Lecture 4: Currency crises

Rhys Bidder

University of Oxford - MFE - International Finance

Trinity, 2019

Disclaimer

The views expressed in this presentation, and all errors and omissions, should be regarded as those solely of the authors, and are not necessarily those of the Federal Reserve Bank of San Francisco, the Federal Reserve Board of Governors or the Federal Reserve System.

National Accounts and Balance of Payments

National income accounting

- National income of an open economy satisfies following *identity*

$$Y \equiv C + I + G + EX - IM$$

- Ignoring net unilateral transfers $\Rightarrow$ *current account* $\equiv$ net exports

$$CA \equiv EX - IM$$

- Consequently, we have

$$CA \equiv Y = \underbrace{(C + I + G)}_{Absorption}$$

- Defining national saving as...

$$S \equiv Y - C - G$$

- ...we have that investment is funded by domestic saving or CA deficit

$$I \equiv S - CA$$

Interpreting the current account

- $CA < 0 \Rightarrow$ country imports more than it exports (in the given period)
  - Imports not funded (on net) with export earnings $\Rightarrow$ adds to net external debt, or...
  - Absorption not funded (on net) with domestic income $\Rightarrow$ adds to net external debt
- $CA < 0 \Rightarrow$ investment exceeds domestic savings (in the given period)
  - Gross additions to capital are at least partly funded by foreigners ('net foreign investment')
  - Minor issue over depreciation (required to assess net investment)
- Setting aside valuation changes, the CA balance equals the change in the country's foreign wealth or the 'net international investment position' (NIIP)
- Open economies have additional method of intertemporal transfers
  - $CA > 0$ is another way of saving, for example

Decomposing domestic savings

- Suppose government raises net taxes, T, from households - then we can define *private saving* as

$$S^p \equiv Y - T - C$$

- Naturally, we define *government saving* as

$$S^g \equiv T - G$$

- Clearly, we have

$$S = S^p + S^g$$

- Thus we have

$$S^p = I + CA + (G - T)$$

- That is, households can save through investing in the domestic capital stock, lending to foreigners or lending to the government

Balance of payment accounts

- Payment to (from) foreigners $\Rightarrow$ Debit (Credit)
- Transactions arising from
  - Imports/exports of goods and services - enters **current account (CA)**
  - Purchase/sale of financial assets - enters **financial account (FA)**
  - Alternative transfers of wealth (e.g. charity, debt forgiveness, non-produced/intangible assets) - enters **capital account (KA)**
- Every transaction implies a debit and a credit *somewhere* in the BoP
  - Reflects use of double-entry book-keeping
  - See any textbook for examples of this
- Fundamental BoP identity (fails in practice due to mis-measurement)

$$CA + KA = FA$$

Official reserve transactions

- As we head towards discussing BoP / currency crises we discuss the role of 'official reserve transactions'
- Official international reserves are foreign assets held by domestic central banks
  - Gold, Forex, sovereign debt...
  - Often in high rated sovereign debt denominated in reserve currency - i.e. US Treasuries
  - Bought and sold by central banks for various reasons - *typically to influence exchange rates / money supply* - as discussed last week
- These transactions appear in the *financial account*

U.S. BoP - 2015

- Current account $= -\$462.97bn$
- Capital account $= -\$0.04bn$
- Statistical discrepancy $= \$267.78$
- Financial account $= -\$195.23$ (net liabilities to foreigners $\uparrow$)
  - Net U.S. acquisition of financial assets excl. derivs. $= \$225.40$
  - Net U.S. incurrence of financial liabilities excl. derivs. $= \$395.23$
  - Financial derivatives, net $= -\$25.39$
- $-462.97 - 0.04 + 267.78 = -195.23$

U.S. BoP - 2015 - All accounts

- Current account $= -\$462.97bn$
- Capital account $= -\$0.04bn$
- Statistical discrepancy $= \$267.78$
- Financial account $= -\$195.23$ (net liabilities to foreigners $\uparrow$)
  - Net U.S. acquisition of financial assets excl. derivs. $= \$225.40$
    - Official reserve assets $= -\$6.29$
    - Other assets $= \$231.69$
  - Net U.S. incurrence of financial liabilities excl. derivs. $= \$395.23$
    - Official reserve assets $= -\$98.1$
    - Other assets $= \$493.33$
  - Financial derivatives, net $= -\$25.39$
- $\underbrace{-462.97}_{CA}\underbrace{-0.04}_{KA}\underbrace{+267.78}_{SD} = \underbrace{-195.23}_{FA}$

U.S. BoP - 2015 - Financial account

- Financial account $= -\$195.23$
  - Net U.S. acquisition of financial assets excl. derivs. $= \$225.40$
    - Official reserve assets $= -\$6.29$
    - Other assets $= \$231.69$
  - Net U.S. incurrence of financial liabilities excl. derivs. $= \$395.23$
    - Official reserve assets $= -\$98.1$
    - Other assets $= \$493.33$
  - Financial derivatives, net $= -\$25.39$
- Net change in U.S. official reserve assets $= -6.29 - (-98.1) = 91.81$
  - $CA + KA + SD = FA = \underbrace{91.81}_{\Delta OR} \underbrace{-261.64}_{\Delta OA} \underbrace{-25.39}_{\Delta DR} = -195.23$
- $\Delta OR =$ additional net claims on foreigners from ORT among CBs

BoP - redefinition

- We have been using the terms 'BoP' and 'BoP accounts' interchangeably
- Let us now relabel and define 'the balance of payments' as...
  - Net purchases of foreign assets by domestic CB - net purchases of domestic assets by foreign CBs
  - ΔOR in our earlier notation
- Recall, we have $CA + KA = \Delta OR + \Delta OA$, so (ignoring SD)...
  - BoP is (equivalently) the international payments gap that must be funded through central banks' activities rather than by changes in *private* NIIP

$$\underbrace{CA + KA - \Delta OA}_{\text{Payments gap}} = \Delta OR$$

BoP and CA

$$-\Delta OA = \underbrace{-CA}_{>0 \Leftrightarrow \text{deficit}} + \Delta OR$$

- Suppose $CA = \bar{x} < 0$, $KA = 0$ and $\Delta OR = 0$
  - Requires $\Delta OA = \bar{x}$
- Suppose $CA = \bar{x} < 0$, $KA = 0$ and $\Delta OR > 0$
  - Requires $\Delta OA < \bar{x}$ (more negative)
- Suppose $CA = \bar{x} < 0$, $KA = 0$ and $\Delta OR < 0$
  - Requires $\Delta OA > \bar{x}$ (less negative)

BoP and CA

$$-\Delta OA = \underbrace{-CA}_{>0 \Leftrightarrow \text{deficit}} + \Delta OR$$

- Suppose $CA = \bar{x} < 0$, $KA = 0$ and $\Delta OR = 0$
  - Requires $\Delta OA = \bar{x}$
- Suppose $CA = \bar{x} < 0$, $KA = 0$ and $\Delta OR > 0$
  - Requires $\Delta OA < \bar{x}$ (more negative)
- Suppose $CA = \bar{x} < 0$, $KA = 0$ and $\Delta OR < 0$
  - Requires $\Delta OA > \bar{x}$ (less negative)

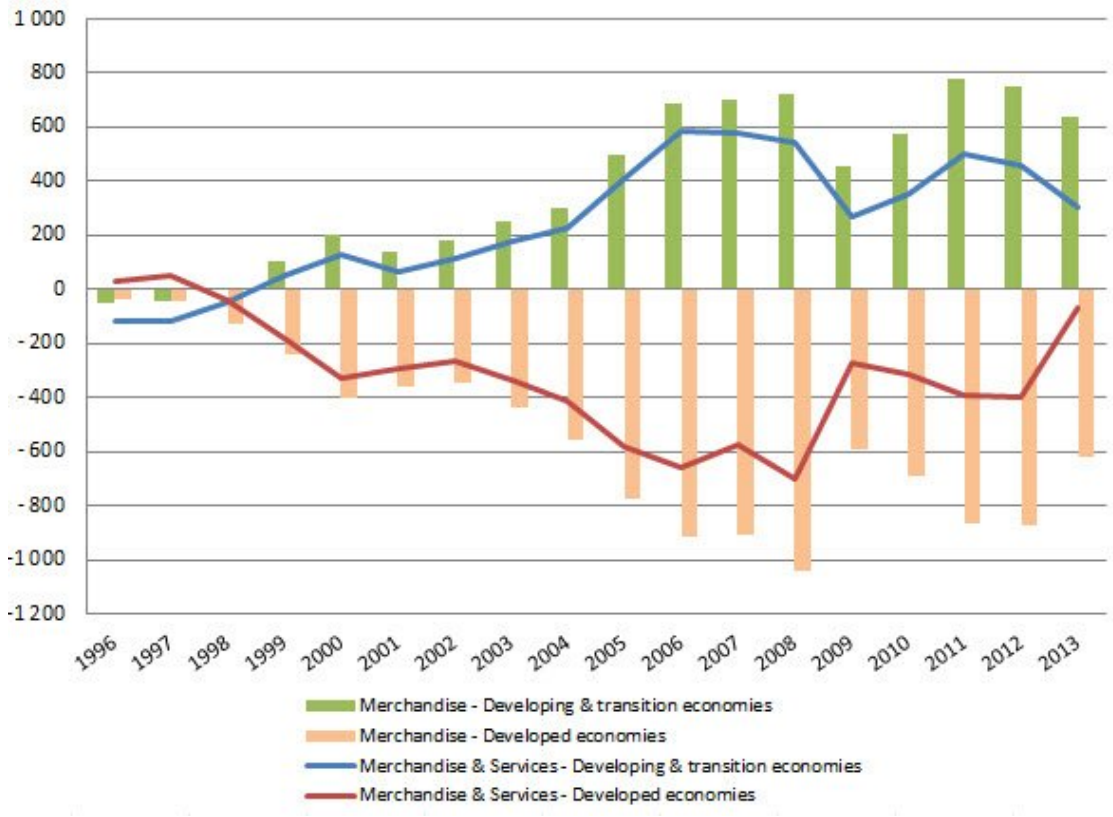
BoP and CA

$$-\Delta OA = \underbrace{-CA}_{>0 \Leftrightarrow \text{deficit}} + \Delta OR$$

- Suppose $CA = \bar{x} < 0$, $KA = 0$ and $\Delta OR = 0$
  - Requires $\Delta OA = \bar{x}$
- Suppose $CA = \bar{x} < 0$, $KA = 0$ and $\Delta OR > 0$
  - Requires $\Delta OA < \bar{x}$ (more negative)
- Suppose $CA = \bar{x} < 0$, $KA = 0$ and $\Delta OR < 0$
  - Requires $\Delta OA > \bar{x}$ (less negative)
  - Fills gap between a CA deficit and the funding from net *private* sales of assets to foreigners.

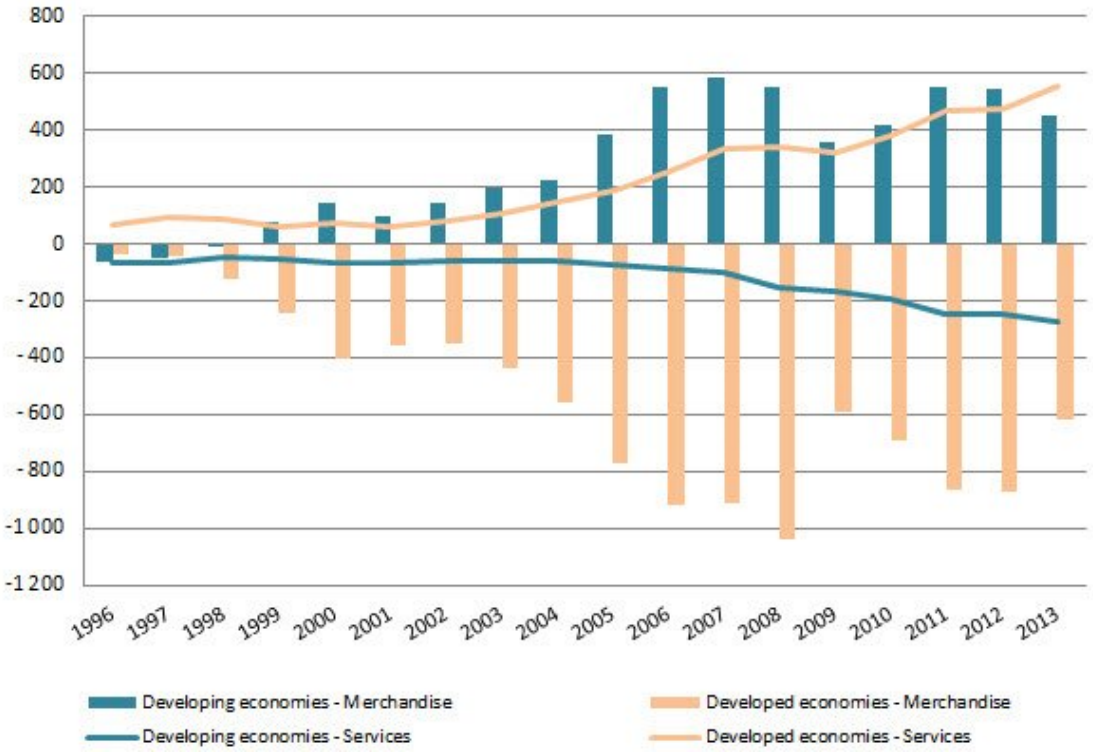
Global Imbalances - Current Account

Trade balance - developed vs developing



Merchandise and total trade balance 1996-2013 (Billion dollars and current prices). Source: UNCTAD

Trade balance - developed vs developing



Merchandise and services trade balance 1996-2013 (Billion dollars and current prices). Source: UNCTAD

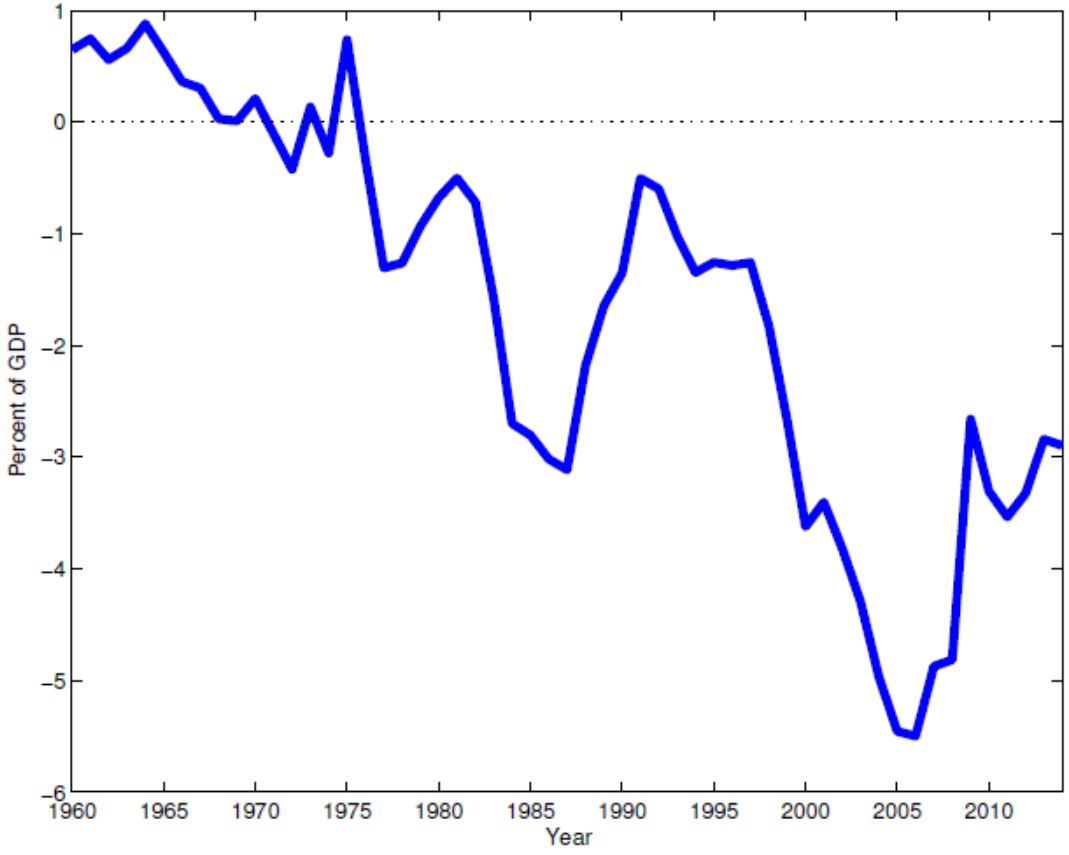
U.S. Trade balance and CA

Item	Billions of dollars	Percentage of GDP
Current Account	-389.5	-2.2
Trade Balance	-508.3	-2.9
Balance on Goods	-741.5	-4.3
Balance on Services	233.1	1.3
Income Balance	238.0	1.4
Net Investment Income	247.4	1.4
Compensation of Employees	-9.4	-0.1
Net Unilateral Transfers	-119.2	-0.7
Private Transfers	-104.9	-0.6
U.S. Government Transfers	-14.3	-0.1

Data Source: Bureau of Economic Analysis, http://www.bea.gov.

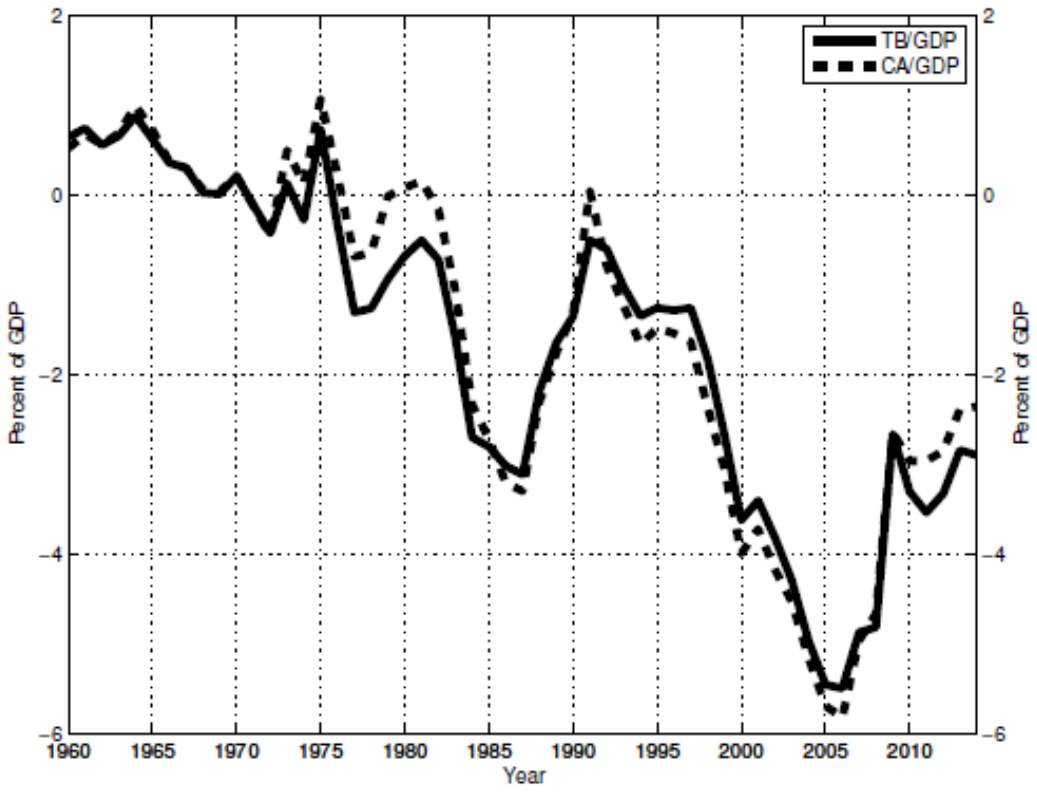
The U.S. International Transactions Account, 2014. Source: SGUW; BEA

U.S. Trade balance and CA



U.S. trade balance as share of GDP. Source: SGUW; BEA

U.S. Trade balance and CA



The U.S. Trade Balance and Current Account As Percentages Of GDP: 1960-2014. Source: SGUW; BEA

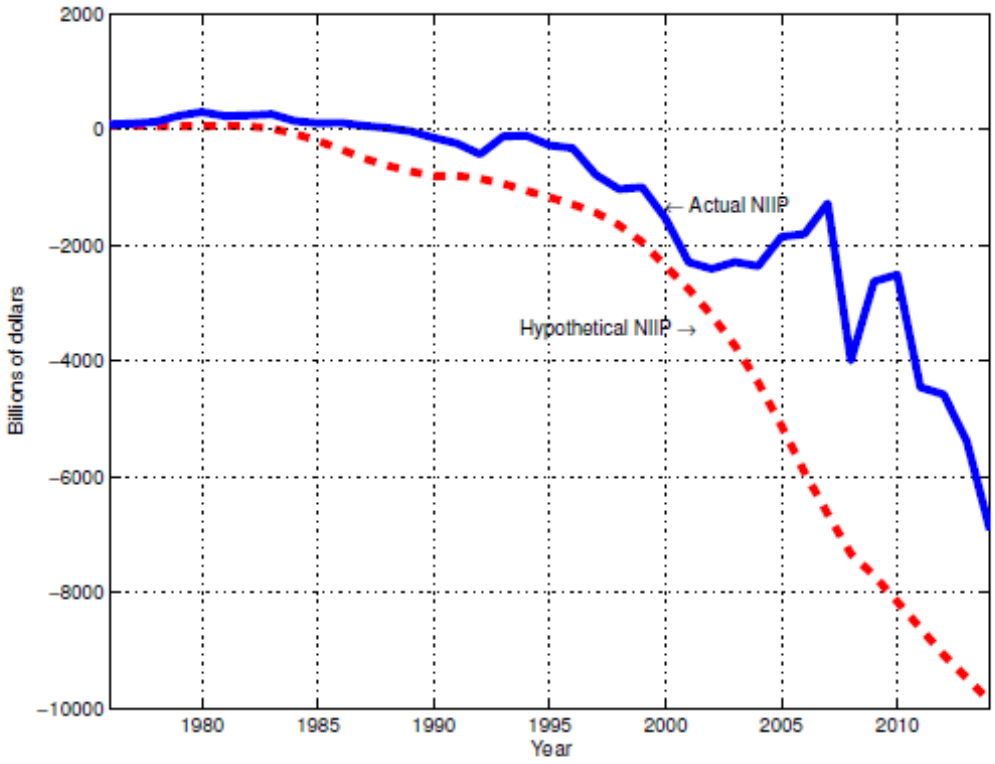
U.S. Net International Investment Position

- NIIP = value of foreign assets owned by the country's residents - value of the country's assets owned by foreign residents
- We asserted earlier that $\Delta NIIP = CA$ in the absence of 'valuation changes'
- More generally: NIIP also affected by changes in the prices of a country's assets and liabilities

U.S. Net International Investment Position

- The NIIP would be even more negative without favorable offsetting valuation changes
  - From 2002-2007 this was especially the case
  - Without valuation changes, NIIP would have been 43% of GDP, rather than 13%
- Note: the enormous increase in the magnitude of **gross** positions (assets and liabilities) associated with global financialization increase the importance of valuation changes for given asset price fluctuations

U.S. Net International Investment Position



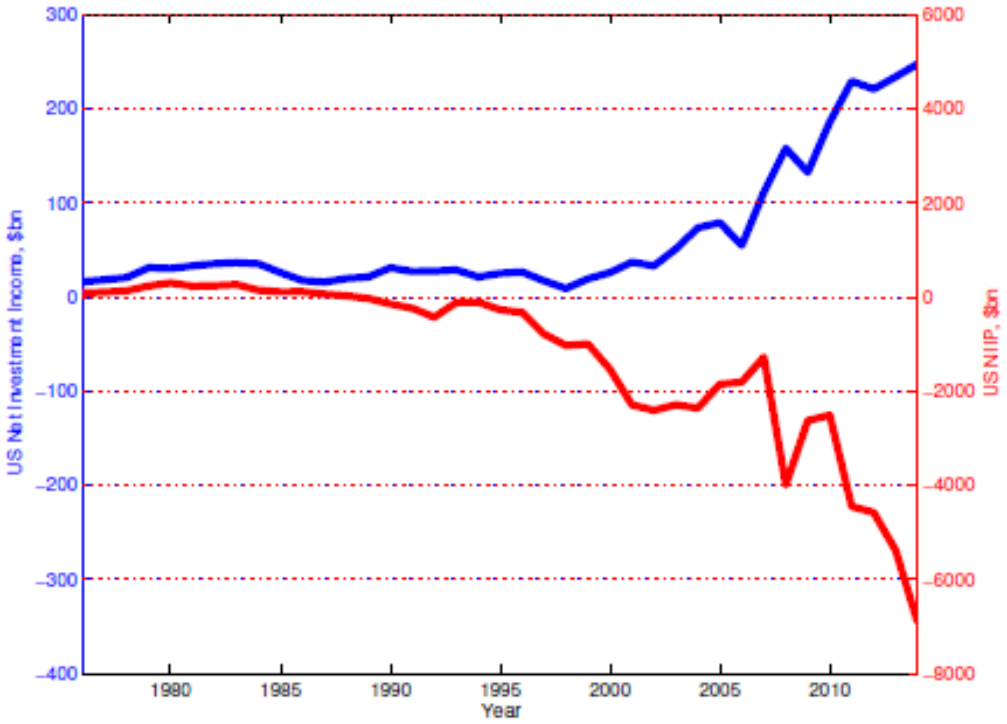
Note: the actual $NIIP$ data are from the Bureau of Economic Analysis. The hypothetical $NIIP$ for a given year is computed as the sum of the $NIIP$ in 1976 and the cumulative sum of current account balances from 1977 to the year in question.

Actual U.S. NIIP and the Hypothetical U.S. NIIP Since 1976. Source: SGUW; BEA

U.S. Net International Investment Position

- Source of valuation changes, 2002-2007 (Milesi-Ferretti, 2009)...
  - Assets (liabilities) denominated in foreign currency (dollars) and dollar depreciated
  - Foreign stock markets outperformed and equities were significant component of assets
  - This came back to bite, however, in 2008 - a big hit to the value of *US* equity portfolio abroad
- Somewhat paradoxically, given its net debtor status, the U.S. has had positive net investment income...

U.S. Net International Investment Position

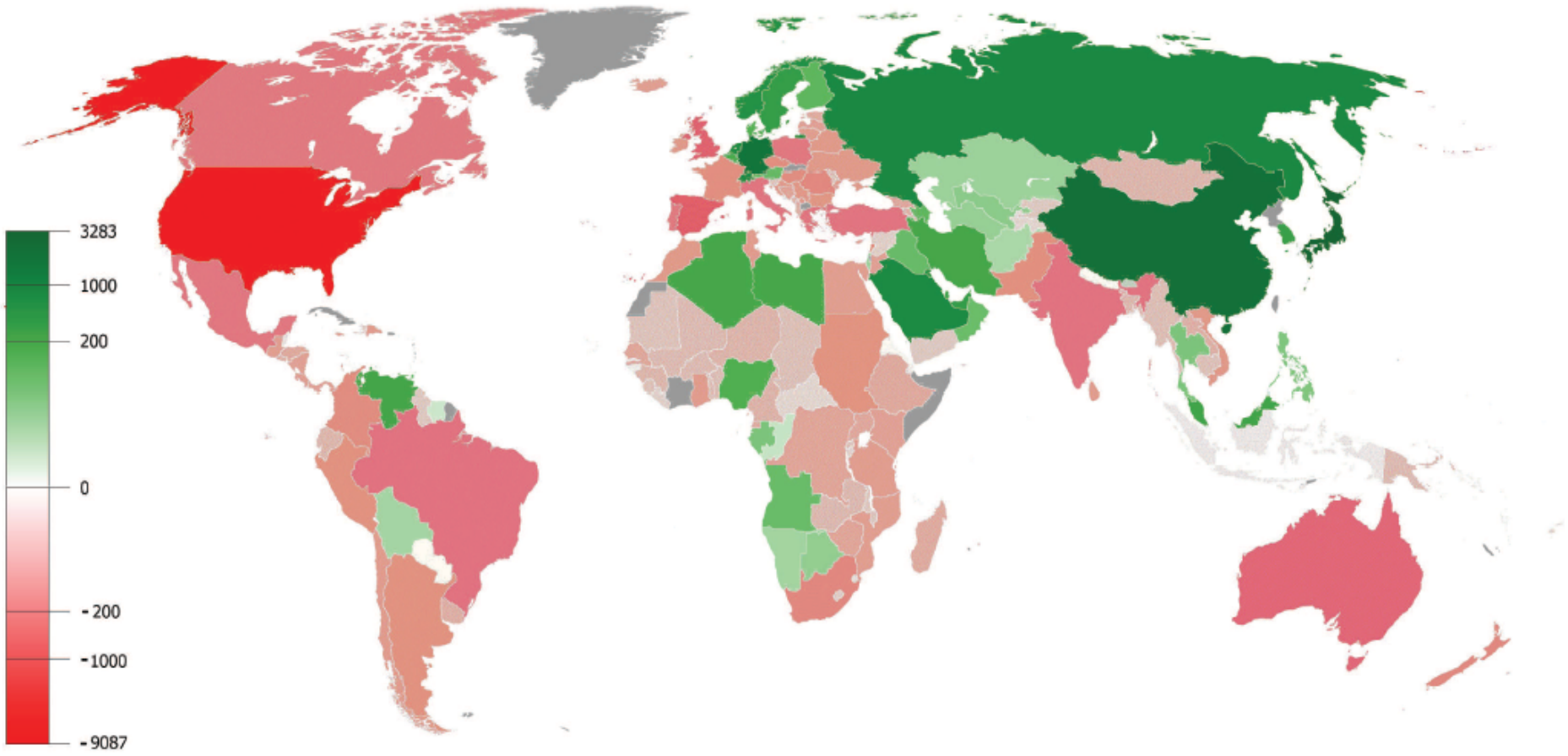


U.S. Net Investment Income and the Net International Investment Position (United States 1976-2014). Source: SGUW; BEA

U.S. Net International Investment Position

- Not paradoxical if one allows for sufficiently large return differential on assets and liabilities
- U.S. has, so far, been able to borrow cheaply in dollars and is heavily invested in 'equities'
- Only a 0.7% annual spread would be required to explain patterns from 1976 to 2014 (see calculations in SGUW text - online)

Global imbalances



Sum of current account balances between 1980 and 2012 (billions of U.S. dollars). Source: SGUW; Wikipedia

Global imbalances

- Lenders of the world have been...
  - Oil exporting countries (Russia, Middle East, Norway, Venezuela)
  - China, Japan, and Germany
- RoW and, especially, U.S. have been borrowing from these countries
- Frequently people argue that the scale and pattern of these 'imbalances' are unsustainable

Sustainability of trade deficits

- One might ask whether CA deficits can be sustained indefinitely (see SGUW online text)
- Let us first consider whether a country can sustain *trade deficits* indefinitely
  - Two period economy ($t = 1, 2$)
  - Ignore net international payments to employees
  - Ignore net unilateral transfers
  - Ignore valuation changes
  - Country inherits NIIP from 'period 0' of B_0^*
  - r is interest paid on net investments

Sustainability of trade deficits

- Under our simplifying assumptions

$$CA_1 = \underbrace{rB_0^*}_{NII} + TB_1$$

- Also, we have (recall no valuation changes)

$$CA_1 = B_1^* - B_0^*$$

- Consequently, we have (using the two equations)

$$B_1^* = (1+r)B_0^* + TB_1$$

- Similarly, for the next period

$$B_2^* = (1+r)B_1^* + TB_2$$

Sustainability of trade deficits

- Combining the 'budget constraints' for the two periods yields

$$(1+r)B_0^* = \frac{B_2^*}{1+r} - TB_1 - \frac{TB_2}{1+r}$$

- Since no foreigners will lend in period 2 (finite horizon), we have $B_2^* \geq 0$
- Since, also, domestic agents will not lend in period 2, we have $B_2^* \leq 0$
- Thus, $B_2^* = 0$ and we obtain

$$(1+r)B_0^* = -TB_1 - \frac{TB_2}{1+r}$$

- The initial NIIP equals the PDV of the sequence of trade deficits

Sustainability of trade deficits

$$(1+r)B_0^* = -TB_1 - \frac{TB_2}{1+r}$$

- An initial negative NIIP requires (subject to paying off debts) positive trade balances currently or in the future
  - This result extends to inifinite horizon
  - Thus U.S. negative *trade balance* cannot be sustained indefinitely
- If *NIIP* is initially positive then, henceforth, negative trade balances can be run indefinitely
- Let us now turn to CA deficits...

Sustainability of CA deficits

- Since $CA_t = B_t^* - B_{t-1}^*$ for $t = 1, 2$, we have

$$B_0^* = -CA_1 - CA_2 + B_2^*$$

- Using the logic from before ($B_2^* = 0$) we obtain

$$B_0^* = -CA_1 - CA_2$$

- Thus, with a finite horizon, an initial negative NIIP (see U.S.) must be followed currently or in the future by current account surpluses at some point, of sufficient magnitude
  - $\Rightarrow$ Perpetual CA deficits are unsustainable
  - Something has to give (maybe currency depreciates, demand switches away from imports etc.)
- Result needs some amendment in infinite horizon...

Sustainability of CA deficits

- In the infinite horizon the constraints don't restrict an initial debtor to run CA surpluses in any period
- Instead, they must run small enough deficits for it to pay 'enough' of its accrued interest owed on existing liabilities
- This implies foreign debt grows sufficiently slowly
  - Clearly, running surpluses will certainly satisfy solvency
  - But surpluses not *necessary* - CA deficit can be growing
  - Value of net debt $= 0$ in PDV terms
- Growing debt requires economy to be growing
  - Otherwise eventually will not be able to cover interest payments
- A lower growth rate will imply a tighter constraint on CA deficit growth rate
  - Bad news about higher r or lower growth will tighten constraint
  - If there is doubt about willingness to pay off debt - this will worsen it

Fixed Exchange Rates

Fixed Exchange Rates and Currency Attacks

- Previously, we discussed fixed exchange (FE) rates in relation to optimal currency areas
  - Currency unions are the 'limiting case' of a FE regime
- In this (sub) section we examine FE, emphasizing their implications for currency crises
  - An introductory, but excellent, reference is Krugman, Obstfeld and Melitz's textbook (also followed for NI/BoP section)

Central bank balance sheet

- We assume a simple CB balance sheet:
  - Assets
    - Foreign assets (official reserves)
    - Domestic assets (think domestic govt. bonds, MBS. . .)
  - Liabilities
    - Deposits of private banks held at CB
    - Currency in circulation or private vaults
    - Net worth - assume zero/constant here

Central bank balance sheet

- We assume a simple CB balance sheet:
  - Assets
    - Foreign assets (official reserves)
    - Domestic assets (think domestic govt. bonds, MBS. . .)
  - Liabilities
    - Deposits of private banks held at CB
    - Currency in circulation or private vaults
    - Net worth - assume zero/constant here

Central bank balance sheet

- We assume a simple CB balance sheet:
  - Assets
    - Foreign assets (official reserves)
    - Domestic assets (think domestic govt. bonds, MBS. . .)
  - Liabilities (= monetary base)
    - Deposits of private banks held at CB
    - Currency in circulation or private vaults

Central bank balance sheet

- Under our simplifying assumptions $\Delta A = \Delta M^s$
  - Any asset purchase or sale will necessarily change the money supply
- Consider buying foreign assets (let us assume narrow banking)
  - With domestic currency: Directly increases claims in circulation
  - With check: Purchaser deposits with private bank and it increases its deposit at CB
- Consider selling foreign assets (let us assume narrow banking)
  - For domestic currency: Directly removes claims in circulation (cash put in CB vault $\Leftrightarrow$ ceases to be part of money base)
  - For check: Clearing check means purchaser's private deposit declines and private bank will reduce its deposits at CB
- 'Sterilization' is where an equal but offsetting transaction in *domestic* assets is undertaken to leave M^s unchanged - we will not discuss this

Forex market and fixed exchange rates

- Assume inflation equalized across countries and relative PPP holds
- For now assume exchange rate fixed *and expected to remain fixed*
- Interest parity implies $R = R^*$
- Equilibrium in the domestic money market implies $M^s = M^d$
- Typical to model real money demand as a function of R and Y
  - Opportunity cost $\Rightarrow$ decreasing in R
  - Transactions purposes $\Rightarrow$ increasing in Y
- Given P and Y the CB must set M^s to equate real money demand and supply

$$\frac{M^s}{P} = L(R^*, Y)$$

Asset market equilibrium

- We now consider a few thought experiments
- In all cases we assume initially an economy in equilibrium with E pegged credibly at E_0
  - $R = R_0^*$
  - $\frac{M_0}{P} = L(R^*, Y)$
  - No expected change in the exchange rate
- Then we consider three 'shocks'
  - $Y \uparrow$ with credibility/enforcement of peg maintained
  - R^* with credibility/enforcement of peg maintained
  - Expectations of a depreciation next period, *all else equal*
- If maintained, the last example is akin to BoP crisis/capital flight

Asset market equilibrium - 1: $Y \uparrow$

- Suppose $Y \uparrow$ (and peg remains credible)
  - Real money demand increases
  - So money demand schedule 'shifts right' in $(\frac{M}{P}, R)$ space
  - Unchanged $M^* \Rightarrow R > R^*$ to clear market
  - But since UIP schedule is unchanged (why?) $R > R^*$ would require an appreciation to respect parity
  - To avoid this violation of peg, CB must buy foreign assets, thereby increasing the M^s sufficiently
  - Ensures Forex and money market both clear under the credible peg, unchanged $R = R^*$

Asset market equilibrium - 2: $R^* \uparrow$

- Suppose $R^* \uparrow$ to $R_1^* > R_0^*$ (and peg remains credible)
  - UIP $\Rightarrow$ for a given R, a higher current E is required
    - Why? Need weaker E *now* to allow for additional appreciation to match returns
  - Parity implies, *in equilibrium*, that $R = R_1^*$
  - Initial $R < R_1^*$ would induce excess demand for foreign assets and, thus, a domestic depreciation
  - To avoid this violation of peg, CB must sell foreign assets, thereby decreasing the M^s sufficiently
  - Ensures Forex and money market both clear under the credible peg with R rising to R_1^*
- Notice that the tighter monetary policy has been 'imported'

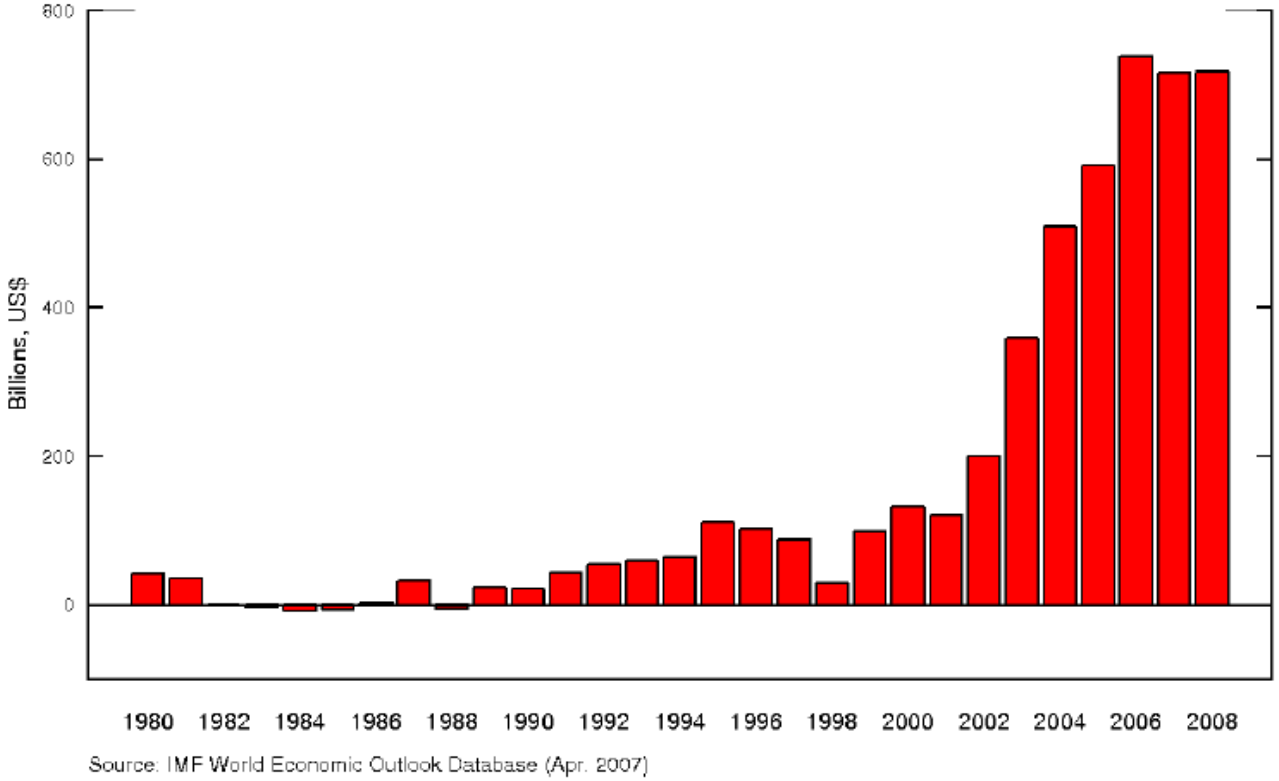
Asset market equilibrium - 3: Capital flight

- Suppose the market comes to believe, *all else equal*, tomorrow's exchange rate will be $E_1 > E_0$ (a depreciation that violates the peg) but the CB is, in fact, committed to ensuring the peg is respected
  - UIP $\Rightarrow$ for a given current E, a higher R is required (UIP locus 'shifts right' in (R, E) space)
  - Parity will *in equilibrium* that $R = R^* + \frac{E_1 - E_0}{E_0}$
  - Initial $R < R^* + \frac{E_1 - E_0}{E_0}$ would induce excess demand for foreign assets and, thus, a domestic depreciation
  - CB must sell foreign reserves at the pegged rate, thereby decreasing the M^s sufficiently
  - Forex and money markets clear with R rising to $R^* + \frac{E_1 - E_0}{E_0}$
- Notice similarities with the previous experiment ($R^* \uparrow$)

Asset market equilibrium - Some comments

- We can think of various stories for the last two examples
  - Perhaps the markets think that a debtor will decide to try and reduce external debt by running CA surpluses (recall earlier discussion)
    - Perception may be that this is best achieved by choking off domestic demand (by raising rates, say) or by devaluing the currency (to induce substitution away from imports)
    - Could undermine belief in commitment to peg?
  - Perhaps risk aversion (or perception of risk - e.g. sov. default) increases abroad or alternative investments abroad offer higher returns
    - Possible contagion if risk aversion is specific to developing countries with similar pegs and imbalances
    - Consider 'taper tantrum' and reversal of international 'search for yield'
    - Does the CB have enough foreign reserves to defend peg over long periods if other CBs aren't cooperative?
    - Capital flight $\Rightarrow$ runs down reserves and tightens policy - possibly painful - is it politically feasible?

Accumulation of reserves



Accumulation of foreign reserves by developing economies. Source: Reinhart and Reinhart (2008; IMF

Accumulation of reserves

- Not only for 'fully fixed' regimes
- Possibly to limit undesired volatility...

Accumulation of reserves

Pound Sterling + Add to myFT

UK Treasury prepared currency war chest for Brexit, says BofA

Investment bank argues British government could stockpile again ahead of new EU departure date

© Bloomberg

Accumulation of reserves

Capital markets + Add to myFT

Turkey's central bank ramps up use of borrowed dollars

Short-term swaps pad out forex reserves at a time of 'volatile' economic outlook

Currency Crises

Currency crises

A currency crisis is a speculative attack on the foreign exchange value of a currency, resulting in a sharp depreciation or forcing the authorities to sell foreign exchange reserves and raise domestic interest rates to defend the currency.

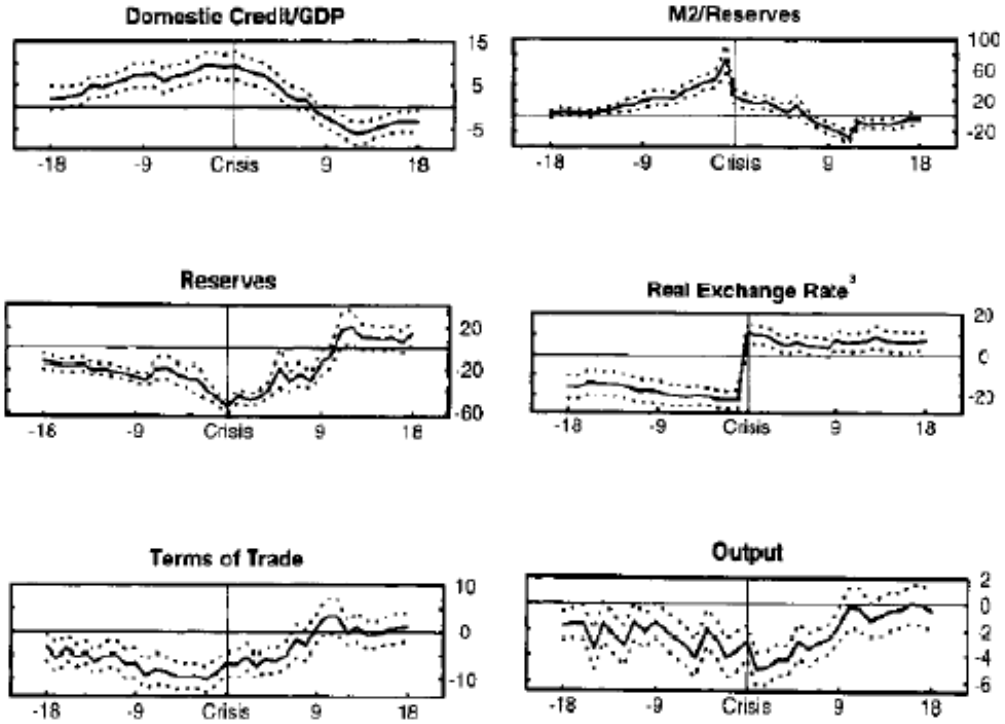
- Glick and Hutchinson (2011)

Currency crises

- Breakdown of Bretton Woods FE system (1971-73)
- GBP in 1976 (required IMF loan)
- GBP and other European currencies in ERM crisis (1992-93)
- Mexican Peso and Latin-America (1994-95)
- Asia (1997-98)
- Russian (1998)

Currency crises - characteristics

Figure 3. Empirical Regularities of Selected Variables before Currency Crises



Note: The horizontal axes represent the number of months before (with a negative sign) and after a crisis. Vertical axis reports level of variables reported as 12-month changes, in percent, relative to "tranquil" times, except for the real exchange rate which is defined as deviations from trend, in percent, relative to "tranquil" times. An increase in the real exchange-rate index denotes a depreciation. The sample consists of 20 small open economies countries experiencing currency crises during the period 1970–mid-1995. Currency crises are defined as changes in a weighted average of the change in the nominal exchange rate and of reserves that exceed three standard deviations from the mean (separate sample characteristics are used for countries experiencing hyperinflations).
Source: Kaminsky and Reinhart (1999).

Currency crises - characteristics

- Credit build up
  - Much current work on this (see Jorda *et al* (various))
  - BIS emphasizing this - in relation to low frequency 'financial cycles'
- Gradual and then sudden decline in currency reserves
  - Defending the peg despite imbalances (even before 'attack')
- Overvaluation and economic weakness prior to attack
  - Given stickiness of prices, this obviously is a pre-requisite given devaluation after abandoning
  - Reflects underlying competitiveness (e.g. productivity) problem undermining peg - and erodes purchasing power
  - Economic weakness makes higher interest rates more painful - undermines confidence in willingness to defend peg

Currency crises - matter of political will

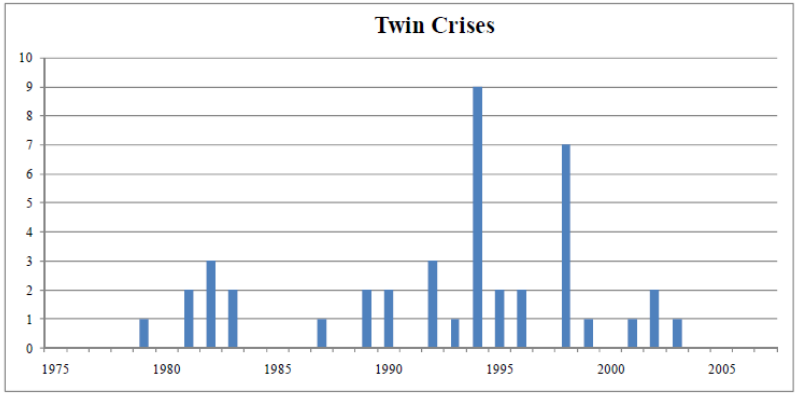
Although it is technically feasible for a country to maintain a pegged exchange rate as long as its central bank has access to enough foreign exchange reserves to respond to speculative attacks, its central bank also must be willing always to subordinate all the other goals of monetary policy. In practice, this means that it must be willing to raise domestic interest rates high enough to maintain the attractiveness of its currency to speculators.

- Glick and Hutchinson (2011)

Currency crises - characteristics

- Substantial capital inflows (often short term debt) in advance
  - Enabled by broadening and deepening of global markets
  - Search for yield
  - Initial confidence in peg (lower exchange rate risk) and liberalization reforms
- Frequently involve contagion (Kaminsky *et al* 2003)
  - Thai baht (1997) $\rightarrow$ Indonesia, Korea, Malaysia, Phillipines...
  - Russia (1998) $\rightarrow$ former Soviet republics, Hong Kong, Brazil, Mexico...
  - Key elements - 'unholy trinity' (Kaminsky *et al* 2003)
    - *Abrupt* capital flow reversal
    - Element of 'surprise'
    - Leveraged common creditors (banks, hedge funds, mutual funds, bond holders)
  - Other theories: Herding, information cascades, behavioral 'panic'

Currency crises - characteristics

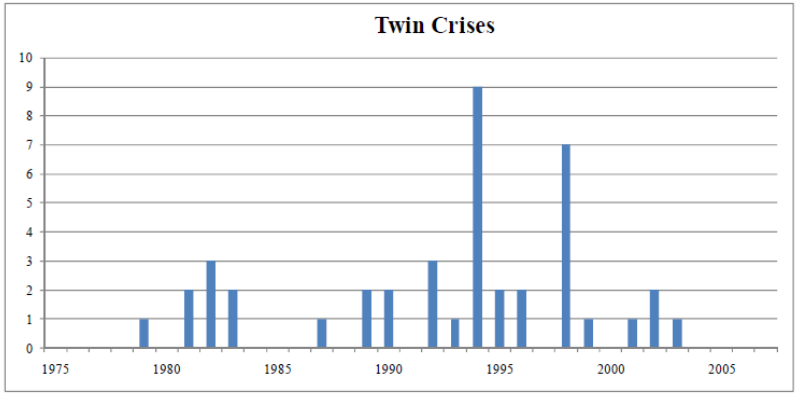


Note: A twin crisis is defined as currency crisis that is accompanied by a banking crisis in the preceding, same, or following year.
Source: Laeven and Valencia (2008).

Source: Glick and Hutchinson (2011); Laeven and Valencia (2008)

- Often, not always, accompanied by banking crises ('twin crises')
- Relate to credit growth prior to crises
  - Banks/firms borrowing at low rates before sudden stop (see Greece)
  - External denomination of debt implies that devaluation raises burden
  - Weakening economy implies balance sheets impaired
  - Defense of peg and consequent higher interest rates also problematic (esp. Asian crisis)

Currency crises - characteristics



Note: A twin crisis is defined as currency crisis that is accompanied by a banking crisis in the preceding, same, or following year.
Source: Laeven and Valencia (2008).

Source: Glick and Hutchinson (2011); Laeven and Valencia (2008)

- Often, not always, accompanied by banking crises ('twin crises')
- Relate to credit growth prior to crises
  - Banks/firms borrowing at low rates before sudden stop (see Greece)
  - External denomination of debt implies that devaluation raises burden
  - Weakening economy implies balance sheets impaired
  - Defense of peg and consequent higher interest rates also problematic (esp. Asian crisis)

Currency crises - models

- We will discuss two 'generations' of models of capital crises
  - 1st generation
    - Bad policy and rational markets
  - 2nd generation
    - Bad policy and rational markets but...
    - Also 'mediocre policy', rational markets and multiple equilibria

Currency crises - 1st generation models

- Consensus used to be that in the periods leading to crises, the CB's foreign reserves would gradually decline to zero
- Instead, what was observed was that there was a point where
  - There was an enormous speculative attack
  - Reserves went to zero almost immediately
- These models were also motivated by the sense that some underlying policy was being pursued that was fundamentally unsustainable
- Seminal work by Krugman-Flood-Garber
  - Our treatment follows Frankel notes
  - See also Agenor and Montiel textbook - Ch. 14

Currency crises - 1st generation models

- Money demand function (in logs)

$$m - p = y - \lambda i$$

- UIP condition

$$i = i^* + \Delta s^e$$

- Assumptions
  - Flex prices/PPP (so $s = p - p^*$)
  - Output at constant potential, $\bar{y}$
  - Normalized $p^* - \lambda i^* = 0$, WLOG
- Combining conditions - given assumptions - yields

$$m - s = \bar{y} - \lambda \Delta s^e$$

Currency crises - 1st generation models

- Under fixed rate regime
  - Rearrange previous condition and impose $s = \bar{s}$

$$m = \bar{s} + \bar{y} - \lambda \Delta s^e$$

  - This equation determines the money supply (recall, we know that M^s is out of the hands of the domestic CB in a fixed regime)
  - Recall CB holds foreign reserves, FR, and domestic assets, DA, which we take to be 'sovereign debt'
- Under flexible rate regime
  - Rearrange previous condition and allow $s = tildes$

$$\tilde{s} = m - \bar{y} + \lambda \Delta s^e$$

  - This equation determines the exchange rate

Currency crises - 1st generation models

- Krugman experiment is to imagine the CB allowing a fixed rate of growth of sovereign debt
  - 'Bad policy': passive CB and active/irresponsible fiscal authority
  - If not 'bad', then at least in tension with peg
- Let percentage growth rate of DA be μ so $da_t = da_0 + \mu t$
  - As long as s is fixed at $\bar{s}$ reserves must adjust
  - Percentage growth rate of reserves $= -\mu$
  - You can see reserves will run out (in which case $m = da$) but when?

Currency crises - 1st generation models

- Let us define a 'shadow' exchange rate

$$\tilde{s}_t = \overbrace{da_t}^{m=da_t+0} - \bar{y} + \lambda\mu = da_0 + \mu t - \bar{y} + \lambda\mu$$

- Think of this as exchange rate that would prevail under a float in absence of foreign assets (money supply then equal only to da)
- Let T be the time at which the speculative attack occurs
- **Rational expectations $\Rightarrow$ cannot be an expected jump in s**
  - O/W scope for infinite profits from riskless position in foreign holdings
- Thus T is defined by $\tilde{s}_T = s_T = da_0 + \mu T - \bar{y} + \lambda\mu$ which implies

$$T = \frac{\bar{s} - da_0 + \bar{y} - \lambda\mu}{\mu}$$

- Exchange rate then floats at $\tilde{s}$ and continues to depreciate

Currency crises - 1st generation models

$$T = \frac{\bar{s} - da_0 + \bar{y} - \lambda\mu}{\mu}$$

- Recall that when the peg is still prevailing expected depreciation is zero
- In particular, this holds in the initial period, thus

$$\bar{s} = m - \bar{y} + \lambda \times 0 = m - \bar{y} = \log\left(DA_0 + FR_0\right) - \bar{y}$$

- Substituting into the previous expression yields

$$T = \frac{\log\left(DA_0 + FR_0\right) - da_0 - \lambda\mu}{\mu}$$

- High FR_0 and low μ postpones speculative attack (intuitive)

Currency crises - 2nd generation models

- 1st generation models posit some irreconcilable tension between the peg and some other aspect of policy (fiscal profligacy, unsustainable current account...)
- Also, the policy is often on 'auto pilot' - not explained where the lack of commitment to the peg comes from
- 2nd generation models focus on policymaker's making a cost-benefit decision between respecting or abandoning the peg
- The costs may be dependent on private-sector beliefs about the policymaker's decision
- **This introduces 'feedback' that can lead to multiple equilbiria**

Currency crises - 2nd generation models

- If the economy is 'somewhat' vulnerable, then pessimistic beliefs about the reliability of the peg can be self confirming
  - Recall our earlier example where exchange rate expectations shifted
  - Required interest rates to rise
  - In Asian crisis this featured (and additionally depositors got nervous)
  - This has a contractionary effect and undermined fragile banks
  - Thus, there is a cost to maintaining the peg that is tied to private sector beliefs
- Various Asian (1990s) countries were attacked despite previously performing well and in absence of egregious CA or fiscal deficits

Currency crises - 2nd generation models

A speculative currency attack can take place and succeed even though current policy is not inconsistent with the exchange rate commitment. This is because the policies implemented to defend a particular exchange rate level, such as raising domestic interest rates, may also raise the costs of defense by dampening economic activity and/or raising bank funding costs.

- Glick and Hutchinson (2011)

Currency crises - 2nd generation models

- If the economy has fundamentals that are 'rock solid' then these multiple equilibria may not apply
  - Explains why Asian countries have accumulated enormous Foreign reserves
  - Structural reforms to improve response to BoP pressure **and** peg defense response
- If the economy has awful fundamentals (as in 1st generation) then only one equilbrium (peg fails regardless)
- It is in an intermediate range where whether and when a crisis strikes is unpredictable
  - Depends on animal spirits
  - May explain why floating (or managed floating) has become more fashionable