lagged quantity | -0.035 | 0.021 | | | -0.11*** | -0.069* | | |
| crisis indicator | (0.030) | (0.030) | | | (0.032) | (0.037) | | |
| Lagged price | | | 0.063 | 0.20** | | | 0.085 | 0.19** |
| crisis indicator | | | (0.070) | (0.087) | | | (0.069) | (0.082) |
| Lagged contagion | | | 0.012** | 0.011* | | | 0.008 | 0.004 |
| indicator | | | (0.006) | (0.006) | | | (0.006) | (0.006) |
| I(Creditor rights | | -0.026 | | -0.100 | | -1.72*** | | -0.075* |
| index = 3 or 4) | | (0.029) | | (0.063) | | (0.103) | | (0.042) |
| I(Latin America) | | -0.017 | | 0.20** | | 9.94*** | | 0.020 |
| I(East Asia-J) | | -0.074* | | 0.28*** | | 1.48*** | | 0.16*** |
| I(Asia,Africa) | | -0.084 | | 0.020 | | 0.55*** | | 0.031 |
| I(Commonwealth+J) | | -0.031 | | -0.20*** | | 0.21** | | -0.10* |
| Observations | 693 | 693 | 693 | 693 | 679 | 679 | 679 | 679 |
| LL | 5.10 | -50.19 | -341.0 | -397.6 | -70.61 | -366.7 | -331.7 | -375.2 |
| AR1 | 0.23 | 0.24 | 0.21 | 0.30 | 0.52 | 0.79 | 0.00 | -0.02 |

Iterated FGSL. Standard errors in parentheses. 40 countries.
Dependent variable is log of stock price level (columns (1)-(4)) and volatility (columns (5)-(8)).
Country fixed effects are included in odd-numbered columns.
* significant at 10%; ** significant at 5%; ***significant at 1%.

Table 3: Marginal effects of the first–stage probit regressions

| Dependent variable: I(liquidity crisis) | Quantity definition | | Price definition | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Lagged dependent variable | 0.142*** | 0.119** | 0.089* | 0.047 |
| | (0.047) | (0.047) | (0.058) | (0.040) |
| ICRG political risk index | -0.002*** | -0.002*** | -0.003* | -0.003*** |
| | (0.001) | (0.001) | (0.001) | (0.001) |
| Growth rate of GDP per capita | -0.349*** | -0.337*** | | |
| | (0.102) | (0.102) | | |
| Capital controls (de jure) | | | -0.001** | -0.002*** |
| | | | (0.001) | (0.001) |
| Lagged contagion indicator | | | 0.005* | 0.005* |
| | | | (0.003) | (0.003) |
| I(Creditor rights index = 3 or 4) | | -0.055*** | | -0.078*** |
| | | (0.020) | | (0.021) |
| McFadden's $R^2$ | 0.16 | 0.18 | 0.16 | 0.21 |
| Predicted probability variable | PLCQ1 | PLCQ2 | PLCP1 | PLCP2 |

Probit regressions' marginal effects. Standard errors in parentheses. 707 observations. * significant at 10%; ** significant at 5%; ***significant at 1%.

Table 4: Second–stage regressions of the stock market level. Full sample. Country FEs.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Lagged dependent variable | 0.747*** | 0.745*** | 0.711*** | 0.710*** |
| | (0.020) | (0.020) | (0.022) | (0.022) |
| Growth rate of GDP per capita | 0.075 | 0.076 | 0.073 | 0.082 |
| | (0.067) | (0.067) | (0.066) | (0.067) |
| PLCQ1 | -0.645*** | | | |
| | (0.124) | | | |
| PLCQ2 | | -0.675*** | | |
| | | (0.125) | | |
| PLCP1 | | | -1.034*** | |
| | | | (0.192) | |
| PLCP2 | | | | -0.835*** |
| | | | | (0.198) |
| LL | 18.59 | 19.14 | 20.92 | 16.33 |
| AR1 | 0.18 | 0.18 | 0.21 | 0.21 |

Iterated FGSL. Standard errors in parentheses. 40 countries. 654 observations.
Dependent variable is log of real stock market index.
Country fixed effects are included.
* significant at 10%; ** significant at 5%;***significant at 1%.

Table 5: Second–stage regressions of the stock market level. Full sample. Region FEs.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Growth rate of GDP per capita | 0.034*** | 0.036*** | 0.015* | 0.018** |
| | (0.009) | (0.009) | (0.008) | (0.009) |
| PLCQ1 | -0.066*** | | | |
| | (0.014) | | | |
| PLCQ2 | | -0.073*** | | |
| | | (0.015) | | |
| PLCP1 | | | -0.175*** | |
| | | | (0.025) | |
| PLCP2 | | | | -0.195*** |
| | | | | (0.030) |
| I(Creditor rights index = 3 or 4) | 0.001 | -0.002 | -0.001 | -0.011 |
| | (0.011) | (0.011) | (0.011) | (0.011) |
| I(Latin America) | 0.017 | 0.017 | 0.034** | 0.042** |
| I(East Asia-Japan) | 0.031** | 0.031** | 0.035** | 0.037*** |
| I(Asia+Africa) | 0.047*** | 0.047*** | 0.069*** | 0.063*** |
| I(Commonwealth+Japan) | 0.037*** | 0.037*** | 0.035*** | 0.035*** |
| LL | 1220.56 | 1223.54 | 1229.32 | 1229.23 |
| AR1 | 0.71 | 0.72 | 0.70 | 0.71 |

Iterated FGSL. Standard errors in parentheses. 40 countries. 693 observations.
Omitted region is Continental Europe.
Dependent variable is log of real stock market index.
* significant at 10%; ** significant at 5%;***significant at 1%.

Table 6: Second–stage regressions of the stock market volatility. Full sample. Country FEs.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Lagged dependent variable | 0.266*** | 0.266*** | 0.270*** | 0.263*** |
| | (0.036) | (0.036) | (0.036) | (0.036) |
| Growth rate of GDP per capita | -0.268** | -0.271** | -0.217* | -0.211* |
| | (0.115) | (0.115) | (0.116) | (0.114) |
| Log(# publicly listed firms) | 0.009 | 0.011 | 0.019 | 0.022 |
| | (0.041) | (0.041) | (0.041) | (0.041) |
| Capital controls (de jure) | -0.002* | -0.002* | -0.001 | 0.000 |
| | (0.001) | (0.001) | (0.001) | (0.002) |
| PLCQ1 | 0.340** | | | |
| | (0.158) | | | |
| PLCQ2 | | 0.318** | | |
| | | (0.155) | | |
| PLCP1 | | | 0.714*** | |
| | | | (0.258) | |
| PLCP2 | | | | 0.759*** |
| | | | | (0.238) |
| LL | -306.87 | -307.08 | -305.87 | -304.74 |
| AR1 | -0.01 | -0.01 | -0.01 | -0.01 |

Iterated FGSL. Standard errors in parentheses. 40 countries. 644 observations.
Dependent variable is log of real stock return volatility.
Country fixed effects are included.
* significant at 10%; ** significant at 5%;***significant at 1%.

Table 7: Second–stage regressions of the stock market volatility. Full sample. Region FEs.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Growth rate of GDP per capita | -0.101 | -0.100 | -0.059 | -0.039 |
| | (0.134) | (0.134) | (0.134) | (0.133) |
| Log(# publicly listed firms) | 0.035 | 0.036 | 0.034 | 0.034 |
| | (0.027) | (0.027) | (0.027) | (0.027) |
| Capital controls (de jure) | -0.002 | -0.002 | -0.001 | -0.000 |
| | (0.001) | (0.001) | (0.001) | (0.001) |
| PLCQ1 | 0.411** | | | |
| | (0.203) | | | |
| PLCQ2 | | 0.452** | | |
| | | (0.203) | | |
| PLCP1 | | | 0.630** | |
| | | | (0.316) | |
| PLCP2 | | | | 0.909*** |
| | | | | (0.294) |
| I(Creditor rights index = 3 or 4) | -0.140** | -0.120* | -0.143** | -0.108* |
| | (0.063) | (0.064) | (0.062) | (0.065) |
| I(Latin America) | 0.225** | 0.204** | 0.234** | 0.159 |
| I(East Asia-Japan) | 0.305*** | 0.303*** | 0.298*** | 0.302*** |
| I(Asia+Africa) | 0.093 | 0.097 | 0.062 | 0.110 |
| I(Commonwealth+Japan) | -0.207*** | -0.209*** | -0.199** | -0.199** |
| LL | -405.87 | -405.62 | -406.23 | -404.52 |
| AR1 | 0.32 | 0.31 | 0.32 | 0.32 |

Iterated FGSL. Standard errors in parentheses. 40 countries. 682 observations.
Omitted region is Continental Europe.
Dependent variable is log of real stock return volatility.
* significant at 10%; ** significant at 5%;***significant at 1%.

Table 8: Second–stage regressions of the stock market level. Developing countries. Country FEs.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Lagged dependent variable | 0.737*** | 0.730*** | 0.684*** | 0.687*** |
| | (0.025) | (0.026) | (0.029) | (0.030) |
| Growth rate of GDP per capita | 0.724*** | 0.729*** | 0.535*** | 0.613*** |
| | (0.106) | (0.107) | (0.103) | (0.105) |
| PLCQ1 | -0.537*** | | | |
| | (0.144) | | | |
| PLCQ2 | | -0.625*** | | |
| | | (0.150) | | |
| PLCP1 | | | -0.966*** | |
| | | | (0.207) | |
| PLCP2 | | | | -0.749*** |
| | | | | (0.212) |
| LL | -73.24 | -72.70 | -69.81 | -73.41 |
| AR1 | 0.06 | 0.07 | 0.09 | 0.10 |

Iterated FGSL. Standard errors in parentheses. 20 countries. 329 observations
Dependent variable is log of real stock market index.
Country fixed effects are included.
* significant at 10%; ** significant at 5%;***significant at 1%.

Table 9: Second–stage regressions of the stock market level. Developing countries. Region FEs.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Growth rate of GDP per capita | 0.039*** | 0.043*** | 0.013 | 0.019* |
| | (0.012) | (0.012) | (0.010) | (0.011) |
| PLCQ1 | -0.049*** | | | |
| | (0.016) | | | |
| PLCQ2 | | -0.056*** | | |
| | | (0.017) | | |
| PLCP1 | | | -0.182*** | |
| | | | (0.027) | |
| PLCP2 | | | | -0.219*** |
| | | | | (0.035) |
| I(Creditor rights index = 3 or 4) | 0.062** | 0.056** | 0.040 | 0.001 |
| | (0.028) | (0.028) | (0.026) | (0.028) |
| I(East Asia-Japan) | -0.043 | -0.040 | -0.038 | -0.019 |
| | (0.029) | (0.029) | (0.027) | (0.028) |
| I(Asia+Africa) | -0.032 | -0.029 | -0.008 | 0.005 |
| | (0.031) | (0.031) | (0.029) | (0.030) |
| LL | 533.59 | 535.93 | 546.49 | 543.03 |
| AR1 | 0.67 | 0.68 | 0.66 | 0.67 |

Iterated FGSL. Standard errors in parentheses. 20 countries. 348 observations
Omitted region is Latin America.
Dependent variable is log of real stock market index.
* significant at 10%; ** significant at 5%;***significant at 1%.

Table 10: Second–stage regressions of the stock market volatility. Developing countries. Country FEs.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Lagged dependent variable | 0.345*** | 0.345*** | 0.350*** | 0.345*** |
| | (0.046) | (0.046) | (0.046) | (0.046) |
| Growth rate of GDP per capita | -0.564*** | -0.572*** | -0.521*** | -0.499*** |
| | (0.138) | (0.138) | (0.143) | (0.140) |
| Log(# publicly listed firms) | -0.091* | -0.088* | -0.075 | -0.072 |
| | (0.048) | (0.048) | (0.049) | (0.049) |
| Capital controls (de jure) | -0.002 | -0.002 | -0.001 | -0.000 |
| | (0.002) | (0.002) | (0.002) | (0.002) |
| PLCQ1 | 0.367** | | | |
| | (0.164) | | | |
| PLCQ2 | | 0.334** | | |
| | | (0.163) | | |
| PLCP1 | | | 0.396 | |
| | | | (0.269) | |
| PLCP2 | | | | 0.509** |
| | | | | (0.253) |
| LL | -171.90 | -172.29 | -173.23 | -172.46 |
| AR1 | 0.02 | 0.02 | 0.02 | 0.03 |

Iterated FGSL. Standard errors in parentheses. 20 countries. 328 observations
Dependent variable is log of real stock return volatility.
Country fixed effects are included.
* significant at 10%; ** significant at 5%;***significant at 1%.

Table 11: Second–stage regressions of the stock market volatility. Developing countries. Region FEs.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Growth rate of GDP per capita | -0.425*** | -0.427*** | -0.333** | -0.319** |
| | (0.159) | (0.159) | (0.162) | (0.161) |
| Log(# publicly listed firms) | 0.109** | 0.109** | 0.107** | 0.109** |
| | (0.046) | (0.046) | (0.047) | (0.046) |
| Capital controls (de jure) | -0.001 | -0.001 | -0.000 | -0.000 |
| | (0.002) | (0.002) | (0.002) | (0.002) |
| PLCQ1 | 0.371* | | | |
| | (0.200) | | | |
| PLCQ2 | | 0.343* | | |
| | | (0.200) | | |
| PLCP1 | | | 0.268 | |
| | | | (0.297) | |
| PLCP2 | | | | 0.410 |
| | | | | (0.315) |
| I(Creditor rights index = 3 or 4) | -0.946*** | -0.917*** | -0.959*** | -0.889*** |
| | (0.119) | (0.123) | (0.118) | (0.134) |
| I(East Asia-Japan) | 0.791*** | 0.788*** | 0.769*** | 0.759*** |
| | (0.141) | (0.141) | (0.141) | (0.142) |
| I(Asia+Africa) | 0.599*** | 0.600*** | 0.585*** | 0.573*** |
| | (0.117) | (0.117) | (0.118) | (0.119) |
| LL | -241.17 | -241.33 | -242.33 | -242.18 |
| AR1 | 0.38 | 0.38 | 0.38 | 0.38 |

Iterated FGSL. Standard errors in parentheses. 20 countries. 347 observations
Omitted region is Latin America.
Dependent variable is log of real stock return volatility.
* significant at 10%; ** significant at 5%;***significant at 1%.

Table 12: Second–stage regressions of the stock market level. Developed countries. Country FEs.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Lagged dependent variable | 0.785*** | 0.785*** | 0.782*** | 0.781*** |
| | (0.028) | (0.028) | (0.029) | (0.029) |
| Growth rate of GDP per capita | -0.240*** | -0.236*** | -0.213** | -0.214** |
| | (0.083) | (0.083) | (0.085) | (0.085) |
| PLCQ1 | -1.000*** | | | |
| | (0.222) | | | |
| PLCQ2 | | -0.896*** | | |
| | | (0.210) | | |
| PLCP1 | | | -0.350 | |
| | | | (0.624) | |
| PLCP2 | | | | -0.279 |
| | | | | (0.511) |
| LL | 114.96 | 113.97 | 107.56 | 107.60 |
| AR1 | 0.23 | 0.23 | 0.25 | 0.25 |

Iterated FGSL. Standard errors in parentheses. 20 countries. 325 observations
Dependent variable is log of real stock market index.
Country fixed effects are included.
* significant at 10%; ** significant at 5%;***significant at 1%.

Table 13: Second–stage regressions of the stock market level. Developed countries. Region FEs.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Growth rate of GDP per capita | 0.023* | 0.022* | 0.013 | 0.012 |
| | (0.013) | (0.013) | (0.014) | (0.013) |
| PLCQ1 | -0.143*** | | | |
| | (0.032) | | | |
| PLCQ2 | | -0.123*** | | |
| | | (0.029) | | |
| PLCP1 | | | -0.084 | |
| | | | (0.085) | |
| PLCP2 | | | | -0.085 |
| | | | | (0.072) |
| I(Creditor rights index = 3 or 4) | -0.011 | -0.014 | -0.009 | -0.011 |
| | (0.013) | (0.013) | (0.013) | (0.013) |
| I(Commonwealth+Japan) | 0.039*** | 0.039*** | 0.036*** | 0.036*** |
| | (0.010) | (0.010) | (0.010) | (0.010) |
| LL | 694.69 | 694.66 | 691.33 | 692.77 |
| AR1 | 0.75 | 0.75 | 0.75 | 0.75 |

Iterated FGSL. Standard errors in parentheses. 20 countries. 345 observations
Omitted region is Continental Europe.
Dependent variable is log of real stock market index.
* significant at 10%; ** significant at 5%;***significant at 1%.

Table 14: Second–stage regressions of the stock market volatility. Developed countries. Country FEs.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Lagged dependent variable | 0.120** | 0.116** | 0.096* | 0.104* |
| | (0.057) | (0.057) | (0.055) | (0.056) |
| Growth rate of GDP per capita | 0.235 | 0.245 | 0.200 | 0.207 |
| | (0.191) | (0.191) | (0.185) | (0.186) |
| Log(# publicly listed firms) | 0.144* | 0.153** | 0.178** | 0.178** |
| | (0.077) | (0.078) | (0.074) | (0.075) |
| Capital controls (de jure) | -0.001 | -0.001 | 0.002 | 0.002 |
| | (0.002) | (0.002) | (0.002) | (0.002) |
| PLCQ1 | 0.388 | | | |
| | (0.426) | | | |
| PLCQ2 | | 0.512 | | |
| | | (0.394) | | |
| PLCP1 | | | 4.536*** | |
| | | | (1.347) | |
| PLCP2 | | | | 3.014*** |
| | | | | (1.050) |
| LL | -123.49 | -123.08 | -118.98 | -120.34 |
| AR1 | 0.01 | 0.01 | 0.01 | 0.01 |

Iterated FGSL. Standard errors in parentheses. 20 countries. 316 observations
Dependent variable is log of real stock return volatility.
Country fixed effects are included.
* significant at 10%; ** significant at 5%;***significant at 1%.

Table 15: Second–stage regressions of the stock market volatility. Developed countries. Region FEs.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Growth rate of GDP per capita | 0.237 | 0.241 | 0.202 | 0.213 |
| | (0.189) | (0.189) | (0.184) | (0.186) |
| Log(# publicly listed firms) | 0.005 | 0.005 | 0.007 | 0.004 |
| | (0.032) | (0.032) | (0.031) | (0.031) |
| Capital controls (de jure) | -0.002 | -0.002 | 0.001 | 0.001 |
| | (0.002) | (0.002) | (0.002) | (0.002) |
| PLCQ1 | 0.347 | | | |
| | (0.414) | | | |
| PLCQ2 | | 0.494 | | |
| | | (0.383) | | |
| PLCP1 | | | 3.899*** | |
| | | | (1.169) | |
| PLCP2 | | | | 2.431*** |
| | | | | (0.890) |
| I(Creditor rights index = 3 or 4) | -0.084 | -0.065 | -0.069 | -0.012 |
| | (0.068) | (0.070) | (0.066) | (0.072) |
| I(Commonwealth+Japan) | -0.174** | -0.174** | -0.162** | -0.158** |
| | (0.081) | (0.081) | (0.079) | (0.079) |
| LL | -149.34 | -148.99 | -145.11 | -146.72 |
| AR1 | 0.25 | 0.25 | 0.25 | 0.25 |

Iterated FGSL. Standard errors in parentheses. 20 countries. 335 observations
Omitted region is Continental Europe.
Dependent variable is log of real stock return volatility.
* significant at 10%; ** significant at 5%;***significant at 1%.