From Chronic Inflation to Chronic Deflation
Liquidity Mischief

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Inflation-Deflation:
Old Fashioned but Persistent Views

- Macroeconomists know little about money.

- Partly because money is added to general equilibrium models in a mechanical way.

- Not long ago, this led to the view that high inflation could rapidly be eliminated by lowering the growth rate of money supply.

- And, until the Great Recession, the consensus view was that deflation is even easier to uproot: Send the helicopters and make everybody happy!

Stopping US 1970s/80s Inflation: Summary

- In the US, Volcker first tried to stop inflation by controlling monetary aggregates.

- It soon became evident that inflation inertia was hard to deactivate, and the Fed resorted to the Federal Funds rate.

- The instrument was effective in stopping inflation and putting a damper on inflation expectations.

- With a stable demand for monetary aggregates, controlling *M* or *i* should give the same results.

- The popular explanation for this not to hold was <u>financial innovation</u> that created quasi-monies not controlled by the Fed.

- However, this does not explain why *i* works, unless
  - the interest rates of quasi-monies are geared to *i*, or
  - *i* is a "pure" rate of interest rate and stabilization plan is highly credible.

Impact on Theory and Current Issues

- Theory lagged behind Fed practice until Woodford put forward the mainstream New Keynesian model (NK).

- In the NK model, adopted by many central banks, i is a "pure" interest rate, and

- Money, quasi-monies and exchange rate are <u>endogenous variables</u>.

- Inflation can be controlled if policy is credible and individuals rule out "explosive" paths.

- These are strong assumptions, but one stands up: the assumption that i is a "pure" interest rate.

- When, as now, $i \leq 0$, there is a disconnect between the Fed and the real economy. The assets associated with i are quasi-monies,

- Lowering i lowers the return on <u>liquidity</u> and only indirectly on, say, investment funding.

- Moreover, if Fed makes $i << 0$, i could become completely irrelevant!

Bare-Bones New Keynesian Model

$$r = i - \pi$$ Fisher equation

$$i = \theta\pi + \gamma c, \theta > 1, \gamma > 0$$ Taylor Rule

$$\frac{\dot{c}}{c} = r - \rho = (\theta - 1)\pi + \gamma c - \rho$$ Euler equation

$$\dot{\pi} = \bar{y} - c$$ Calvo staggered prices

Dynamic System: c and π can jump at $t = 0$. All characteristic roots are positive. One can show that, if unstable paths are ruled out, equilibrium is unique.

US MPolicy 1980-2015

- Liquidity considerations led the Fed to abandon monetary aggregates, and to adopt the interest rate as the monetary policy instrument.

- Now liquidity considerations have made the policy interest rate ineffective, and has led the Fed to go back to monetary aggregates <u>with a twist</u>: QE1 which involved the purchase of 'toxic' assets.

Liquidity and Monetary Issues in a Closed Economy: A Simple Model

Basic Assumptions (*land* model in paper)

Utility function:

$$\int_0^\infty \left[u(c_t) + v(m_t + \theta q_t k_t) \right] e^{-rt} dt$$

Budget constraint:

$$a_0 + \int_0^\infty \left[rk_t - c_t - (i_t - i_m) m_t - (rq_t - r) k_t \right] e^{-rt} dt = 0$$

where,

$a_0 =$ initial wealth, $c =$ consumption,
$m =$ real monetary balances, $k =$ land, $rk =$ output,
$r = MP\ of\ k$ and discount rate, $i =$ nominal interest rate,
$\theta =$ land liquidity coefficient.

Minimizing Liquidity Opportunity Cost

$$z = m + \theta q k = \textcolor{red}{\textbf{liquidity}} \qquad (1)$$

$$(r + \pi - i_m)m + (rq - r)k = \textcolor{red}{\textbf{opp. cost}} \qquad (2)$$

Thus, opportunity cost, given liquidity z, equals

$$(r + \pi - i_m)(z - \theta q k) + (rq - r)k \qquad (3)$$

Hence, at interior optimum:

$$-(r + \pi - i_m)\theta q + rq - r = 0 \qquad (4)$$

Equilibrium Output Price of Land

➢ Solving for the price of land q from equation (4), we get

$$q = \frac{r}{r - (r + \pi - i_m)\theta} \qquad (5)$$

Notice that at Friedman's OQM, $r + \pi - i_m = 0$, $q = 1$, and θ has no effect

➢ To help intuition, consider the special case in which inflation and interest rate on money are zero (i.e. $\pi = i_m = 0$). Then

$$q = \frac{1}{1 - \theta} \qquad (6)$$

Model Implications

- Liquidity increases the relative price of assets that collateralize financial instruments created by the private sector.
  - NB. **If liquidity increased uniformly for all goods and services, real prices would be intact !!**
- But liquidity can evaporate very quickly à la Diamond-Dybvig ...
- <u>unless the central bank is ready to buy up those assets and guarantee their pre-crisis relative price</u>
  - Fed's purchase of "toxic assets" was aimed at keeping large banks afloat, not to stabilize the price of real estate. This does not restore q to its pre-crisis equilibrium!

- Once-and-for all increase in money supply has no effect on relative prices.

- In contrast, higher inflation or lower policy interest rate may increase assets' relative prices, even though there is no nominal rigidity.

  - This gives some support to Greenspan's critics, e.g. John Taylor, who claim that low interest rates are responsible for the real estate bubble.

- However, these policies are ineffective if assets' liquidity is completely lost, i.e., $\theta = 0$.

Back to Basics

Paper/Fiduciary/Fiat Money

Hahn's Problem

- Frank Hahn (1965) showed that in a general equilibrium model with fiat money bearing zero *intrinsic* value, barter equilibria cannot be ruled out.

- The idea is simple: if the price of money in terms of output is nil, the demand for money is *undetermined*. Hence, there exists an equilibrium in which money demand and supply are equated at the zero price.

- Note that for a regular good if its price is zero, its excess demand will be positive, not zero !!

Price Theory of Money (PTM) Keynes to the Rescue !!

"[…] *the fact that contracts are fixed, and wages are usually somewhat stable in terms of money, <u>unquestionably</u> plays a large part in attracting to money so high a liquidity-premium*" Keynes (1961, Chapter 17, p. 236)

Price Theory of Money:
Sticky Prices

- Price setting entails a commitment to make M valuable in terms of output.

- **Staggered prices increase the "credibility" of the commitment**, making the price of money $Q > 0$ more robust.

  - If price setting was fully coordinated, $Q = 0$ could be consistent with equilibrium after the end of the contract period.

Implications and Conjectures

- The <u>PTM answers Hahn's problem</u> by arguing that the equilibrium output price of money cannot be zero, because there is <u>a critical mass of output suppliers that are willing to sell their output in exchange for a finite sum of money</u>.

- The degree of money's resilience is likely to be a function of the area where the currency is employed as a <u>unit of account</u> (UA).

- The US dollar's advantage as Unit of Account may be its <u>global coverage</u>, including <u>commodity prices</u>, and <u>financial transactions</u>.
  - Notice that there exists a <u>Eurodollar market</u>, but NOT a <u>US-pound or US-euro market</u> that compares with the former.

Other Implications

- The euro will not disappear if Europeans continue setting an important share of their prices in euros.

- The dollar will continue being a dominant reserve currency if key commodities and financial contracts are denominated in dollars.

- Gold or bitcoins will not become a serious threat to reserve currencies if prices are not denominated in gold or bitcoins.

- **Floating exchange rates may undermine a currency's credibility.**
  - This may help to rationalize Fear of Floating, Calvo-Reinhart (2002).

Chronic Deflation

US. M2 Velocity

FRED

— M1 Money Multiplier
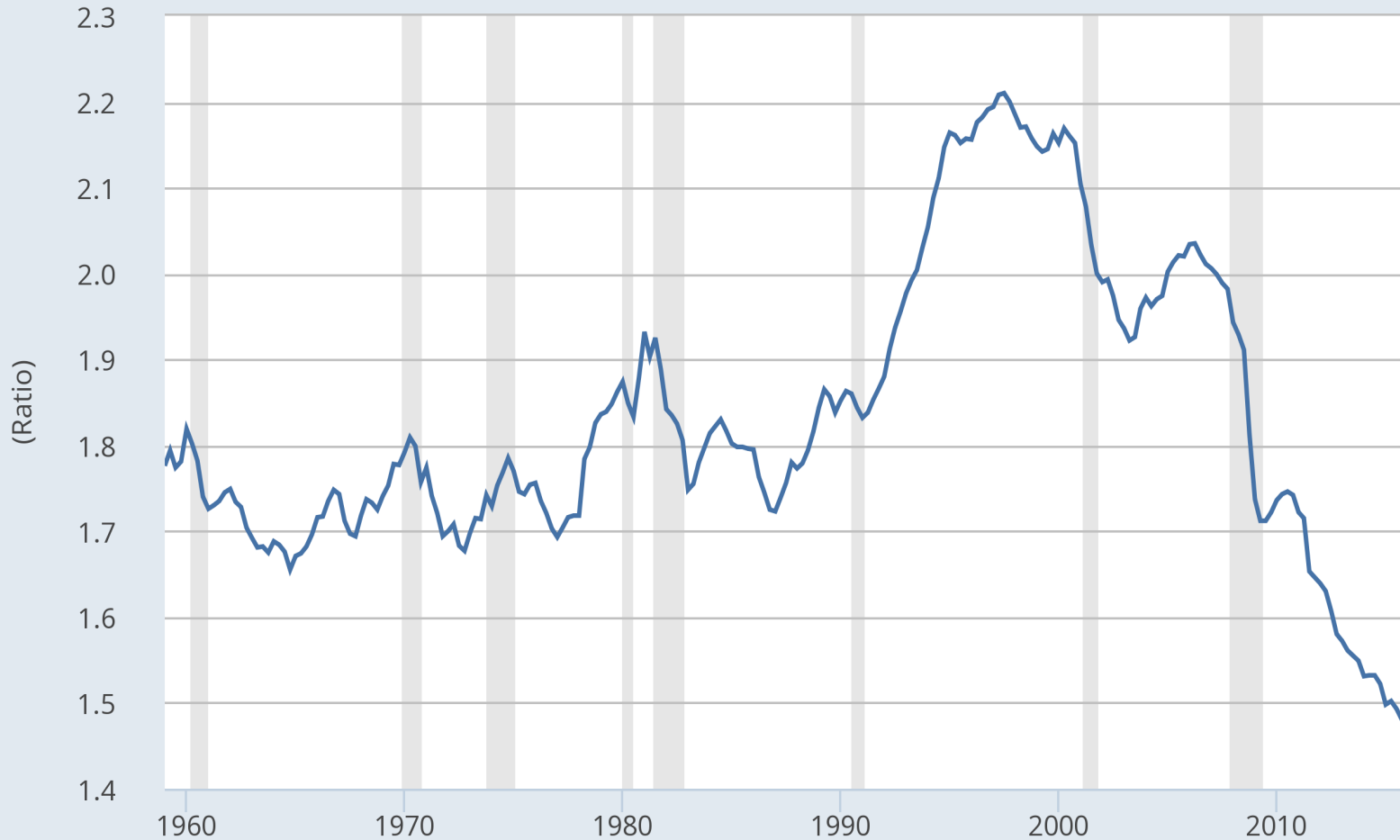
(Ratio)

US M2 Velocity: Anderson et al model

Figure 1: M2 Velocity Tracked by Model Incorporationg
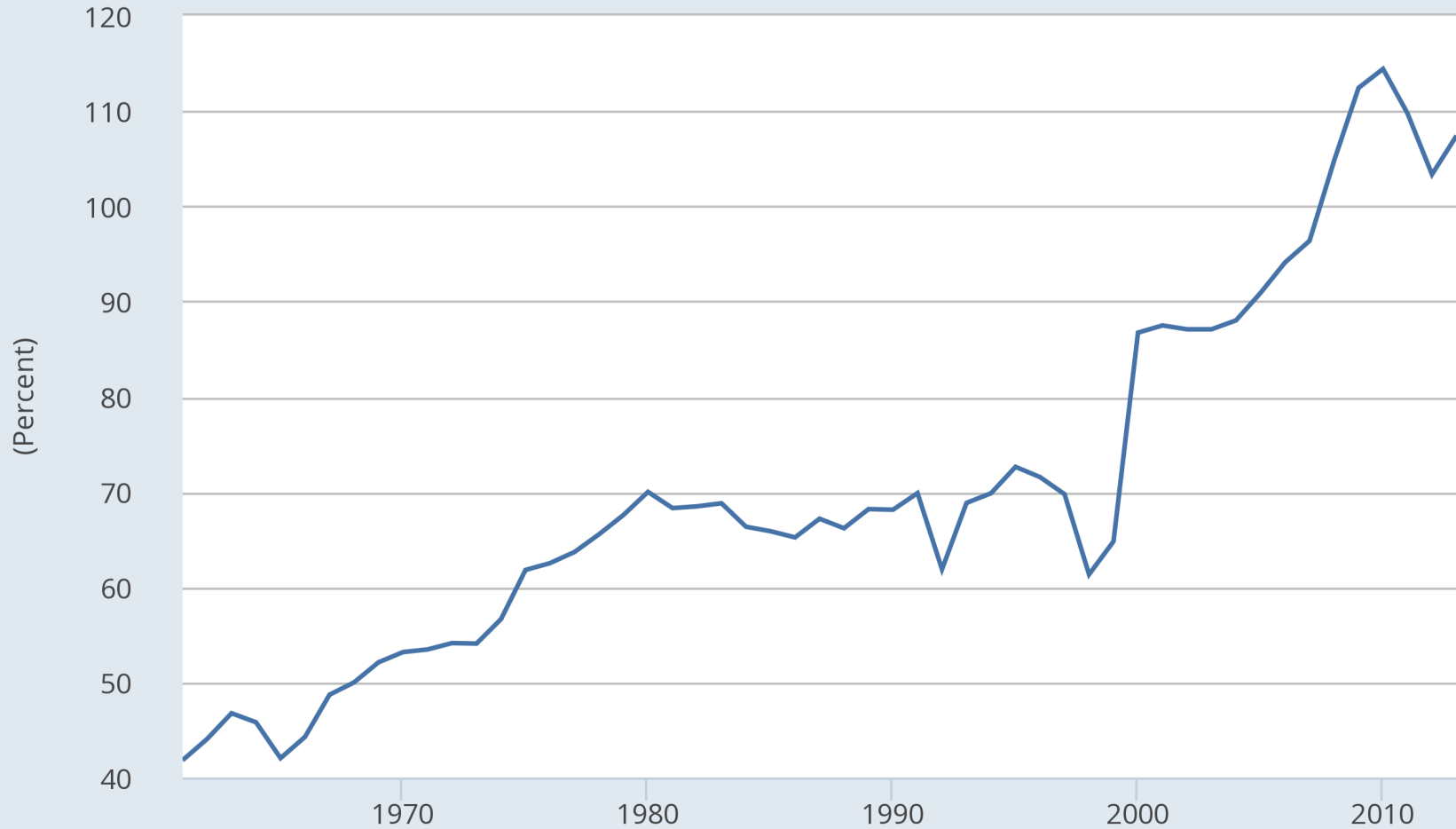Financial Innovation and Risk Premia
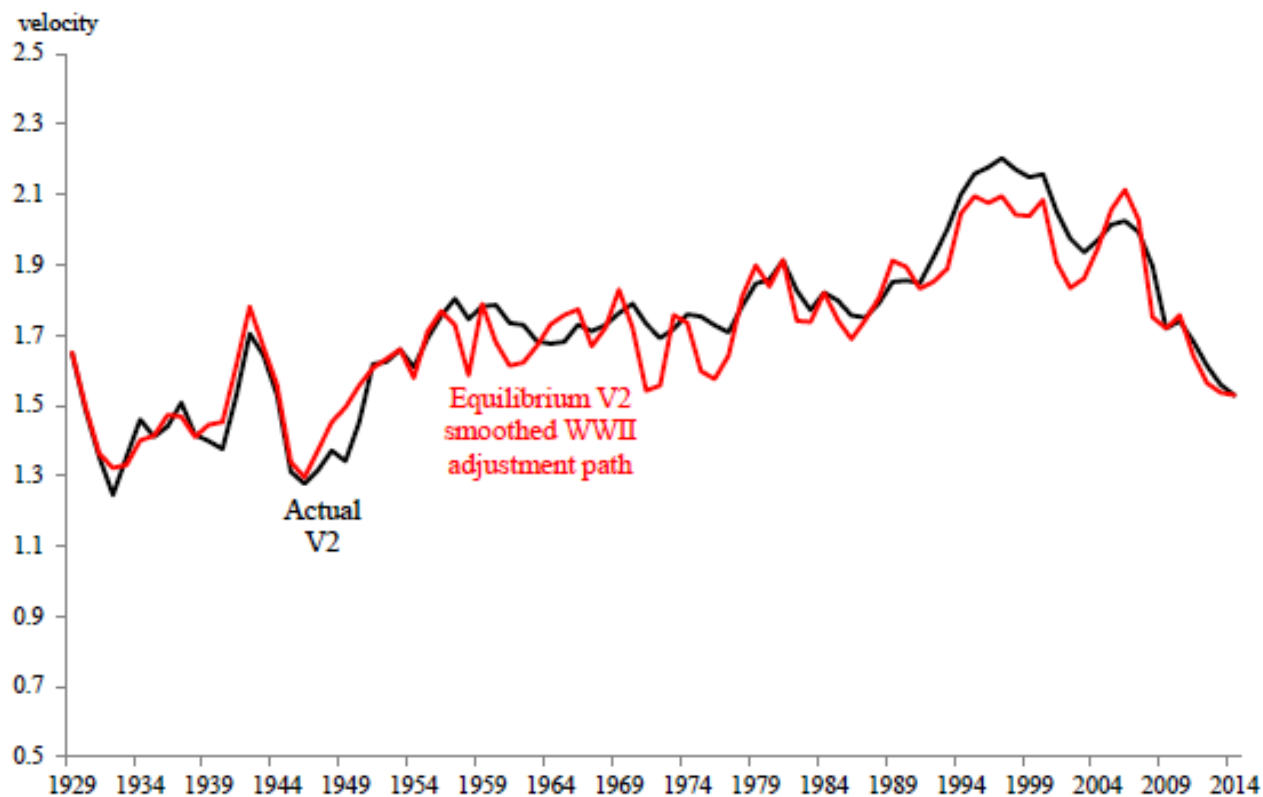
Sources: Board of Governors of the Federal Reserve System, Bureau of Economic Analysis, Friedman and Schwartz (1970), and authors' calculations.

Anderson, Bordo, Duca, "Money and Velocity During Financial Crises..." NBER WP 22100

Eurozone. Broad Money/GDP

Source: World Bank

- It is easy to make the mistake of believing that by increasing M you can produce inflation.

- Just look at EMs and you will find a multitude of examples where pumping M generates more inflation than you ever wished.

- However, when you have a <u>reserve currency</u> things can go the other way:

- More M may lead to lower P. Why?

Pigou Effect

- Aggregate demand increases with real monetary balances = M/P.

- Thus, if P is upward inflexible, the central bank can increase M/P without limit and restore full employment.

- Moreover, Ignoring Fisher's *Debt Deflation*, price deflation has the same stimulus effect.

Liquidity of M

- Suppose the liquidity services of M are proportional to its value as *credit collateral*.

- The latter depends not only on M/P, but also on its real value if there is a <u>run against M</u>.

- If individuals take into account the probability of a run, the liquidity value of M/P could be represented by $M/P + Z((M/P)^e)$, where $Z' < 0$.

- Thus, an increase in M/P may not increase liquidity after some critical point, due to Liquidity Deflation (the "e" component above).

- Pushing M/P beyond that critical point may succeed in stimulating aggregate demand but, eventually, the LD effect will come back to haunt us !

Relevance of Liquidity Deflation

- It is unlikely that LD applies to reserve currencies, e.g., dollar, euro, yen, under current conditions.

- However, it may apply to Safe Assets denominated in terms of reserve currencies, e.g., ABS.

- Hence, QE = "Purchase of ABS with M" may be effective in increasing aggregate demand,
  - but not a fall in P or an increase in the price of ABS.

- In general, in EMs, Liquidity Deflation is less important for lack of domestic safe assets denominated in domestic currency.

Empirical Financial Puzzles

- Several global financial shakeups started at a corner of the world, e.g.,
  - <u>1998 Russian crisis</u> (the crisis that started to seriously challenging the conventional macroeconomic paradigm).
  - 2007/8 subprime/Lehman crisis
  - 2013 Taper Tantrum (a no-crisis crisis) in September 2013.
- Huge haircut on Asset-Backed securities during the Lehman crisis, <u>accompanied</u> by an increase in the demand for dollar bills (Liquidity Trap).
- Anti-Liquidity Trap (Capital Flight) in EMs.

External Financial Conditions for EMs
(EMBI sovereign spread & Current Account Balance in EMs, millions of USD, last four quarters)
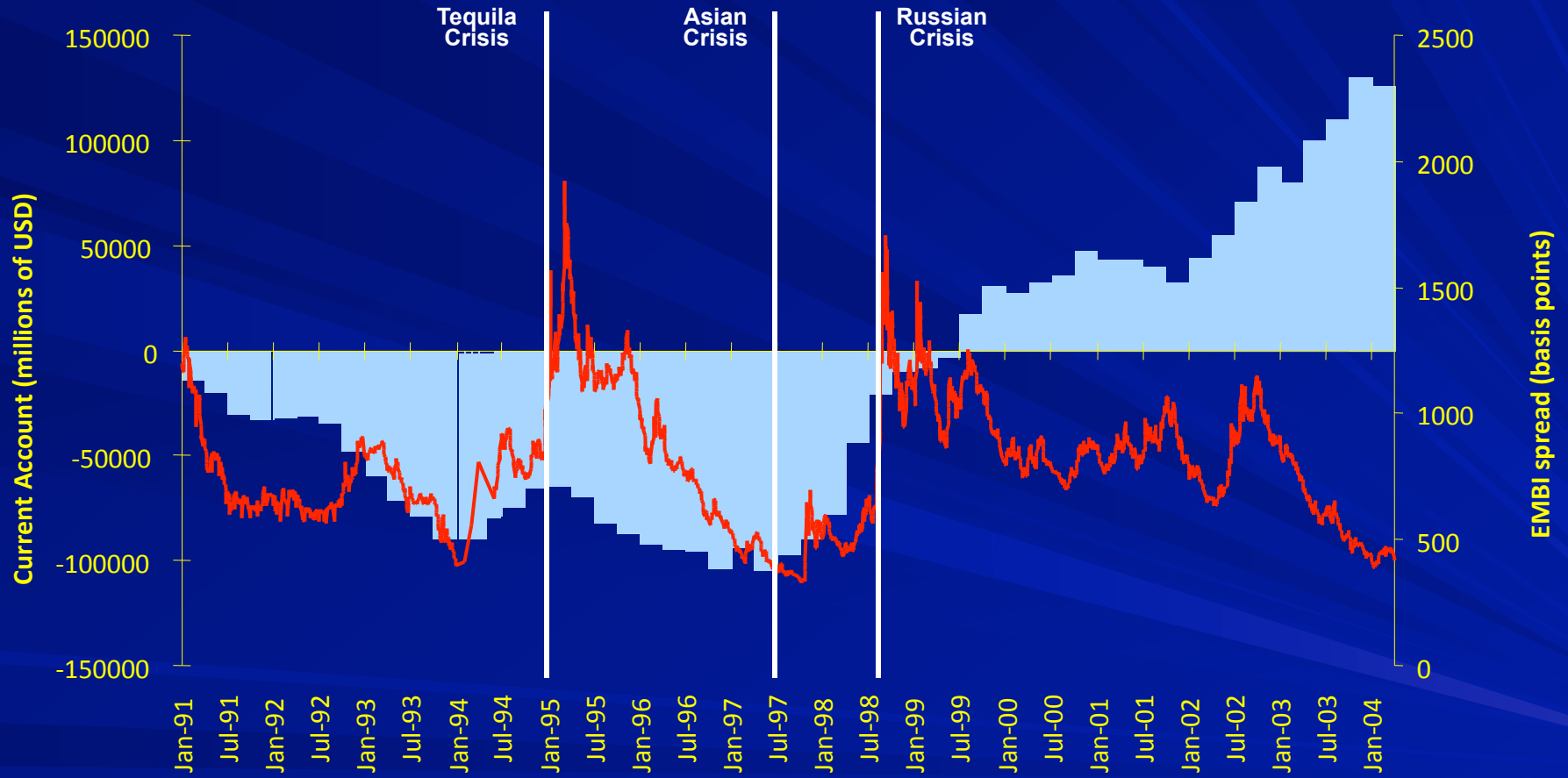
Note: Includes Argentina, Brazil, Chile, China, Colombia, Czech Republic, Egypt, Hungary, India, Indonesia, Israel, Korea, Malaysia, Mexico, Morocco, Pakistan, Peru, Philippines, Poland, Slovak Republic, South Africa, Thailand, Turkey and Venezuela.

LAC 7: INVESTMENT
(LAC-7, s.a. Investment, 1998.II=100)

Annualized growth: **10.6%**
2002.IV-2004.III

Russian Crisis

Annualized growth: **7.4%**
1990.I-1998-II

Annualized growth: **- 4.1%**
1998.II-2002-IV
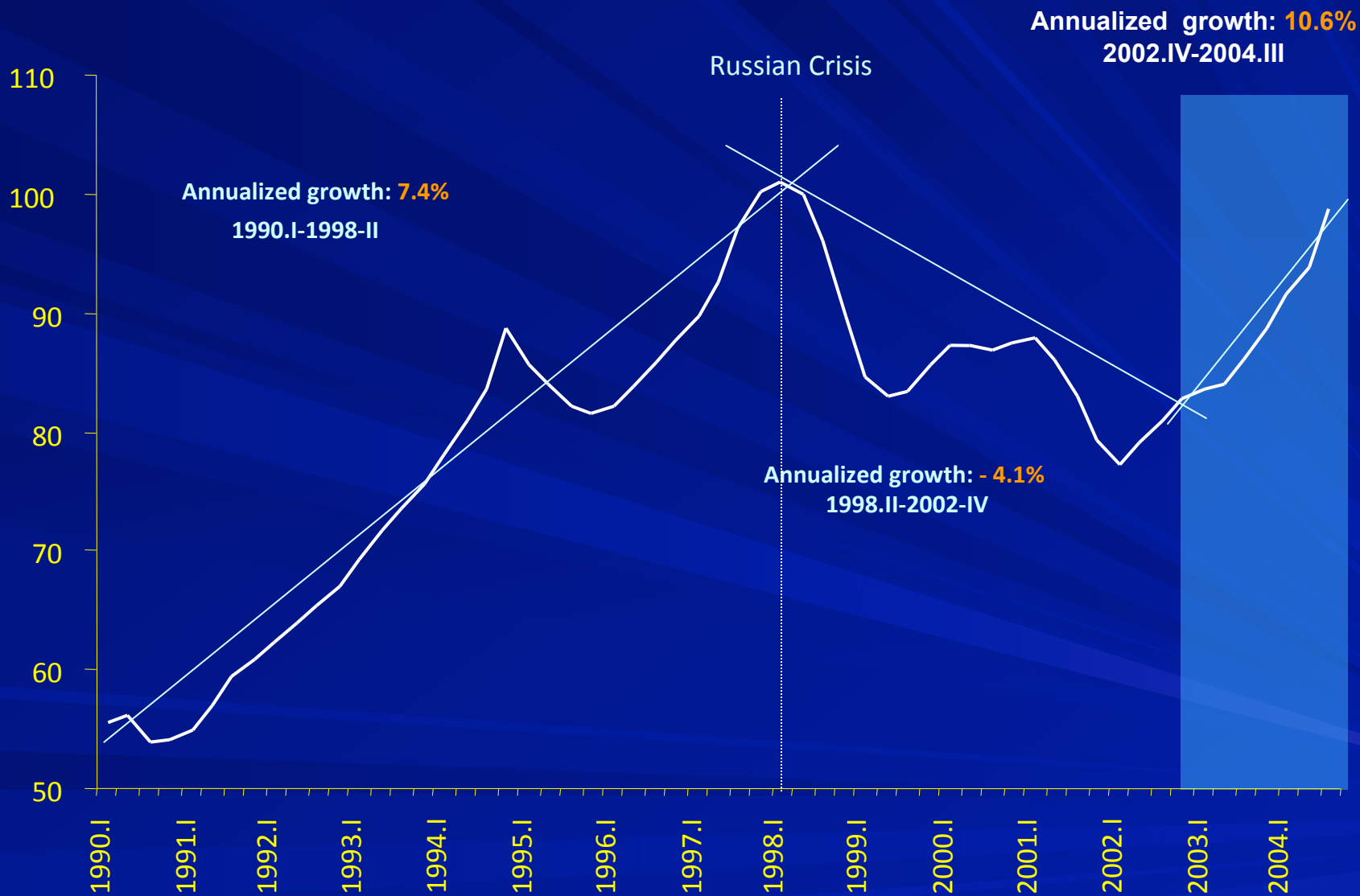
LAC 7: GROWTH
(LAC-7, s.a. GDP, 1998.II=100)

Annualized growth: **5.5%**
2002.IV-2004.III

Russian Crisis

Annualized growth: **4.4%**
1990.I-1998.II

Annualized growth: **0.2%**
1998.II-2002.IV

- Several global financial shakeups started at a corner of the world, e.g.,
  - 1998 Russian crisis (the crisis that started to seriously challenging the conventional macroeconomic paradigm).
  - 2007/8 subprime/Lehman crisis
  - 2013 Taper Tantrum (a no-crisis crisis) in September 2013.

- Huge haircut on DM Asset-Backed securities during the Lehman crisis, accompanied by an increase in the demand for dollar bills/T-bills (Liquidity Trap).

- Anti-Liquidity Trap (Capital Flight) in EMs.

Meltdown of Safe Assets

List of Safe Assets: pre and post crisis

	Billion USD		% of World GDP	
	2007	2011	2007	2011
US Federal government debt held by the public	5,137	10,692	9.2	15.8
Held by the Federal Reserve	736	1,700	1.3	2.5
Held by Private Investors	4,401	8,992	7.9	13.3
GSE obligations	2,910	~~2,023~~	5.2	~~3.0~~
Agency and GSE-backed mortgage pools	4,464	~~6,283~~	8.0	~~9.3~~
Private-issue ABS	3,901	~~1,277~~	7.0	~~1.9~~
German and French government debt	2,492	3,270	4.5	4.8
Italian and Spanish government debt	2,380	~~3,143~~	4.3	~~4.7~~
Monetary Base	2,870	5,867	5.1	8.7
United States	852	2,532	1.5	3.7
Euro Zone	1,117	1,583	2.0	2.3
United Kingdom	135	314	0.2	0.5
Japan	766	1,439	1.4	2.1
Safe Assets	**23,418**	**18,129**	**41.9**	**26.8**

Note: Numbers are struck through if they are believed to have lost their 'safe haven' status after 2007.

Source: Bank of England, Federal Reserve Flow of Funds, Haver Analytics, IMF, Barclays Capital.

CENTRAL DM LIQUIDITY PUZZLE

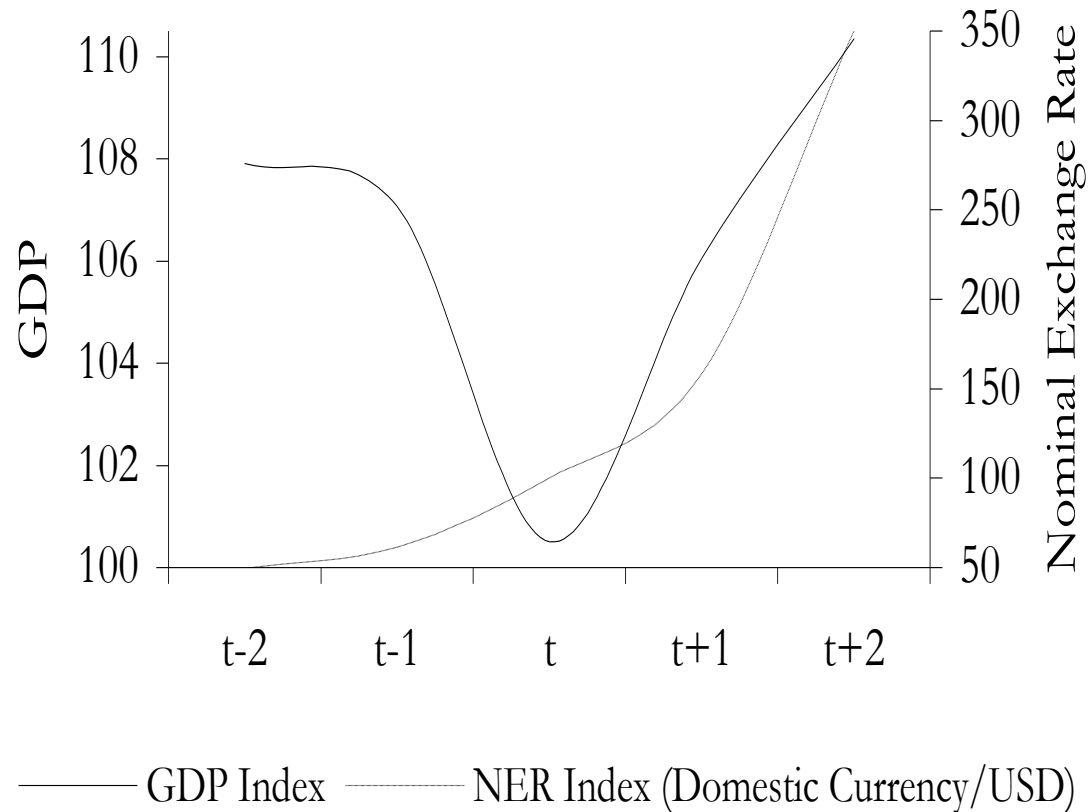- **The Lehman crisis was associated with a phenomenal Liquidity Crunch**

Figure 4: The Repo-Haircut Index
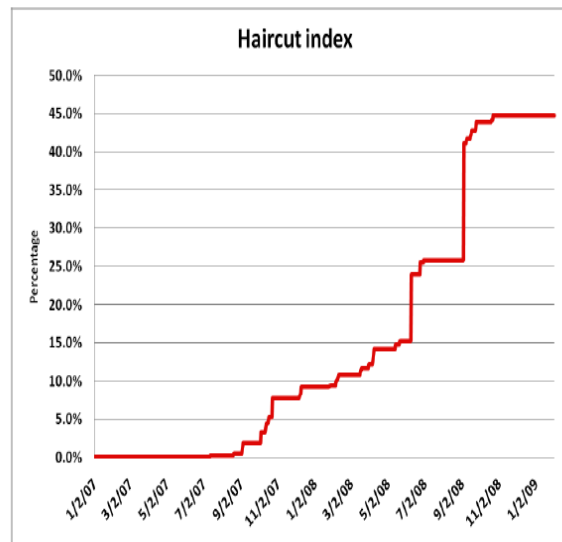
Source: G.Gorton and A. Metrick "Securitized Banking and the Run on Repo," 2012

- **However, Developed Market economies (DMs) exhibited Liquidity Trap**
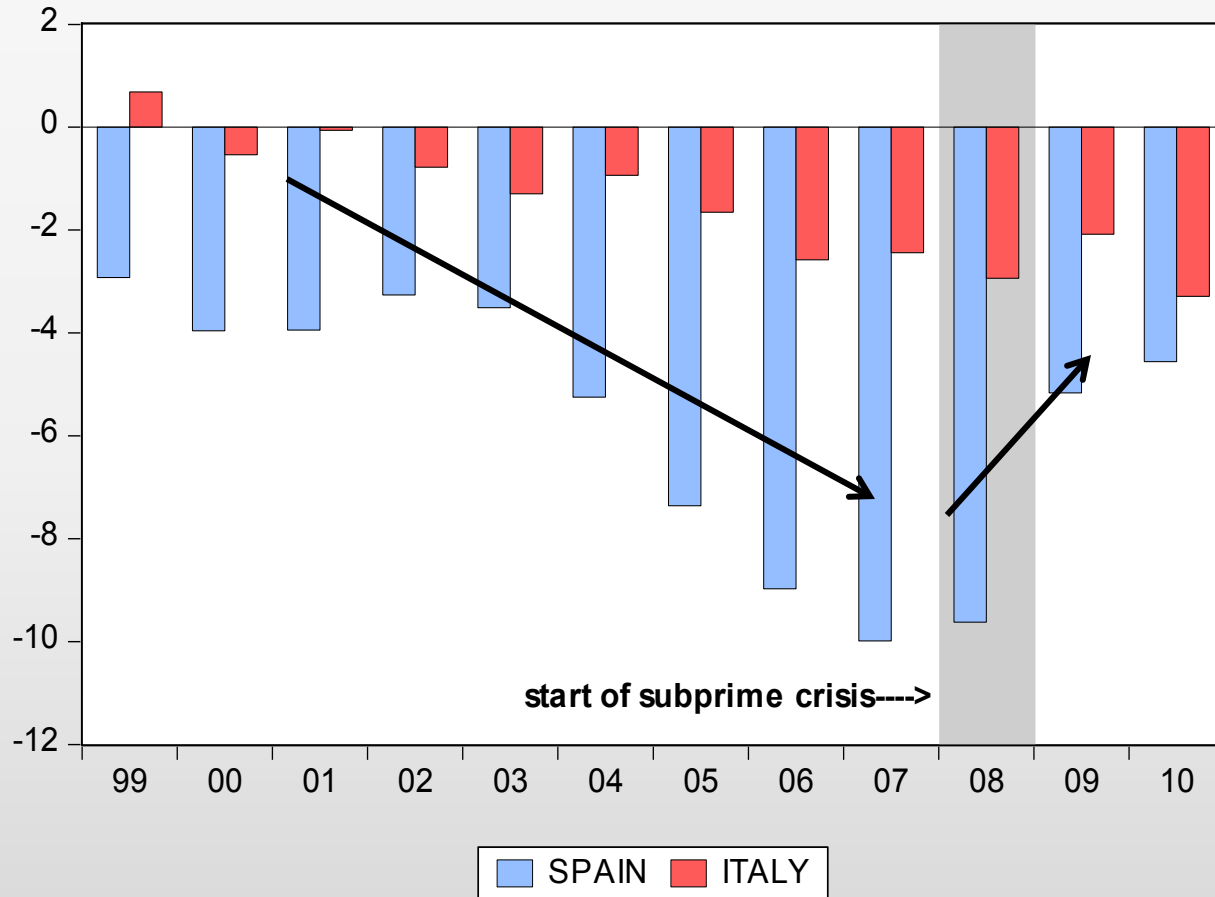
Sudden Stop and Devaluation in EMs

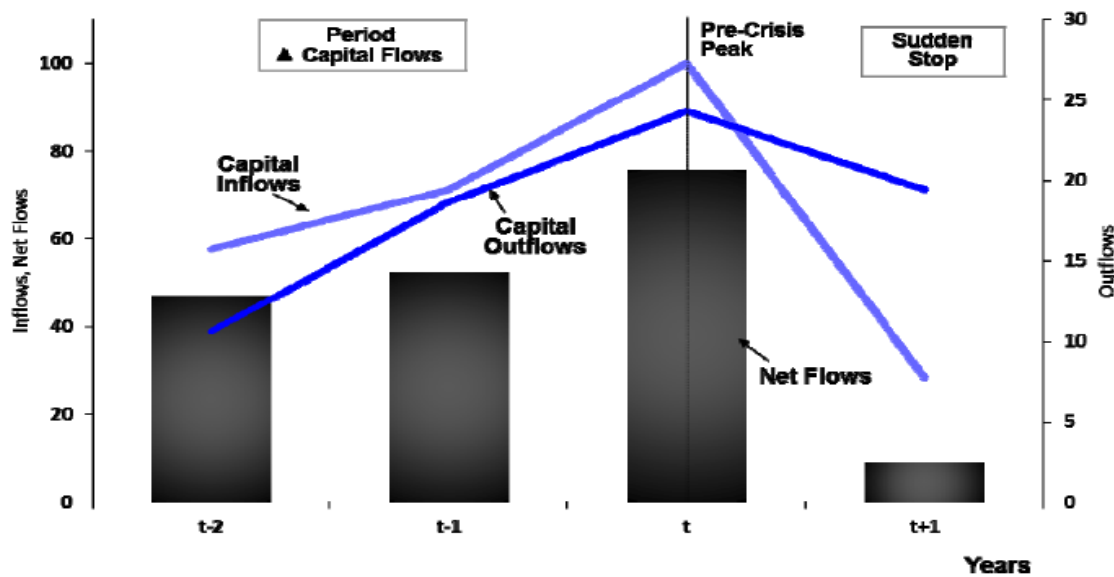Source: Calvo, Izquierdo and Mejia (2008).

More Puzzles

- Acceleration of Capital Inflows. In the run-up of crisis, capital inflows continue at a <u>faster</u> rate.

- Greater role for Gross Capital Inflows and Outflows.

Current Account (% of GDP)

Emerging Markets: Acceleration and Bidirectional Flows

Figure 1. Capital Flows to EMs: Dynamics pre-Sudden Stop
(Average episode of 3S Output Collapse, Real USD, Pre-Crisis Peak Capital Inflows =100)
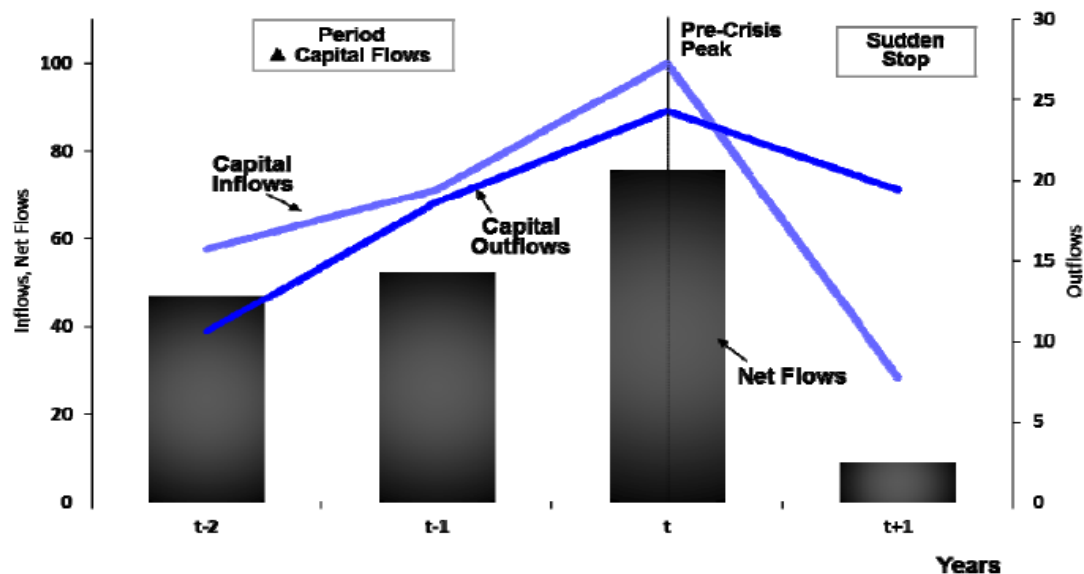
Note: Average of 3S Output Collapses episodes in Calvo, Izquierdo and Mejia (2006). Excludes Peru and South Africa due to data availability.
Capital Inflows include Financial Account liabilities and Net Errors and Omissions. Capital Outflows include Financial Account assets. Net Flows is the difference between Capital Inflows and Capital Outflows.

More Puzzles

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Emerging Markets: Acceleration and Bidirectional Flows

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Strong Increase in Bidirectional Portfolio Flows after 1998
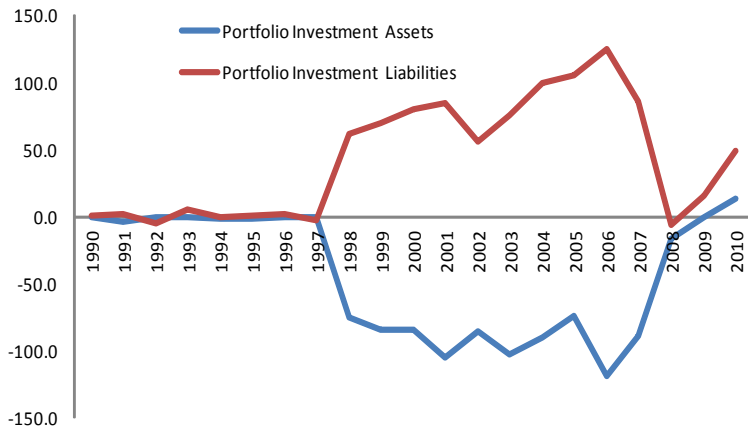

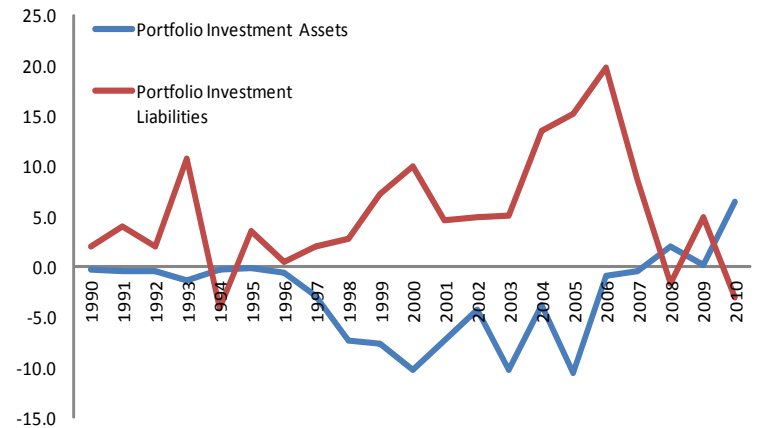
Portugal: Portfolio Assets and Liabilities (% GDP)
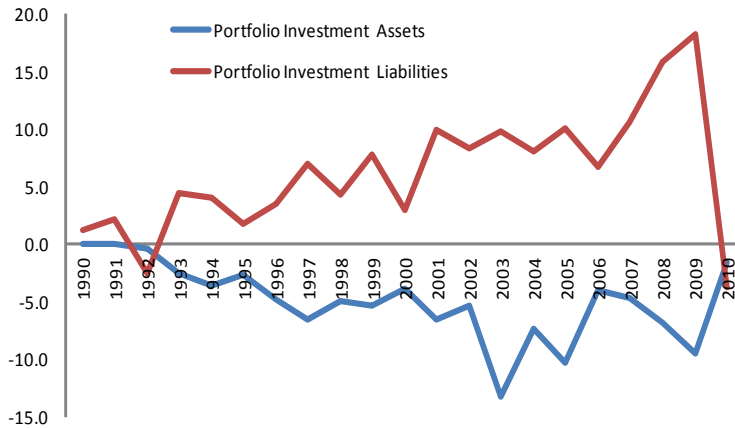
Italy: Portfolio Assets and Liabilities (% GDP)
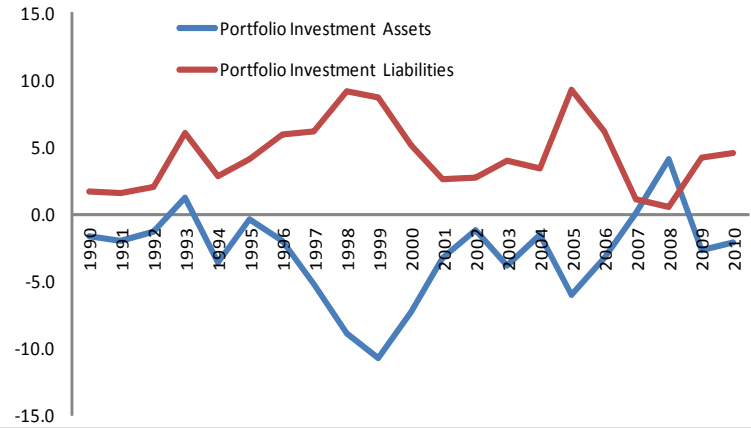
Ireland: Portfolio Assets and Liabilities (% GDP)

Spain: Portfolio Assets and Liabilities (% GDP)

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