ORIGINAL SIN AND DARK MATTER
(STILL) MATTER:
ASSET COMPOSITION AND SOLVENCY

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Why do we care about deficits?

• Because deficits determine the evolution of net financial assets
• Surplus = ∆Net Financial Assets = ∆NFA
• Financial income is a function of financial assets and liabilities
• Fin.Income = i * NFA
• The higher the debt, the higher the primary surplus needed to be solvent
• Steady State Primary Surplus = (i - g) d
• Where g is the nominal growth rate and d is the debt to GDP ratio
• This is true both for fiscal dynamics as well as balance of payments dynamics
For example, let us look at Japan
Japan accumulated US$ 3 T in CAS and increased its Fin. Income in US$ B 140
Japan accumulated ~50% of GDP in CAS and 2.5% in net financial income.
Japan: implied interest rate is reasonable
But many countries do not look like Japan

Let us look at the US
The US accumulated US$ 8 T in CAD, but its fin. income went up by US$ 130B.
The cumulative CAD is 50% of GDP
Financial income increased 1% of GDP
The US pays a negative interest rate on its net financial position.
One accounting approach

- Consider that all assets pay a benchmark rate
  - Say 5%
- If you can invest and obtain a higher return, it is as if you own an asset that pays also pays 5% and that represents the difference
- If you pay more than 5%, it is as if you borrowed a larger debt that also pays 5% but that represents the same interest payment
- We call this asset “dark matter”
US dark matter is 80 percent of GDP
Japan’s dark matter is insignificant
How can the US do this?

• Say the US borrowed US$ 8 trillion net
• ...but in fact it borrowed US$ 20 trillion gross
• Say it pays 3% on its gross debt
  – US$ 600 billion
• It uses the extra US$ 12 trillion to invest abroad
• Say the return is 7%
  – US$ 840 billion
• Net financial income would go up by US$ 240 billion
Why don’t we all do this?

- We can all ask Goldman Sachs or JP Morgan to manage our money
- But US investments abroad are mostly FDI
- They include productive knowledge
- The apparent financial return incorporates payment for the use of productive knowledge
- When China buys US treasuries, it does not add any knowledge to the investment
- Differential returns are an equilibrium phenomenon
- If some countries get excess returns, others pay excess returns (they must add to zero worldwide)
China’s CAD at US$ 2T
Interest income at US$20B

Cumulative Current Account, Billions

Investment Income Net, Billions USD

Cumulative Current Account, Billions

Investment Income Net, Billions USD

year

1980 1990 2000 2010
China’s CAD at 30% of GDP
Interest income at 0% of GDP
China’s implied interest rate is negligible
China imports dark matter to the tune of 30% of GDP.
Interpretation

• China is running current account surpluses
• But it has large FDI inflows
  – With their embedded knowledge
• ...and it is buying a lot of international securities
  – With their normal returns
Chile
Chile accumulated a CAD of US$15B, but pays a similar amount in dividends.
Chile’s CAD is small but it pays 8% in “debt service” (160% of GDP at 5%)
Chile’s implied interest rate is almost 80% of the cumulative CAD
Chile’s dark matter amounts to 150% of GDP.
Interpretation

- Chile has received significant FDI in mining and elsewhere
- Good times have dramatically increased the returns on those investments
- But the assets that Chile has invested abroad pay much less
- The difference is equivalent to a very large external debt
Colombia
Colombia’s cum. CAD at US$60B
Interest payments at US$12B
Colombia’s CAD is at 20% of GDP
Interest payments at 3.5% of GDP
(not 1 percent at 5%)

![Graph showing cumulative current account and investment income net as percentages of GDP over years 1980 to 2010. The graph indicates fluctuations in these percentages over time.]
Colombia’s implied interest rates at ~20 percent
Peru
Peru accumulated CAD of US$40B
Interest payments at US$10B

Cumulative Current Account, Billions

Year

Investment Income Net, Billions USD

Cumulative Current Account, Billions

Investment Income Net, Billions USD

1980 1990 2000 2010

-40 -30 -20 -10 0 10 20 30 40

-8 -6 -4 -2 0 2 4 6 8 10
Peru’s CAD at ~30 percent of GDP
Interest payments at 6%
Peru’s implied interest rate at 20%
Peru’s dark matter is at ~100% of GDP
Mexico
Mexico’s CAD at US$ 270B
Interest payments at US$ 18B

Cumulative Current Account, Billions
Investment Income Net, Billions USD

1980 1990 2000 2010
-300 -200 -100 0 100 200 300
-20 -15 -10 -5 0

Cumulative Current Account, Billions
Investment Income Net, Billions USD

year
Mexico’s CAD at 25% of GDP
Interest payments at less than 2%

![Graph showing cumulative current account and investment income net as percentage of GDP over years from 1980 to 2010.](image-url)
Mexico’s implied interest rate is reasonable.
Mexico does not have much dark matter debt
Brazil
Brazil’s CAD at ~US$ 280B
Interest payments at ~US$40B
Brazil’s CAD is at ~10% of GDP
Interest payments at 2% of GDP
Brazil’s implied interest rate at ~15%
Brazil’s dark matter at ~20% of GDP
Implied interest rate 2010

(Investment income > 0)
Implied interest rate
(Investment income < 0)
RATINGS AND INVESTMENT INCOME
**Ratings: Investment Income matters, cumulative CA does not**

<table>
<thead>
<tr>
<th>VARIABLES</th>
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<td>real GDP per capita, log</td>
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<td>13.62***</td>
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<td>Country FE</td>
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Conclusions

- Assets and liabilities have radically different returns.
- This means that the evolution of the current account is a poor guide to solvency.
- The net financial income is a more relevant indicator of solvency.
- And markets seem to notice.
- A similar analysis could be done for public debt.
ORIGINAL SIN
Eichengreen and Hausmann (1999) defined original sin as "a situation in which the domestic currency is not used to borrow abroad".

- Countries that suffer from original sin need to borrow funds dominated in terms of a major foreign currency.
- If the borrowing country's domestic currency depreciates, the loan will become more difficult to repay.
Measurement

- Eichengreen, Hausmann, and Panizza (2001) used BIS data on the currency composition of international securities to build two indexes of original sin

\[ OSIN1 = 1 - \frac{\text{Securities issued by country } i \text{ in currency } i}{\text{Securities issued by country } i} \]

\[ OSIN3 = \max(1 - \frac{\text{Securities issued in currency } i}{\text{Securities issued by country } i}, 0) \]

- Most research has focused on \( OSIN3 \)
Causes

• The case of the missing apple
  – Original sin (at least its international component) does not appear to be correlated with any of the obvious suspects
    • No correlation with inflation, fiscal deficit, quality of policies, and institutional quality
      – Policies and predictability do matter for the domestic component of original sin
  – Only country size seems to matter
Consequences

• The pain of original sin
  – Original sin leads to “fear of floating,” high GDP volatility, low credit ratings, sudden stops, and limited ability to conduct an independent monetary policy
    • Hausmann, Panizza, and Stein (2001) “Why Do Countries Float the Way They Float?”
Not Everybody Agrees

• Original sin is the outcome of bad policies
  – Burger and Warnock (2006)

• Maybe original sin was a problem in the past but it’s no longer a problem now
  – The principal emerging markets sales desk pitch of recent years has been the expiation of the "original sin" of governments' borrowing in foreign currencies. (John Dizard, Financial Times, October 21 2008).
But original sin has not gone down much

Source: Hausmann and Panizza (2009)
But original sin has not gone down much

Source: Hausmann and Panizza (2009)
But original sin has not gone down

Source: Hausmann and Panizza (2009)
And yet, things seem to have improved

Monetary policy in EM during the Asian/Russian crises (1996-98)

Source: Hausmann and Panizza (2009)
And yet, things seem to have improved

Monetary policy in EM around the subprime crisis (2008-09)

Source: Hausmann and Panizza (2009)
What has gone down is net external borrowing by developing countries

- Consider the following measure of aggregate mismatches:

\[
MISM = \frac{\text{foreign currency debt}}{\text{GDP}} - \frac{\text{international reserves}}{\text{GDP}} + (1 - OSIN) \frac{\text{foreign currency debt}}{\text{GDP}}
\]

- So, a country can reduce its aggregate mismatch by
  - Borrowing less (in gross terms)
  - Accumulating reserves
  - Reducing original sin
Developing countries no longer have a net external debt

Source: Hausmann and Panizza (2009)
Lower mismatches and not lower original sin are the explanation for better polices

### Dependent variable: Policy interest rate

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<td>0.659***</td>
<td>0.533***</td>
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<td>(0.0521)</td>
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<td>0.398***</td>
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<td>(0.0688)</td>
<td>(0.109)</td>
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<td>GROWTH</td>
<td>-0.281***</td>
<td>0.157**</td>
<td>-0.0457</td>
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<td>(0.0769)</td>
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<td>MISM3**</td>
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<td>2.679</td>
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<tr>
<td></td>
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<td>(0.834)</td>
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<td>Observations</td>
<td>270</td>
<td>52</td>
<td>270</td>
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<tr>
<td>R-squared</td>
<td>0.642</td>
<td>0.307</td>
<td>0.649</td>
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<tr>
<td>N. of countries</td>
<td>23</td>
<td>26</td>
<td>23</td>
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<tr>
<td>Period</td>
<td>1993-08</td>
<td>2008-09</td>
<td>1993-08</td>
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</table>

GROWTH+ 0.28*MIS3*GR
p-value 0.00
GROWTH+ 0.09*MIS3*GR
p-value 0.147

Fixed effects regressions

Source: Hausmann and Panizza (2009)
Conclusions

• There is limited traction for the redemption story, but countries seem to be doing what we suggested they could do:

If a country ...suffers from ... original sin..., when it accumulates a net debt, as developing countries are expected to do, it will have an aggregate currency mismatch on its balance sheet. ... such a country can take steps to eliminate that mismatch or prevent it from arising in the first place... it can decide not to borrow. A financially autarchic country will have no currency mismatch because it has no external debt, even though it still suffers from original sin... Alternatively, the government can accumulate foreign reserves to match its foreign obligations. In this case the country eliminates its currency mismatch by eliminating its net debt.

Eichengreen, Hausmann, Panizza (2005a)
RATINGS, INVESTMENT INCOME AND ORIGINAL SIN
## Ratings, Investment Income and OSIN

<table>
<thead>
<tr>
<th>VARIABLES</th>
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<td>(1.621)</td>
<td>(1.616)</td>
<td>(2.086)</td>
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<td>Total debt to GDP</td>
<td>-5.14***</td>
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<td>-4.70***</td>
<td>-4.70***</td>
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<td></td>
<td>(0.924)</td>
<td>(0.957)</td>
<td>(0.939)</td>
<td>(0.979)</td>
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<td>Original Sin (3)</td>
<td>-2.18***</td>
<td>-2.19***</td>
<td>-2.29***</td>
<td>-2.29***</td>
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<tr>
<td></td>
<td>(0.572)</td>
<td>(0.575)</td>
<td>(0.580)</td>
<td>(0.576)</td>
</tr>
<tr>
<td>Central Bank Reserves to GDP</td>
<td>-0.36</td>
<td>-0.53</td>
<td>-0.53</td>
<td>-0.53</td>
</tr>
<tr>
<td></td>
<td>(1.645)</td>
<td>(1.773)</td>
<td>(1.772)</td>
<td></td>
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<tr>
<td>Net Investment Income to GDP</td>
<td>10.53***</td>
<td>10.57***</td>
<td></td>
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<td></td>
<td>(3.401)</td>
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<td>Cumulative CA to GDP</td>
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<td>(0.512)</td>
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<td>Constant</td>
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<td>-25.96***</td>
<td>-33.65***</td>
<td>-33.63***</td>
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<td></td>
<td>(5.688)</td>
<td>(5.609)</td>
<td>(7.404)</td>
<td>(7.461)</td>
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<td>Observations</td>
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<td>Adjusted R-squared</td>
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<td>Year Fe</td>
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<td>Country FE</td>
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</table>
Conclusions

• Countries are borrowing less
• They are holding large FOREX reserves
• ...which lower their net financial income
  • These may be optimal policies in the presence of original sin
  • But they are second best policies
    • The country will not benefit from financial globalization
    • Reserves are expensive
• While reserves give more policy space, they don’t improve perceptions of solvency
Thank you!

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France

Cumulative Current Account, Billions

Investment Income Net, Billions USD

year

Cumulative Current Account, Billions

Investment Income Net, Billions USD

1980 1990 2000 2010
France

![Graph showing cumulative current account and investment income net as a percentage of GDP over the years 1980 to 2010.]
France

Cumulative Dark Matter, % of GDP

Year

1980 1990 2000 2010

0 0.1 0.2 0.3
France

Implied interest rate vs year

-2  -1  0  1  2  3  4  5  6


year
Cumulative current account and investment income

LATIN AMERICA
Argentina

Cumulative Current Account, Billions

Investment Income Net, Billions USD

Cumulative Current Account, Billions

Investment Income Net, Billions USD

year

1980 1990 2000 2010

Argentina

Cumulative Current Account, Billions

Investment Income Net, Billions USD
Argentina

![Graph showing Cumulative Dark Matter as a percentage of GDP from 1980 to 2010. The graph has tick marks at 1980, 1990, 2000, and 2010, with values ranging from -1.5 to 0 on the Cumulative Dark Matter axis. The year range is from 1980 to 2010 on the x-axis.]
Argentina

Year


Implied interest rate

0.05 0.1 0.15

-0.05
DARK MATTER
Cumulative dark matter 2010

Accumulated Dark Matter, % of GDP

GDP per capita, logs

-3 -2 -1 0 1

-3 -2 -1 0 1

Investment Income> 0  Investment Income< 0
What has gone down is net external borrowing by developing countries.

Source: Hausmann and Panizza (2009)
But, maybe redemption was achieved by borrowing domestically.

Countries included in the sample: Argentina, Brazil, Chile, China, Colombia, Croatia, Czech Republic, Hong Kong SAR, Hungary, India, Indonesia, South Korea, Lebanon, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland, Russia, Singapore, Slovakia, South Africa, Taiwan (China), China, Thailand, Turkey, Venezuela.

Source: Hausmann and Panizza (2009)
Possible, but unlikely

Developing countries’ bonds held by US investors

Possible, but unlikely
Possible, but unlikely

Original sin indexes based on US Treasury data

<table>
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<th>Year</th>
<th>Mean</th>
<th>Median</th>
<th>St Dev</th>
<th>Min</th>
<th>Max</th>
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<td>0.16</td>
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<td>2005</td>
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<td>0.81</td>
<td>0.95</td>
<td>0.24</td>
<td>0</td>
<td>1</td>
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US SIN1 = 1 - (OTH+OWN)/TOT

<table>
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<th>Year</th>
<th>Mean</th>
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<th>St Dev</th>
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<th>Max</th>
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<td>2006</td>
<td>0.90</td>
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<tr>
<td>2007</td>
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<td>1</td>
<td>0.21</td>
<td>0.10</td>
<td>1</td>
<td>72</td>
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</table>

Source: Hausmann and Panizza (2009)
Possible, but unlikely

US-SIN2: countries with value of the index lower than 0.9 (2007 survey)

Source: Hausmann and Panizza (2009)
Measurement

• Caveats:
  – These indexes only include international securities
    • They don’t include syndicated bank loans and official (multilateral and bilateral) loans
    • They don’t capture the activity of foreign investors in the domestic bond market
  – They don’t measure the domestic component of original sin