Discussion of 'Sudden Stops, Financial Crises and Leverage: A Fisherian Deflation of Tobon's Q'

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Characteristics of Sudden Stops

- *After* a sudden stop we see:
  - Sharp reversal of international capital flows.
  - Sudden increase in net exports, driven by a sharp fall in imports.
  - Large fall in output.
  - Fall in asset prices.
- *Before* a sudden stop we see:
  - Domestic absorption (C+I+G) above trend.
  - Trade balance below trend.
  - High asset prices.

A Challenge

- Mendoza: explaining Sudden Stops is a challenge for a large class of DSGE small open economy models.
- These models (even with nominal rigidities) assume perfect world credit markets.
- In response to a large output drop, households borrow from abroad.
- Data suggest the opposite.
- Net exports rise, current account improves precisely when consumption and output collapse.

Mendoza paper

- Develops a framework that accounts for qualitative characteristics of Sudden Stops and 'normal' business cycles.
- Key Features:
  - Purely real model.
  - Domestic agents borrow from abroad to pay for wage bill, imported intermediate goods and consumption loans.
  - There's a collateral constraint on total borrowing from abroad.
  - 3 shocks: TFP, foreign interest rate, price of imported goods.

Mendoza Paper

- Calibrate model to Mexican data
- Model can match
  - Behavior of output, consumption, investment and net exports when Sudden Stop occurs.
  - Period of economic expansion that precede Sudden Stop.
  - Pattern of recovery that follows.
  - Reproduce qualitative (not quantitative) behavior of Tobin's Q.

Outline of discussion

- Point to key features of model that lead to large kick from collateral constraints.
- Discuss frictionless market, alternative explanation of Sudden Stops.
- Breaking the observational equivalence of the two explanations
  - The different characteristics of business cycles in emerging and developed economies.
  - Micro evidence on collateral constraints in emerging markets.
- What's missing from the model(s)?

The Model

$$E_0\left[\sum_{t=0}^{\infty}\exp\left(-\sum_{\tau=0}^{t-1}\rho(c_\tau - N(L_\tau))\right)u(c_t - N(L_t))\right]$$

$$c_t + i_t + p_t v_t = \exp(\varepsilon_t^A)F(k_t, L_t, v_t) - \phi(R_t - 1)(w_t L_t + p_t v_t) - q_t^b b_{t+1} + b_t$$

$$F(k_t, L_t, v_t) = A k_t^\beta L_t^\alpha v_t^\eta,\ \alpha + \beta + \eta = 1$$

$$i_t = \delta k_t + (k_{t+1} - k_t)\left[1 + \Psi\left(\frac{k_{t+1} - k_t}{k_t}\right)\right]$$

$$(w_t L_t + p_t v_t) - q_t^b b_{t+1} \leq \kappa q_t k_{t+1}$$

Shocks

$$R_t = R(\exp(\varepsilon_t^R)$$

$$p_t = p(\exp \varepsilon_t^p)$$

- ε_t^A, ε_t^R, and ε_t^p follow a stationary joint first-order Markov process.

The collateral constraint

- Sudden Stops are driven by two "credit channel" effects.

  (1) Endogenous financing premium affects one-period debt, working capital loans, and the return on equity.

    - Premium reflects fact that effective cost of borrowing rises when the collateral constraint binds.

  (2) Debt-deflation mechanism.

    - When collateral constraint binds, agents sell capital to meet "margin calls."
    - Sale of assets reduces price of capital.
    - Further tightens constraint, sets off further fall in asset prices ...

- Deb deflation mechanism is key source of amplification.

- Increasing κ per se has only small effects on amplification.

Why is debt deflation mechanism powerful in this model?

- Intermediate goods are important for production.
- Firms must borrow in advance to pay for intermediate goods and labor.
- The amount that firms borrow enters into their collateral constraint.
- If there were no costs of adjustment, Tobin's q would be constant and the debt deflation mechanism would be shut down.
- For this mechanism to be important, q must move around a lot.

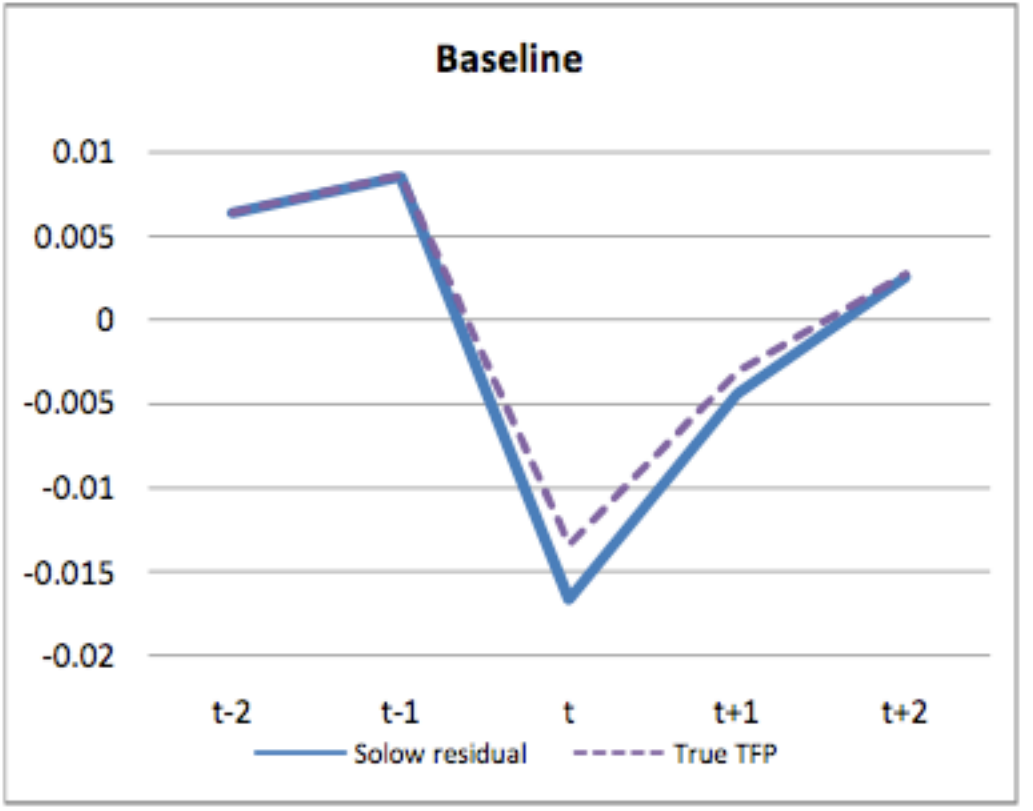
Intuition

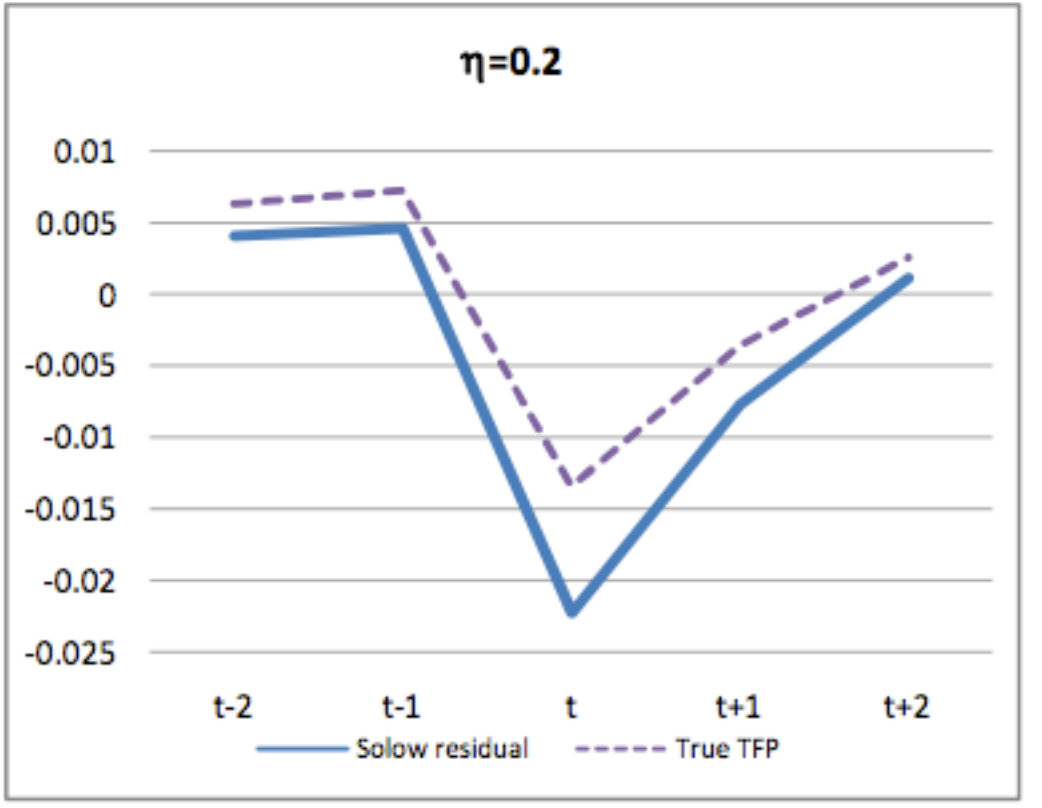
- By assumption MPK is an increasing function of L_t and v_t.
- If the collateral constraint binds you have to employ less L_t and v_t.
- But this reduces MPK which leads to a fall in q_t.

What is a Sudden Stop in this model?

- Good shocks lead to booming economy, high leverage.
    - Positive TFP shocks, low prices of intermediate goods and low interest rates.
- Then a bad shock hits: low realization of technology.
- Negative consequences magnified by debt deflation mechanism.

Figure 3: Solow Residuals and "True" TFP in Sudden Stop Events
(means of deviations from long-run averages)





Why does the current account improve after a sudden stop?

- Agents would like to borrow to smooth consumption.
- They can't because the collateral constraint is binding.
- The bad technology shock (positively serially correlated) directly leads to a decline in the imports of imported goods.
- Debt deflation mechanism magnifies this effect.
- Question: if R_t and p_t were set to a constant, would the results change much?

Frictionless Models and Sudden Stops

- Aguiar and Gopinath (2006) can explain sudden stops and countercyclical trade balances with frictionless SOE model.

- Also provides answer to a closely related question.
- Why are business cycles in emerging markets and developed economies so different?

    - Trade balance is strongly countercyclical in emerging markets as compared to developed markets.

    - Consumption is 40% more volatile than income at business cycle frequencies for emerging markets, as compared to a ratio of little less than one for developed markets.

    - Income growth and net exports are twice as volatile in emerging markets.

Table 1: Emerging Vs Developed Markets (Averages)

	Emerging Markets		Developed Markets	
	HP	BP	HP	BP
$\sigma(Y)$	2.74	2.02	1.34	1.04
$\sigma(\Delta Y)$	1.87	1.87	0.95	0.95
$\rho(Y)$	0.76	0.86	0.75	0.90
$\rho(\Delta Y)$	0.23	0.23	0.09	0.09
$\sigma(C)/\sigma(Y)$	1.45	1.32	0.94	0.94
$\sigma(I)/\sigma(Y)$	3.91	3.96	3.41	3.42
$\sigma(TB/Y)$	3.22	2.09	1.02	0.71
$\rho(TB/Y,Y)$	-0.51	-0.58	-0.17	-0.26
$\rho(C,Y)$	0.72	0.74	0.66	0.69
$\rho(I,Y)$	0.77	0.87	0.67	0.75

This table lists average values of the moments for the group of emerging (13) and developed (13) economies. The values for each country separately are reported in Table 2. HP refers to hp-filtered data using a smoothing parameter of 1600. BP refers to Band Pass filtered data at frequencies between 6 and 32 quarters with 12 leads and lags. The standard deviations are in percentages. The definition of an emerging market follows the classification in S&P (2000).

Figure 1

Aquiar and Gopinath (2006)

- Basic insight: low frequency characteristics of real GDP looks very different in emerging markets

$$Y_t = e^{z_t} K_t^{1-\alpha} (\Gamma_t L_t)^{\alpha}$$

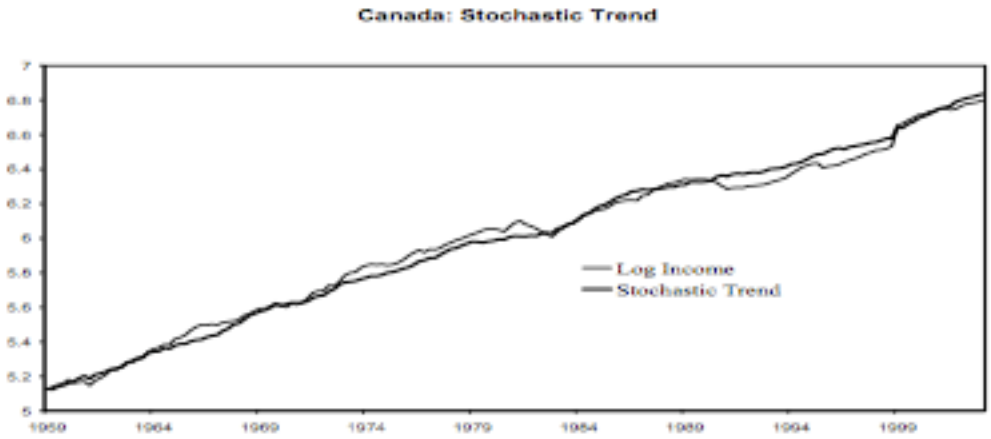
$$z_t = \rho z_{t-1} + \varepsilon_t^z$$

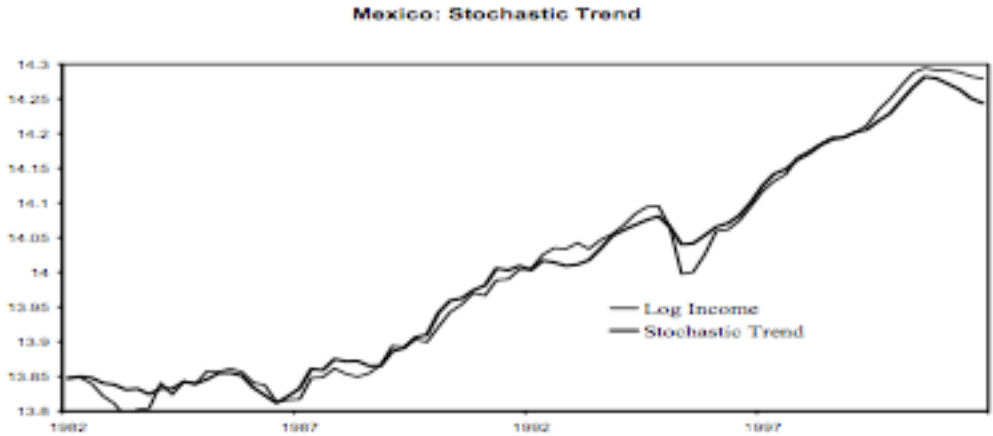
$$\begin{aligned} \Delta \ln \Gamma_t &= \ln(g_t) \\ \ln(g_t) &= (1-\rho_g)\ln(\mu_g) + \rho_g \ln(g_{t-1}) + \varepsilon_t^g \end{aligned}$$

Aquiar and Gopinath (2006)...

- ε_t^g is much more important in emerging markets.
- Shocks to trend growth are the primary source of fluctuations in emerging markets.
- If ρ_g is positive, and credit markets are perfect, consumption will rise by more than 1 to 1 with a shock to TFP.
- This is essentially Danny Quah's response to the Deaton paradox.

Figure 2: Stochastic Trends estimated using the KPSW(1991) methodology





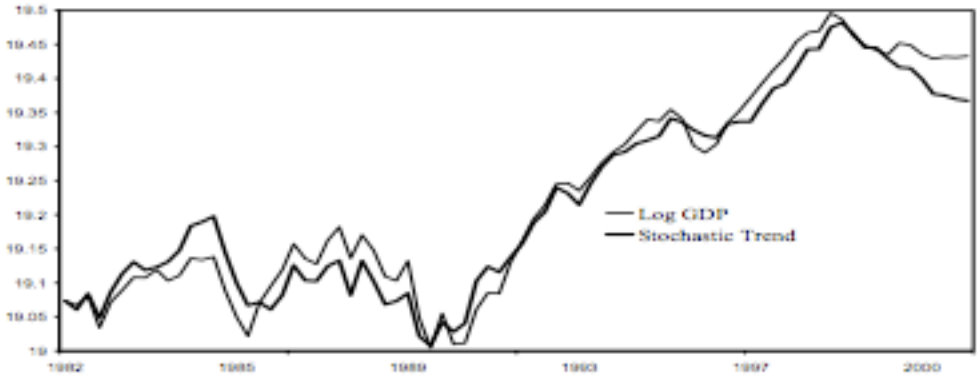
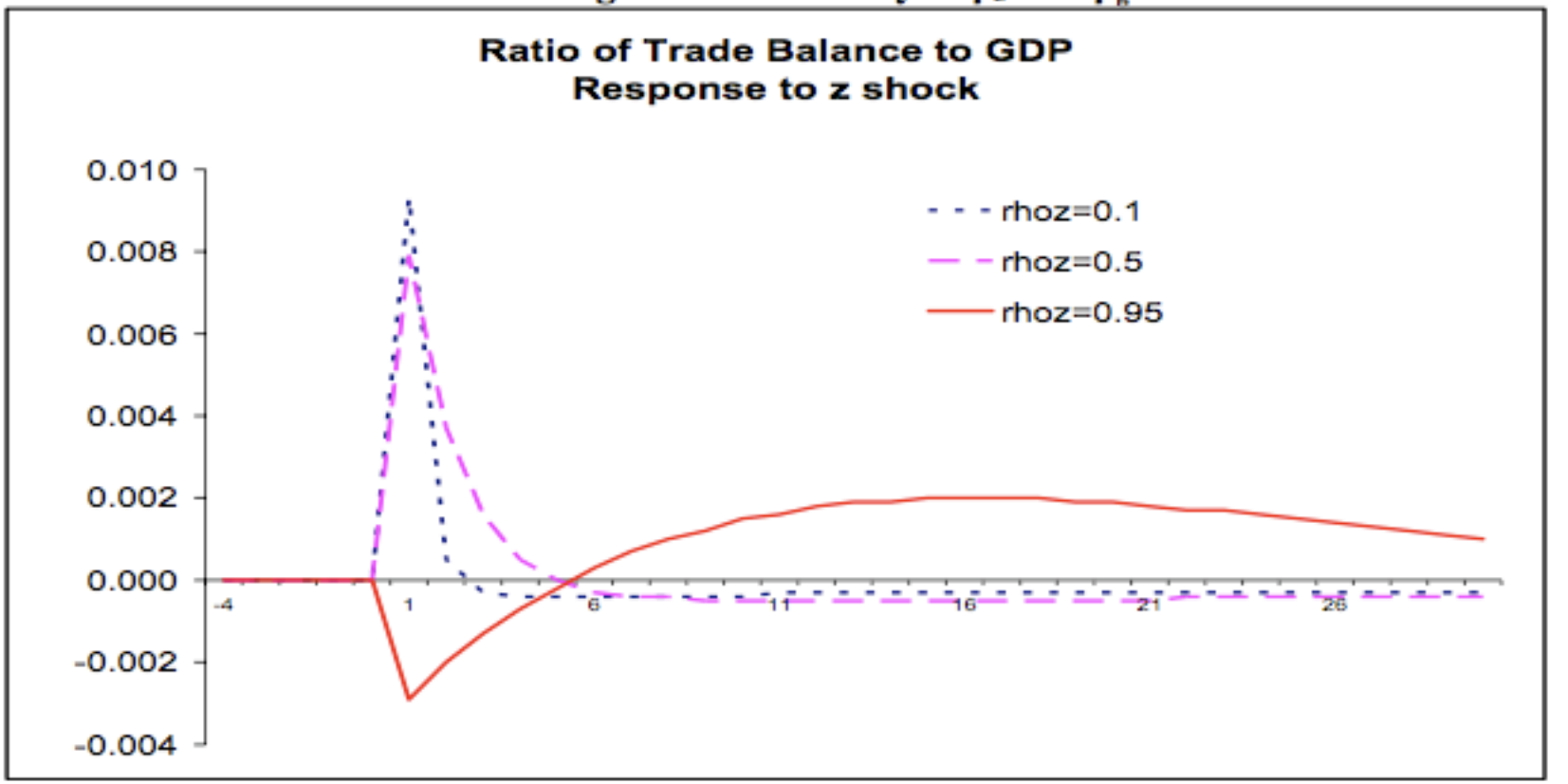


Figure 5: Sensitivity to ρ_z and ρ_g



The 1994-1995 Mexican Tequilla Crisis

- Use Kalman filter and estimated parameters of DSGE model to decompose Solow residuals calculated using Mexican data into permanent (g) and transitory (z) processes.
- Feed shocks through model, calculate predicted path of net exports for the period surrounding the 1994-1995 Tequila crisis in Mexico.
- Prediction of sudden stop in 1994 : Imuch of the observed drop in the Solow residual reflects shock to trend.
- Like in Mendoza, sudden stops are set off by bad shocks to TFP.
- But the mechanism for the output drop and improvement in current account is different.

Assessing Alternative Explanations

- Which explanation should we prefer?
- Aquiar - Gopinath can explain difference between 'normal' business cycles in emerging markets and developed economies.
- Can Enrique account for these differences?
  - He assumes TFP is stationary process.
  - Must choose collateral constraints to differ as a function of stage of development.

Breaking the 'Observational Equivalence' of the two models

- There's lots of evidence against the perfect credit market assumption.
- But what direct evidence do we have for collateral constraints in international markets?

$$q_t^b b_{t+1} - (w_t L_t + p_t v_t) \geq -\kappa q_t k_{t+1}$$

- It's the dollar value of domestic value of K that's relevant as collateral.

What's the institutional story?

- Surely these constraints don't apply to sovereign debt since you can't seize the collateral.
- It could apply to private sector laons.
- If you default on a loan, someone sells K in domestic market, converts proceeds into dollars which are then shipped abroad.
- This is credible on a priori grounds once you realize that most lending to small and medium firms is channeled through domestic banks which borrow from abroad.
    - Not clear that this logic applies to 'trade credit'.
- What's the direct evidence for collateral constrains?

Micro Evidence on Collateral:Liberto and Mian (2009)

- Cross country data set containing loans made by small and medium firm lending division of a multinational bank in 15 countries.
- Information on value as well as type of collateral pledged as security of each loan.
- Sample period: 2002 - 2004.
- For each loan, bank reports liquidation value of collateral pledged for a loan.
    - Reflects bank's assessment of market value of collateral in event of bankruptcy, assuming lender receives full ownership of collateral.
- Divide liquidation value of collateral by value of approved loan to construct rate of collateralization for loan.

	Country	Number of Firms	Avg. Loan Size ('000US$)	No. of Industries	Private Credit to GDP	Creditor Rights	Legal Origin	Public Registry	Private Bureau	GDP per Capita
1	Argentina	120	86	18	0.19	1	French	1	1	3,650
2	Chile	1,124	142	77	0.61	2	French	1	1	4,390
3	Czech	1,440	296	73	0.42	3	German	0	0	6,740
4	Hong Kong	1,169	618	65	1.54	4	English	0	1	25,430
5	India	494	626	49	0.30	2	English	0	0	530
6	Korea	1,427	94	71	0.93	3	German	0	1	12,020
7	Malaysia	552	411	48	1.38	3	English	1	1	3,780
8	Pakistan	96	599	35	0.28	1	English	1	0	470
9	Romania	135	191	47	0.08	1	French	0	0	2,310
10	Singapore	100	991	30	1.17	3	English	0	0	21,230
11	Slovakia	140	466	43	0.43	2	German	1	0	4,920
12	South Africa	307	269	59	0.76	3	English	0	1	2,780
13	Sri Lanka	102	468	17	0.29	2	English	0	1	930
14	Taiwan	443	723	54	0.99	2	German	1	1	13,320
15	Turkey	765	358	54	0.20	2	French	1	0	2,790
	Total / Average	8,414	352	87	0.64	2.3		0.47	0.53	7,019

Variable	Mean	SD	SD Within Country	SD Within Country-Industry	Obs
Risk Grade	2.58	0.97	0.88	0.80	8,414
A	0.15				1,287
B	0.31				2,580
C	0.35				2,926
D	0.19				1,621
Sales Size Indicators	0.90	0.94	0.76	0.69	8,414
0	0.40				3,383
1	0.38				3,194
2	0.14				1,166
3	0.07				616
Others	0.00				55
Total Approved (in `000 $)	570.00	980.00	847.50	782.83	8,414
Log Approved	12.00	1.91	1.52	1.33	8,414
Total Outstanding (in '000 $)	351.00	674.00	638.80	594.92	8,414
Default by end of sample?	5.41	22.61	20.43	19.22	8,414
Collateralization Rate	53.90	44.69	34.83	31.94	8,414
Break down of Coll. Rate By:					
Non-specific Assets	16.82	33.55	29.53	27.10	8,414
Firm-Specific Assets	37.08	43.75	28.29	25.36	8,414
Break down of Non-Specific Assets:					
Land	11.10	28.91	26.08	24.25	8,414
Liquid Assets	5.72	20.01	16.83	15.10	8,414
Break down of Non-Specific Assets:					
Firm Inventory/Machinery	11.35	28.80	25.25	20.27	8,414
Other Firm Assets	24.12	40.35	26.88	21.41	8,414
Account Receivable	0.78	5.84	5.60	5.01	8,414
Guarantee	0.35	4.88	4.84	4.60	8,414
Letter of Credit	0.49	6.71	6.56	5.28	8,414

Conclusion: Great Paper

- Micro evidence points in favor of Mendoza model relative to Gopinath model.
- But both models depend critically on exogenous drops in TFP to generate Sudden Stops and their aftermath
- In case of emerging markets the data required to get decent good estimates of TFP (e.g. Basu and Fernald) just isn't available.
- Even for the US we can't correct for movements in the markup.
- If TFP is a parable for something, what is it exactly?
- What role is there for 'hot money', contagion, monetary policy and currency denomination mismatches in financial sector?
- One tip-off that we're missing an important ingredient: the quantitative behavior of asset prices before and after Sudden Stops.