Country Insurance and Corporate Risk-Taking

Hui Tong (IMF)

Shang-Jin Wei (Columbia University)

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(Does not necessarily reflect IMF's view)

Rising FX Reserves

Lessons from Asian Crisis

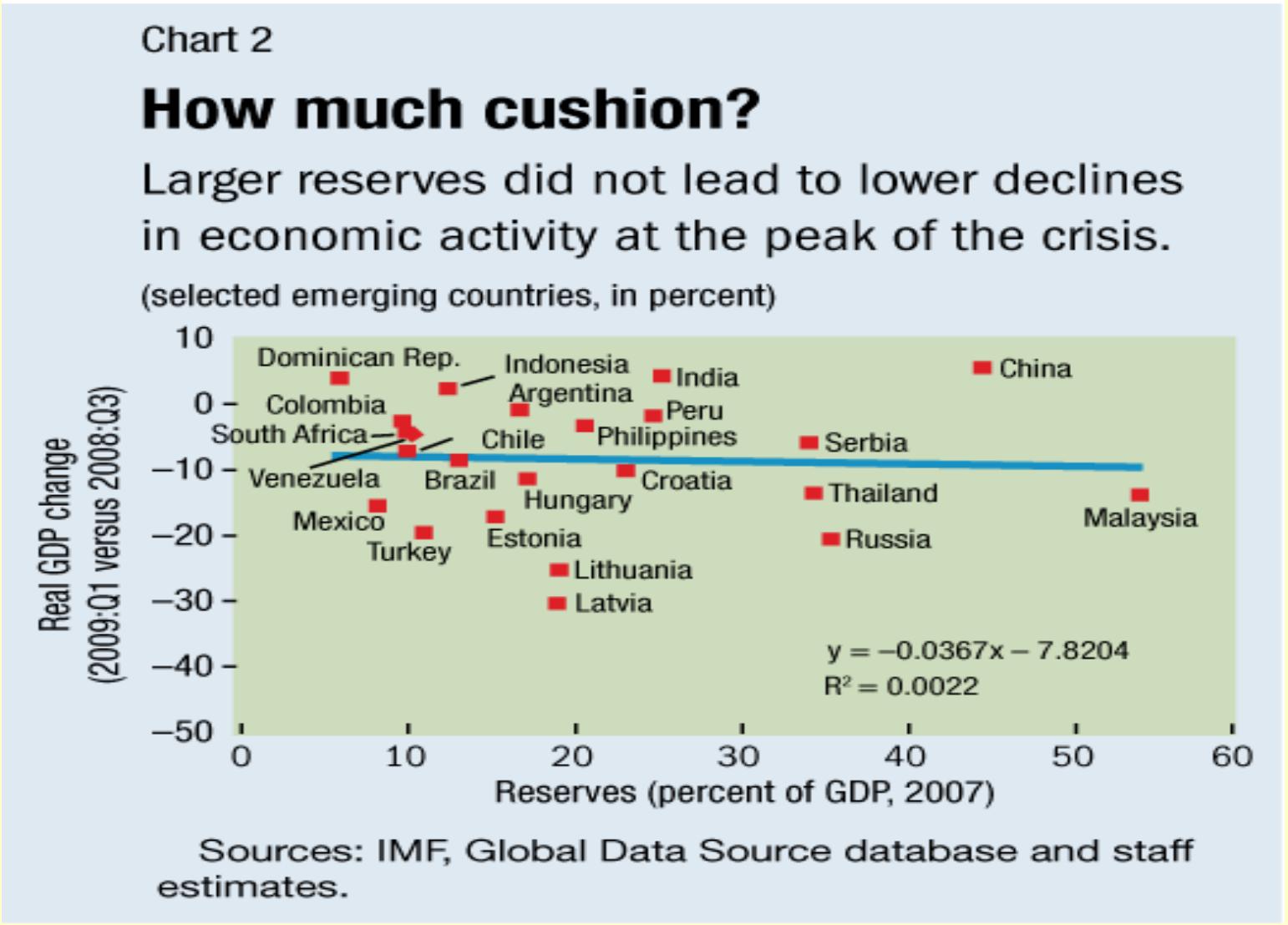
- "Emerging markets must inoculate themselves against future currency attacks by increasing liquidity, such as foreign reserves"
  - In *Foreign Affairs* (1999), "A Self Helping Guide for Emerging Markets", by Martin Feldstein.

- Reserve accumulation reduces currency crisis (Frankel and Rose, 96), twin crisis (Kaminsky and Reinhart, 99), and hence liquidity shocks.

- Frankel and Saravelos (2010) find that low FX reserves as a leading indicator of the current crisis.

Much ado about nothing?

(Blanchard et al, 2010)



One Mechanism

- Reserve accumulation, as an increase in country insurance, could induce firms to increase risk taking and hence to make themselves more vulnerable to negative shocks.

Main Findings

- For 4893 firms in 24 emerging economies over 2000-06, a robust but previously undocumented data pattern:
  - corporate risk taking is positively correlated with country-level Reserve/GDP.

- Particularly for sectors that intrinsically have more liquidity needs for working capital and capital expenditure.
- Still hold when Reserve/GDP is instrumented by cumulative trade surplus/GDP.
- Some indications of excessive risk taking.

Measurement of Corporate Risk

- Risk in financial policy:
  - High leverage: Total debt over total asset;
  - Low cash holding: Cash holding/Asset;

- Risk in investment policy, Coles et al. (2006) :
  - Relatively more investment in R&D than in physical capital; *log(1+RD/Capital Expenditure).*

- Risk measured by weekly stock return volatility, as in Laeven and Levin (2009). Both total volatility and idiosyncratic volatility.

Data

- We look at 4893 listed manufacturing firms in 24 emerging economies over the period from 2000 to 2006.

Figure 4: Average Leverage (for a Given Reserve/GDP) against Reserve/GDP, conditional on Country and Year Fixed Effects

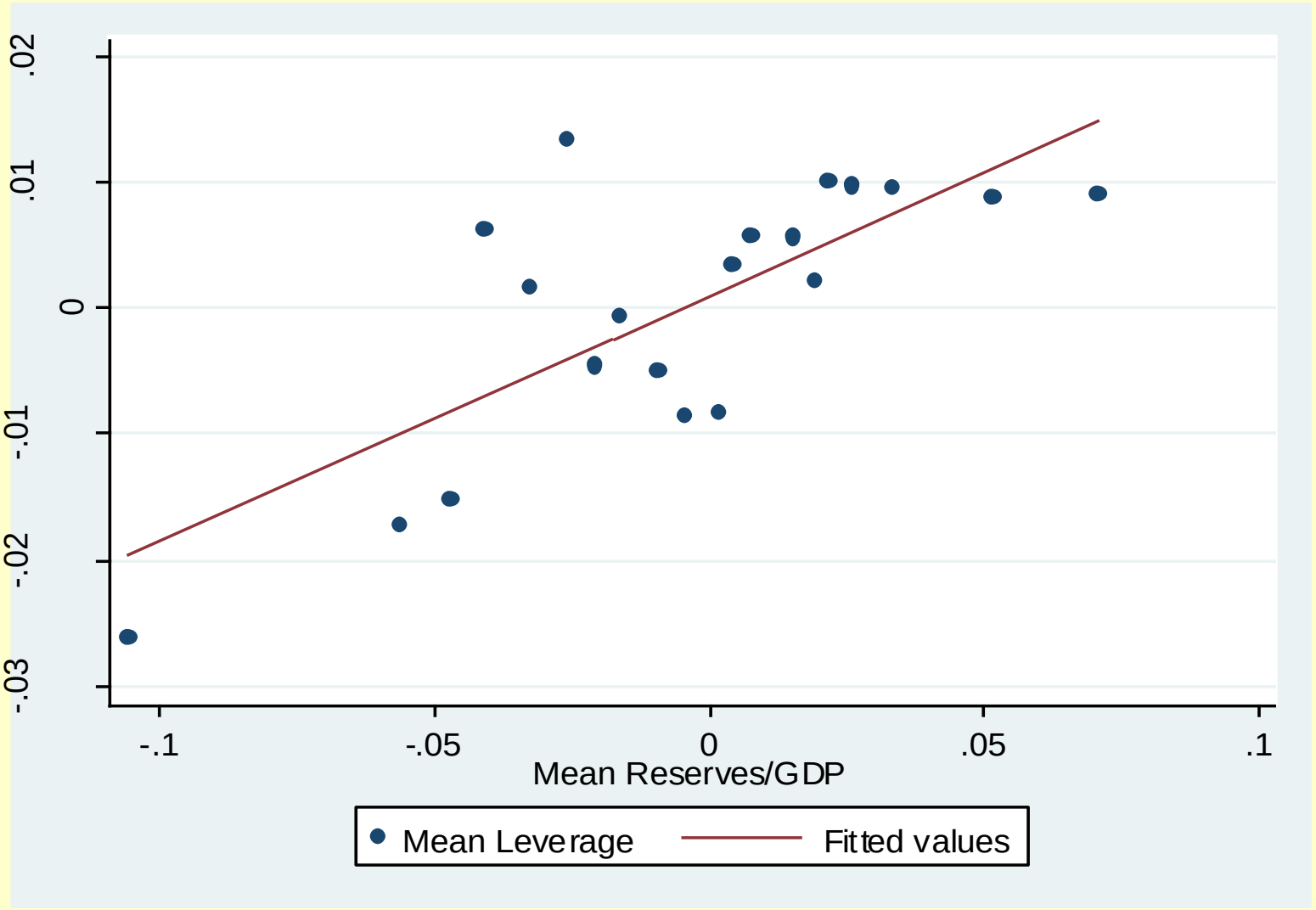


Figure 5: Average Cash/Assets (for a Given Reserve/GDP) vs Reserve/GDP, Conditional on Country and Year Fixed Effects

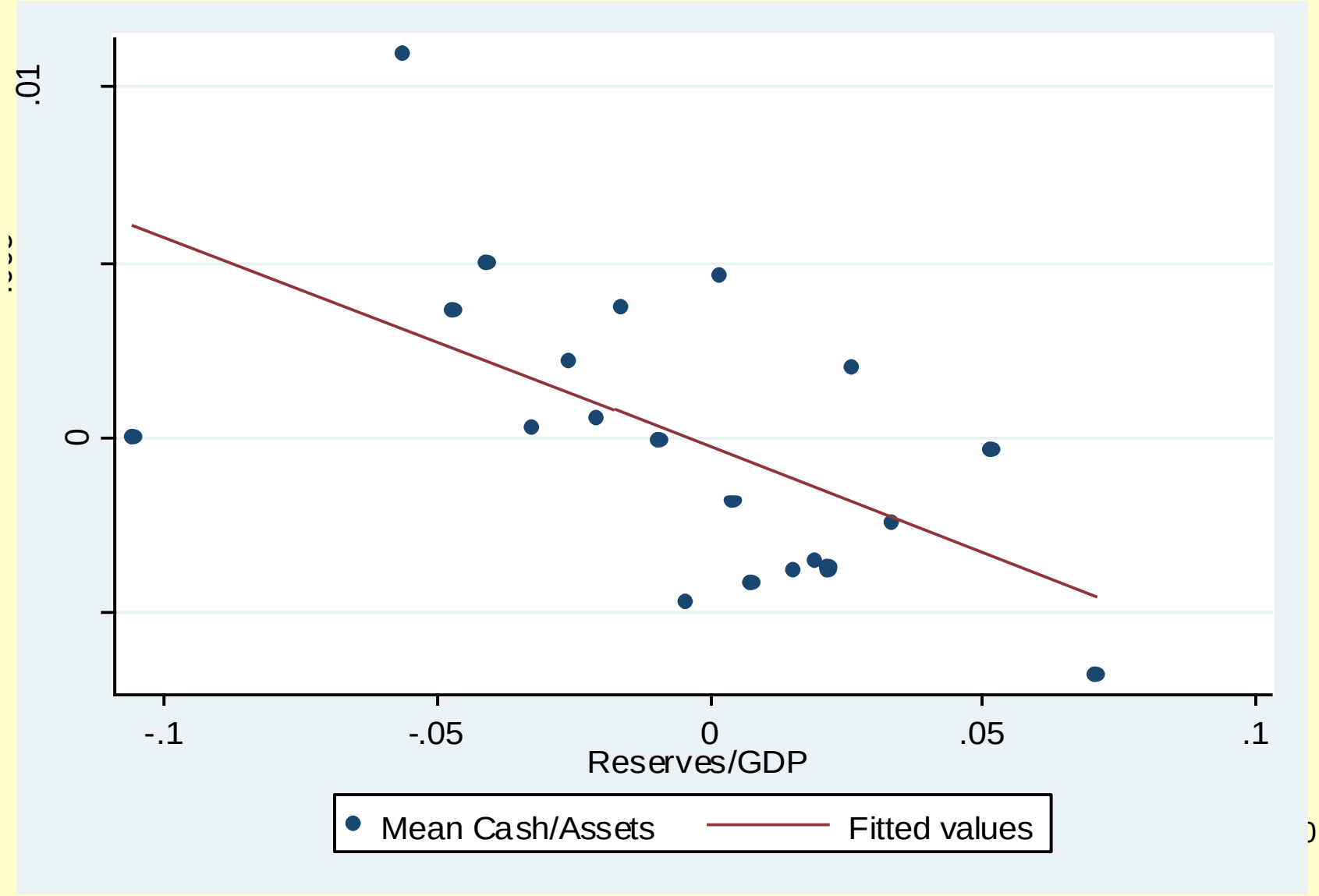


Figure 6: Average Risky Investment (for a Given Reserve/GDP) vs Reserve/GDP, Conditional on Country and Year Effects

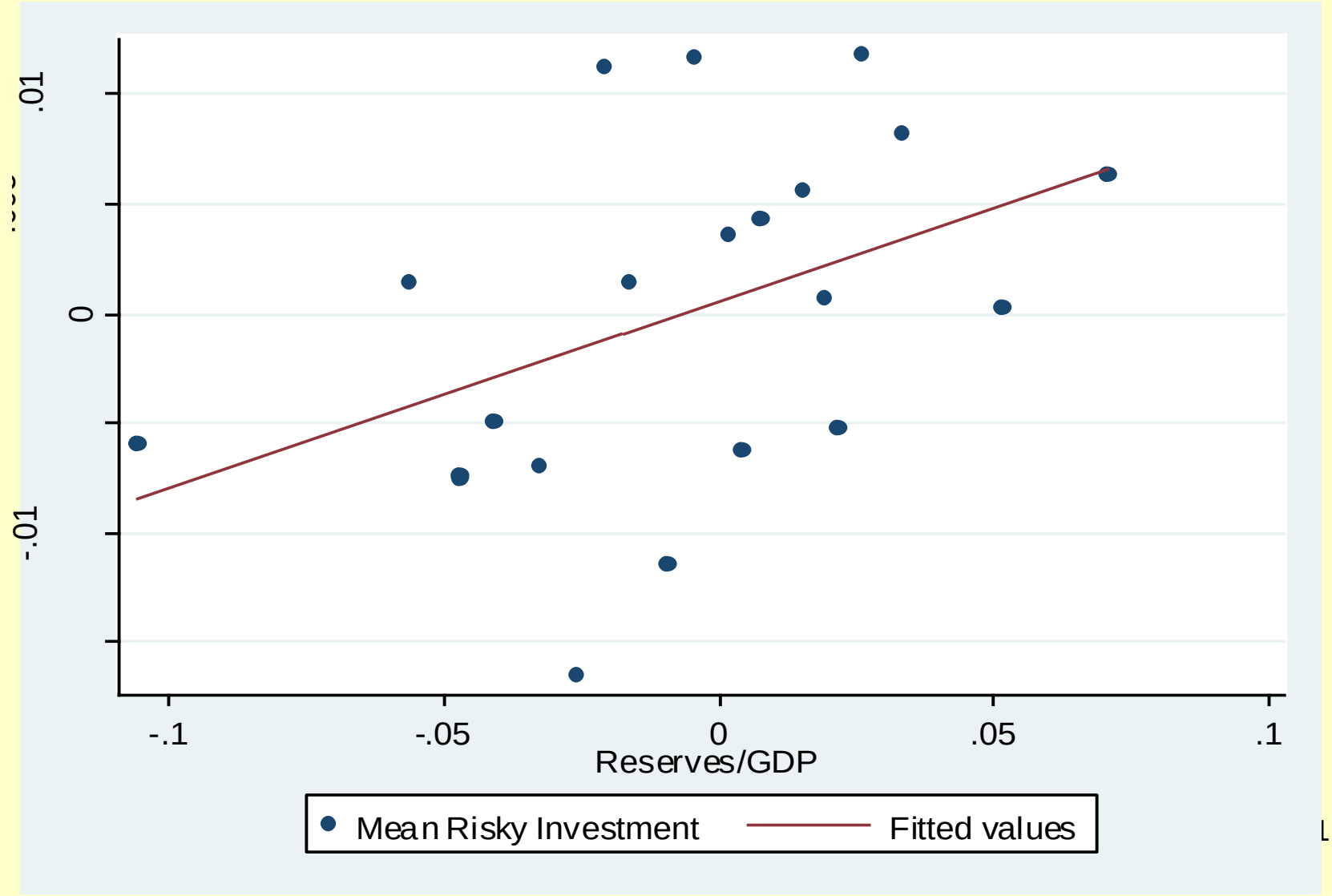
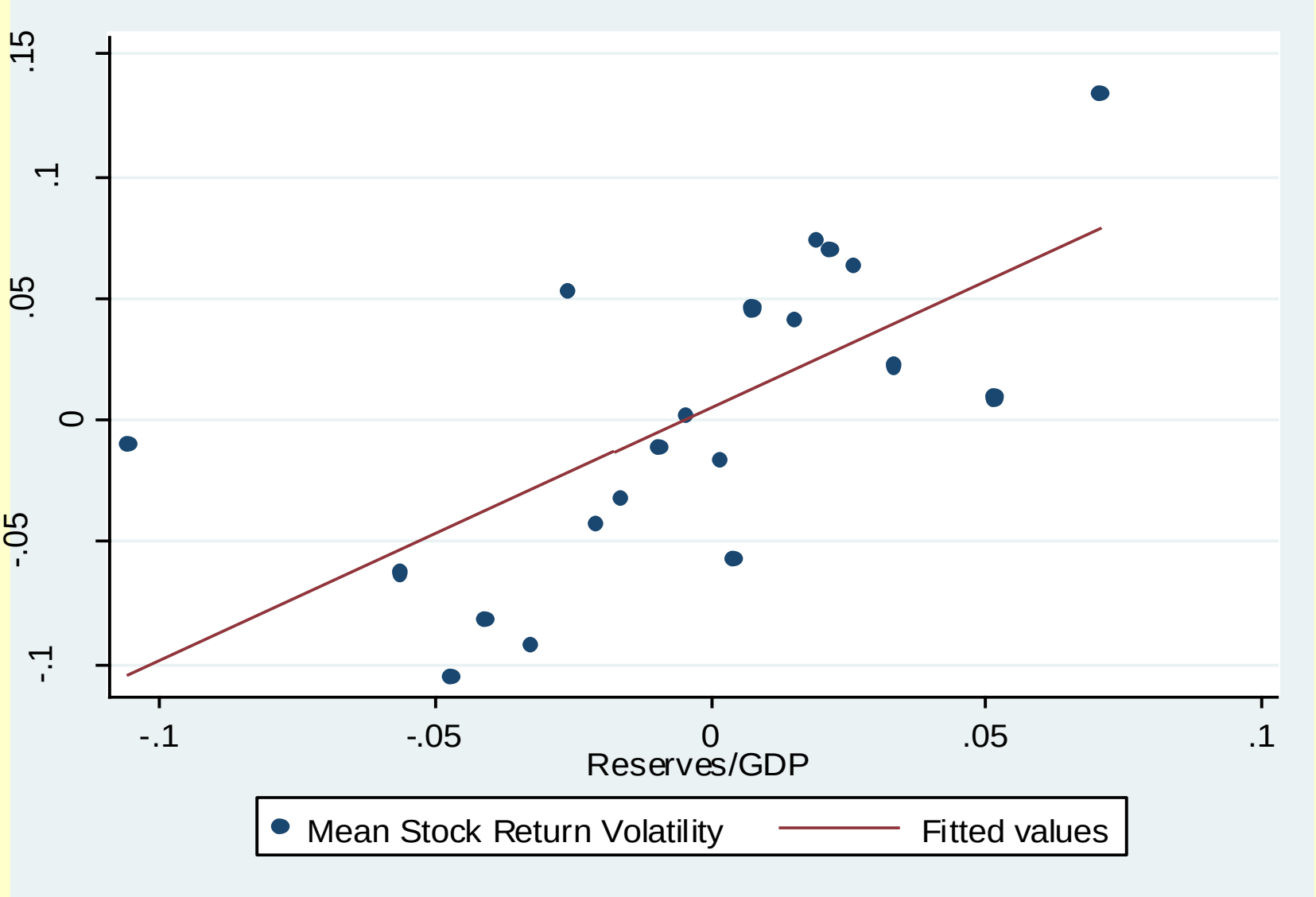


Figure 7: Average Weekly Stock Return Volatility (for a Given Reserve/GDP) vs Reserve/GDP, Conditional on Country and Year Fixed Effects



Correlation or Causality

- At least part of the correlation is due to greater corporate risk taking in response to country's ability to defend against sudden stops.
- We implement a few estimation strategies:
  - Explicitly control for potential common factors and alternative explanations;
  - Explore cross-sector heterogeneity, based on sector's intrinsic vulnerability to liquidity crisis;
  - Use instrumental variable estimation;

Empirical Model

$$RT_{ikt} = \beta\, FXR_{k,t-1} + Controls_{ikt} + Firm\_Effects_i + Year\_Effects_t + \varepsilon_{ikt}$$

- Risk taking for firm i in country k at time t;

Macro and firm Controls

- Macro controls
  - Domestic Liquidity: Broad money over GDP (Obstfeld et al 2009), Domestic private credit over GDP.
  - International Liquidity: financial openness, Debt Liability/GDP

- Firm-level controls
  - Firm size (total assets);Firm growth opportunity (Tobin's Q); Tangibility (PP&E/assets); Profitability (EBIT/total asset)
  - Firm fixed effects

Table 2. The Effect of Reserves on Corporate Risk Taking

	Leverage	Cash/Assets	Risky Investment	Stock Return Volatility
Reserve/GDP	0.14***	-0.12***	0.059*	1.03**
	[0.045]	[0.027]	[0.031]	[0.42]
Growth opportunity	0.0034	0.013***	-0.0013	0.011
Firm size	0.055***	-0.0024	-0.017***	-0.095***
Profit	-0.26***	0.063***	-0.098***	-0.097**
Tangibility	0.17***	-0.31***	-0.086***	0.064*
M2/GDP	0.0011***	0.00038*	0.00046*	0.0033
Domestic Credit/GDP	-0.00068***	-0.00016	0.00047**	-0.00052
Foreign Debt/GDP	0.067***	0.029**	0.0093	0.49***
Financial Openness	-0.014**	-0.0095***	-0.0056	-0.13***
Observations	24386	24364	23623	23007

Identification Issues -What is the mechanism?

- If FX reserves causes corporate risk-taking, what is the mechanism?
  - Is it due to the role of country insurance?
  - Or because the CB's intervention results in the change of monetary supply (without sterilization) or borrowing cost (with sterilization)?
    - We have controlled for this channel by adding broad money and domestic credit over GDP.

Differential Effect across Sectors

- We allow the effect of foreign reserves to vary across sector j, according to their intrinsic dependence on external (i.e. non-internal) finance:

$$\beta_j = \beta_1 + \beta_2 * DependenceonExternalFinance_j$$

- Sectors that depend on external finance suffered more during the 2008-09 crisis (Tong and Wei 2010, RFS).

Differential Effect across Sectors

- If leverage reflects active risk-taking by firms, then firms that are more liquidity constrained *ex ante* would undertake risks more aggressively *ex post*, when country insurance is perceived to be stronger.

- In comparison, a mechanical correlation that does not involve firms actively re-optimizing their risk taking would only change the risks of all firms proportionately.

Intrinsic Needs for Working Capital

- Intrinsic Need for working capital

Cash conversion cycle

$$= 365 * \left(\frac{\text{inventories - account payables}}{\text{cost of goods sold}} + \frac{\text{account receivables}}{\text{total sales}} \right)$$

- We first calculate this ratio for U.S. firms from 1990 to 2006, then take the SIC 3-digit sector median (DEF_WK).
- We apply DEF_WK to other countries, similar to Raddatz (2006 JFE) and Kroszner et al.(2007 JFE).

Intrinsic Dependence on External Finance for Capital Investment

- Dependence on external finance for investment

$$= \frac{[\text{capital expenditures - cash flow}]}{\text{capital expenditures}},$$

- We first calculate this ratio annually for U.S. firms from 1990 to 2006, then construct the SIC 3-digit sector median (DEF_INV).
- We apply DEF_INV to other countries, following Rajan and Zingales (AER 1998).

Table 3. Differential Impact of Reserves on Corporate Risk Taking

	Leverage	**Cash/Assets**	**Risky Investment**	**Stock Return Volatility**
Reserve/GDP	0.043	0.0068	-0.087*	0.63
	[0.060]	[0.025]	[0.051]	[0.51]
Reserve/GDP*DEP_WK	0.037***	-0.045***	0.043**	0.098
	[0.013]	[0.011]	[0.019]	[0.065]
Reserve/GDP*DEP_INV	0.0033	-0.0098	0.052**	0.14***
	[0.010]	[0.0095]	[0.020]	[0.048]
Growth opportunity	0.0025	0.013***	-0.0013	0.012
Firm size	0.055***	-0.0035	-0.018***	-0.092***
Profit	-0.26***	0.064***	-0.10***	-0.10**
Tangibility	0.17***	-0.32***	-0.090***	0.078**
M2/GDP	0.0010***	0.00037*	0.00041	0.0034
Domestic Credit/GDP	-0.00065***	-0.000088	0.00047**	-0.0005
Foreign Debt/GDP	0.065***	0.025**	0.0042	0.52***
Financial Openness	-0.012**	-0.0086***	-0.0051	-0.14***

Identification Issues-Reverse causality?

- Central bank less likely responds to firm's idiosyncratic risk. It'll respond to aggregate liquidity situation; controlled for by macro variables as RHS.

- We instrument reserve/GDP by cumulative trade surplus (TS) over GDP (cumulative from the year of 1999).

  - Could TS affect risk taking directly? Already captured by firm-level profits, growth opportunity, and 4-digit sector-level exports.
  - TS and Reserves may both correlate with financial globalization, but we control for financial globalization.

Table 4. First Stage Estimation of Foreign Reserve/GDP

Cumulative Trade Surplus/GDP	0.89***
	[0.30]
Growth opportunity	-0.0031**
Firm size	-0.0024
Profit	0.0023
Tangibility	0.009
M2/GDP	0.0049***
Domestic Credit/GDP	-0.0016***
Foreign Debt/GDP	0.14***
Financial Openness	-0.043***
Firm and year dummies	yes
Observations	24386
Number of firms	5410
Within R-squared	0.712

Table 5. The Effect of Reserves on Corporate Risk Taking -IV Estimation

	Leverage	Cash/Assets	Risky Investment	Stock Return Volatility
Predicted Reserve/GDP	0.83***	-0.47***	0.24*	0.95
	[0.18]	[0.086]	[0.13]	[1.22]
Growth opportunity	0.0068**	0.011***	-0.00041	0.01
Firm size	0.058***	-0.0036	-0.016***	-0.096***
Profit	-0.26***	0.063***	-0.098***	-0.096**
Tangibility	0.17***	-0.31***	-0.087***	0.065
M2/GDP	-0.0017***	0.0018***	-0.00027	0.004
Domestic Credit/GDP	0.00087*	-0.00094***	0.00087***	-7E-04
Foreign Debt/GDP	-0.043	0.084***	-0.02	0.50**
Financial Openness	0.016**	-0.025***	0.0022	-0.14**
Firm and year dummies	yes	yes	yes	yes
R-squared	0.14	0.152	0.019	0.13

Table 6. Differential Impact of Reserves on Corporate Risk-Taking -IV Estimation

	Leverage	Cash/Assets	Risky Investment	Return Volatility
Predicted Reserves	0.63***	-0.33***	0.15	0.23
	[0.20]	[0.081]	[0.15]	[1.19]
Predicted Res*DEP_WK	0.066***	-0.050***	0.023	0.14**
	[0.020]	[0.013]	[0.028]	[0.069]
Predicted Res*DEP_INV	0.0087	-0.017	0.079***	0.17***
	[0.014]	[0.012]	[0.026]	[0.047]
Growth opportunity	0.0058**	0.011***	-0.00025	0.011
Firm size	0.058***	-0.0046	-0.017***	-0.094***
Profit	-0.26***	0.064***	-0.10***	-0.10**
Tangibility	0.17***	-0.32***	-0.092***	0.081**
M2/GDP	-0.0017***	0.0018***	-0.00043	0.0045
Domestic Credit/GDP	0.00085*	-0.00088***	0.00092***	-0.0011
Foreign Debt/GDP	-0.041	0.082***	-0.028	0.57***
Financial Openness	0.016**	-0.024***	0.0035	-0.15***

Table 9a: Reserves and Systemic Volatility

	Country	Country -IV	Firm	Firm	Firm-IV	Firm-IV
Reserve/GDP	-5.09**	-11.8**	0.5	2.09	-6.29	-6.11
	[2.19]	[5.75]	[1.50]	[1.60]	[6.91]	[6.47]
Reserve/GDP*DEP_WK				-0.82***		-0.79**
				[0.27]		[0.35]
Reserve/GDP*DEP_INV				0.077		0.19
				[0.23]		[0.26]
M2/GDP	0.011	0.033	0.025**	0.028**	0.053*	0.061**
Domestic Credit/GDP	-0.0094	-0.021	0.0032	0.0028	-0.012	-0.016
Foreign Debt/GDP	1.12	1.12	1.55**	1.71**	2.65*	3.02**
Financial Openness	-0.51	-0.51	-0.59***	-0.63***	-0.89**	-0.98***
Growth opportunity			0.16***	0.15***	0.12*	0.11*
Firm size			0.065	0.073	0.037	0.043
Tangibility			-0.66***	-0.57**	-0.60**	-0.49*
Year + country dummies	y	y	y	y	y	y
Firm fixed effects	n	n	y	y	y	y
Observations	168	168	20948	19606	20766	19435

Table 9b. The Impact of Reserve Accumulation on Idiosyncratic Stock Return Volatility

	Average Effect	Asymmetric Effect	Average Effect IV	Asymmetric Effect IV
Reserve/GDP	0.93**	0.42	1.24	0.52
	[0.46]	[0.55]	[1.11]	[1.09]
Reserve/GDP*DEP_WK		0.12*		0.14*
		[0.069]		[0.081]
Reserve/GDP*DEP_INV		0.22***		0.27***
		[0.053]		[0.060]
Growth opportunity	0.01	0.011	0.012	0.013
Firm size	-0.11***	-0.11***	-0.11***	-0.11***
Profit	-0.17***	-0.18***	-0.17***	-0.18***
Tangibility	0.14***	0.16***	0.14***	0.15***
M2/GDP	0.0025	0.0022	0.0012	0.0017
Domestic Credit/GDP	-0.0016	-0.0016	-0.00083	-0.0013
Foreign Debt/GDP	0.48***	0.50***	0.43*	0.49**
Financial Openness	-0.12***	-0.12***	-0.11*	-0.12*

Excessive Risk Taking?

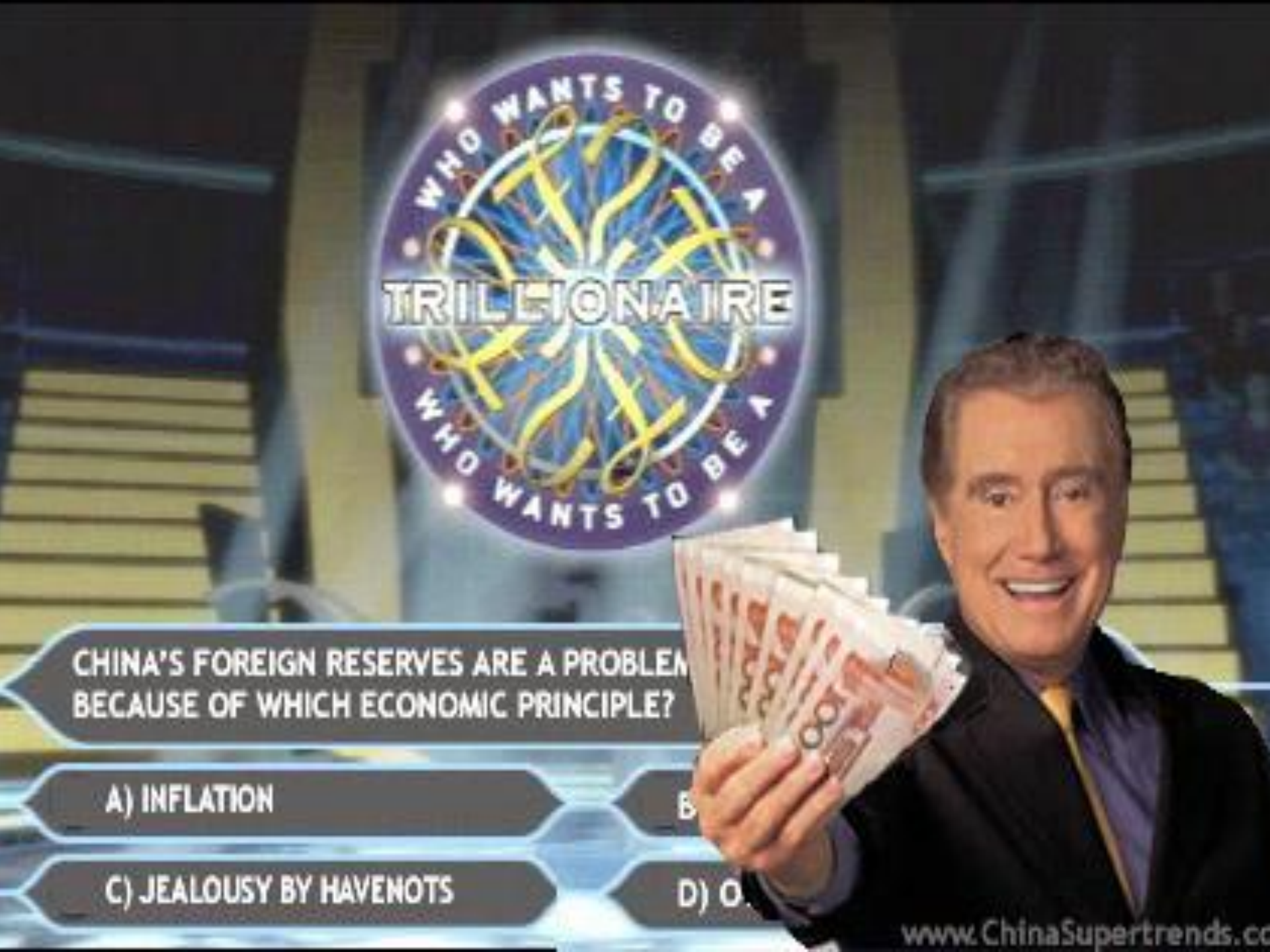
- Is the risk taking excessive?
- We look at the market impact of foreign reserve accumulation.

Table 10a. The Valuation Effect of Foreign Reserve
----DEV: Tobin's Q

	Average Effect	Asymmetric Effect	Average Effect-IV	Asymmetric Effect-IV
Reserve/GDP	-1.63***	-0.7	-7.10***	-6.47***
Reserve/GDP*DEP_WK		-0.35**		-0.25
Reserve/GDP*DEP_INV		-0.095		-0.16
Firm size	-0.25***	-0.26***	-0.26***	-0.27***
Profit	0.70***	0.75***	0.69***	0.74***
Tangibility	-0.47***	-0.48***	-0.42***	-0.42***
M2/GDP	-0.0063	-0.0063	0.017**	0.017**
Domestic Credit/GDP	0.0011	0.0014	-0.011**	-0.011**
Foreign Debt/GDP	-0.1	-0.13	0.79**	0.78**
Financial Openness	0.054	0.058	-0.19**	-0.19**

Table 10b. The Valuation Effect of Foreign Reserve
DEV: Stock Price

	Average Effect	Asymmetric Effect	Average Effect-IV	Asymmetric Effect-IV
Reserve/GDP	-2.30***	-0.9	-14.7***	-13.1***
Reserve/GDP*DEP_WK		-0.44***		-0.38**
Reserve/GDP*DEP_INV		-0.33**		-0.58***
Firm size	0.51***	0.50***	0.48***	0.47***
Profit	1.22***	1.23***	1.20***	1.21***
Tangibility	-0.52***	-0.51***	-0.40***	-0.38***
M2/GDP	-0.0099	-0.01	0.042***	0.041***
Domestic Credit/GDP	0.0063	0.0067*	-0.022***	-0.021***
Foreign Debt/GDP	0.42	0.38	2.44***	2.38***
Financial Openness	-0.14	-0.14	-0.69***	-0.68***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