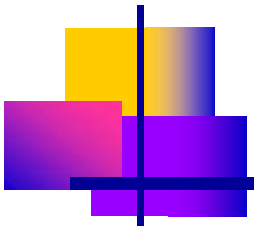
Monetary Policy on the Horns of a Trilemma



Joshua Felman

International Monetary Fund - India

Inaugural Talk for ICRIER's

Open Economy Macro and Finance Seminar

May 21, 2008

Warning!

- The views expressed are personal and are not necessarily those of the IMF, its Executive Board, or its management.

Roadmap of presentation

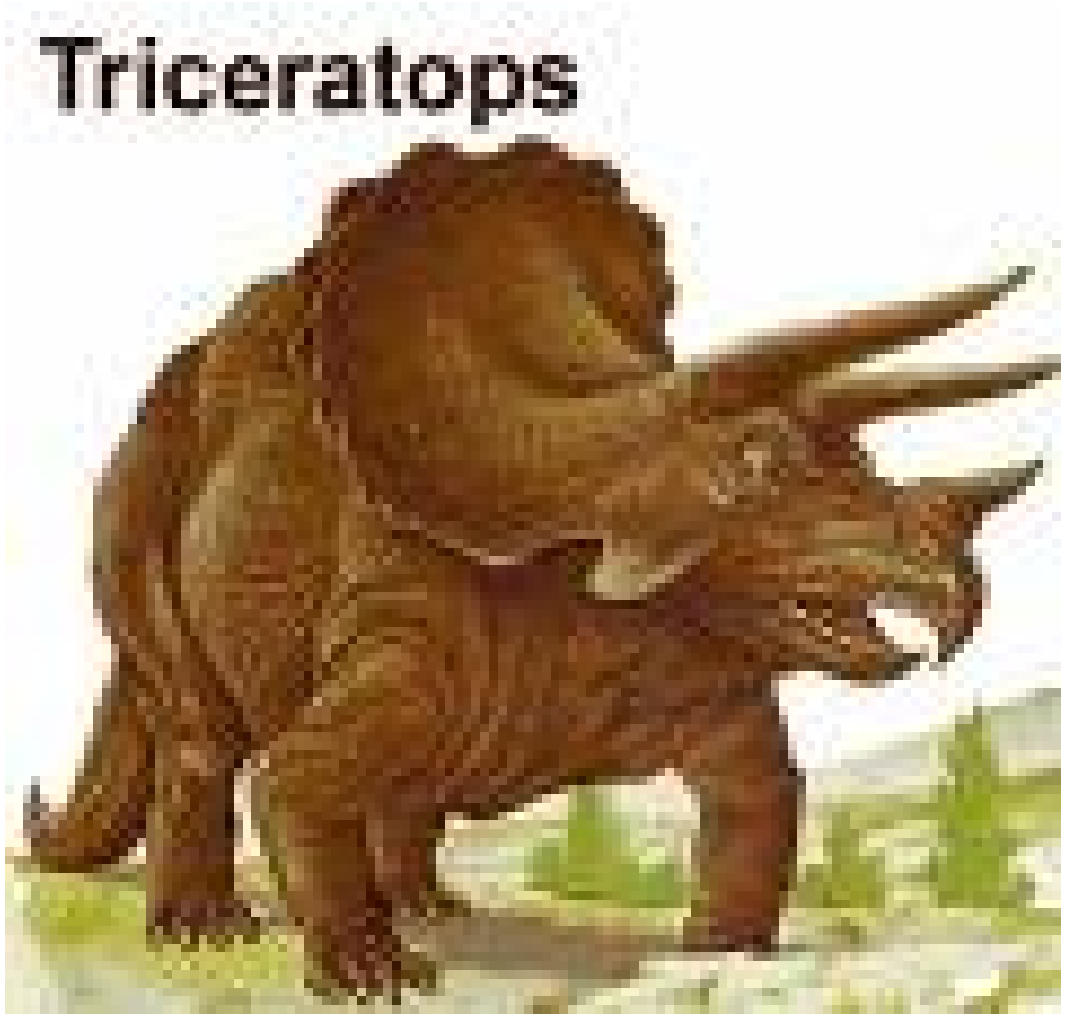
- Is India really caught on the horns of a trilemma?
- Is there a way out?
- Is sterilized intervention sustainable?

Roadmap of presentation

- Is India really caught on the horns of a trilemma?
- Is there a way out?
- Is sterilized intervention sustainable?

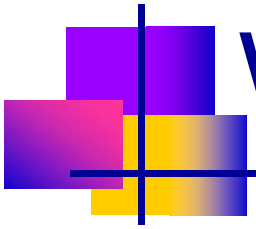
The horns of a dilemma

The horns of a trilemma!



What is the trilemma?

- The trilemma arises from the “impossible trinity”
- You cannot simultaneously:
  - Keep the exchange rate stable
  - Use interest rate policy to target inflation
  - Maintain an open capital account
- Two of these conditions can hold, but not three



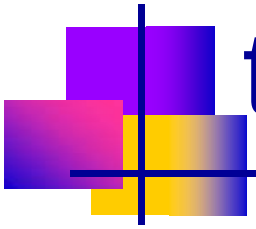
Why not?

- If you maintain a stable exchange rate with interest rates higher than in the rest of the world, then capital will flow in to try to take advantage of the higher interest rates
- In a “frictionless world” the process will only stop when the interest rate differential has been arbitraged away

This creates a “trilemma”

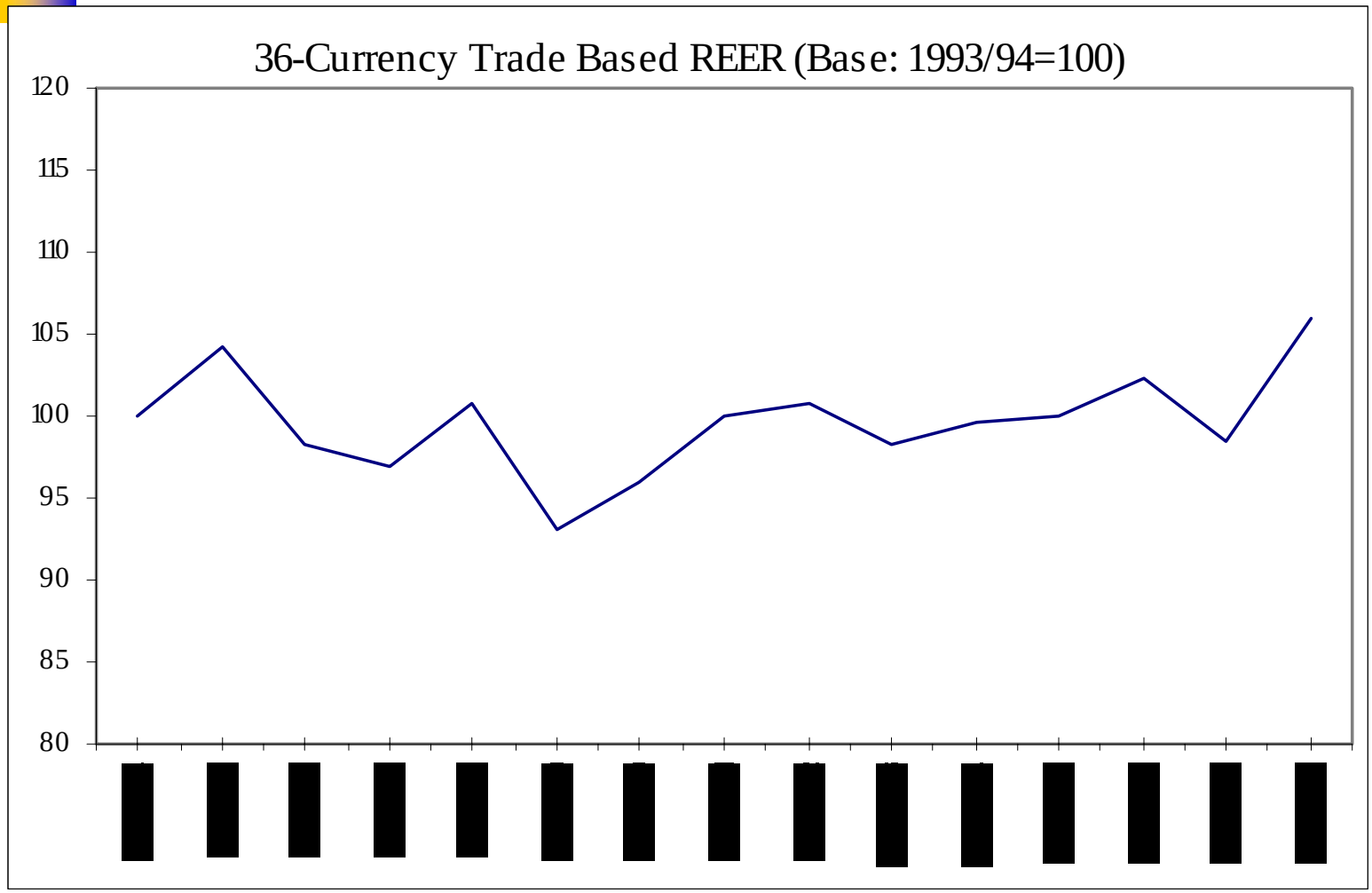
- The impossible trinity is a problem because most countries
  - Have an inflation objective
  - Care about the exchange rate
  - And would prefer to have an open capital account, to facilitate trade and investment
- The incompatibility of these three objectives leads to the “trilemma”
- Most countries don’t want to give up on *any* of these objectives

Does this theory really apply to India?



- Many people argue that India does not face the trilemma, because it has capital controls
- So, it is perfectly feasible for it to maintain relatively high interest rates and a stable exchange rate
- Indeed, they claim this is exactly what India has done for the past 15 years!

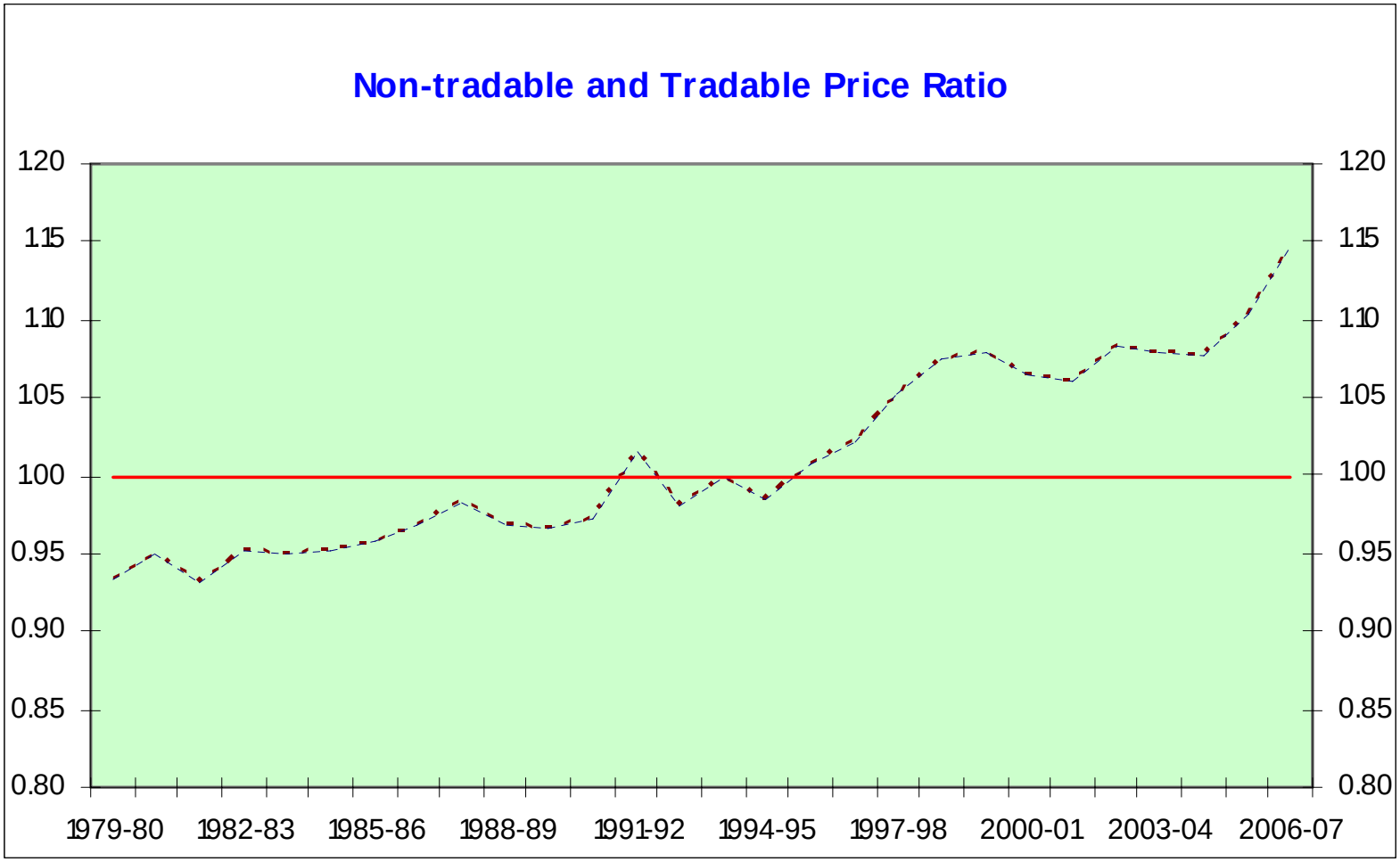
The proof of the pudding?

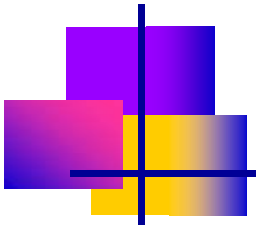


The REER vs. the RER

- But things are never so simple!
- Textbooks hardly ever measure exchange rate trends by the real effective exchange rate (REER)
- They prefer to look at the price of traded goods (such as clothes) relative to the price of nontraded goods (such as infrastructure)
- This is known as the RER, the real exchange rate
- If you do this, as Kohli and Mohapatra (2007) have done, a very different picture emerges!

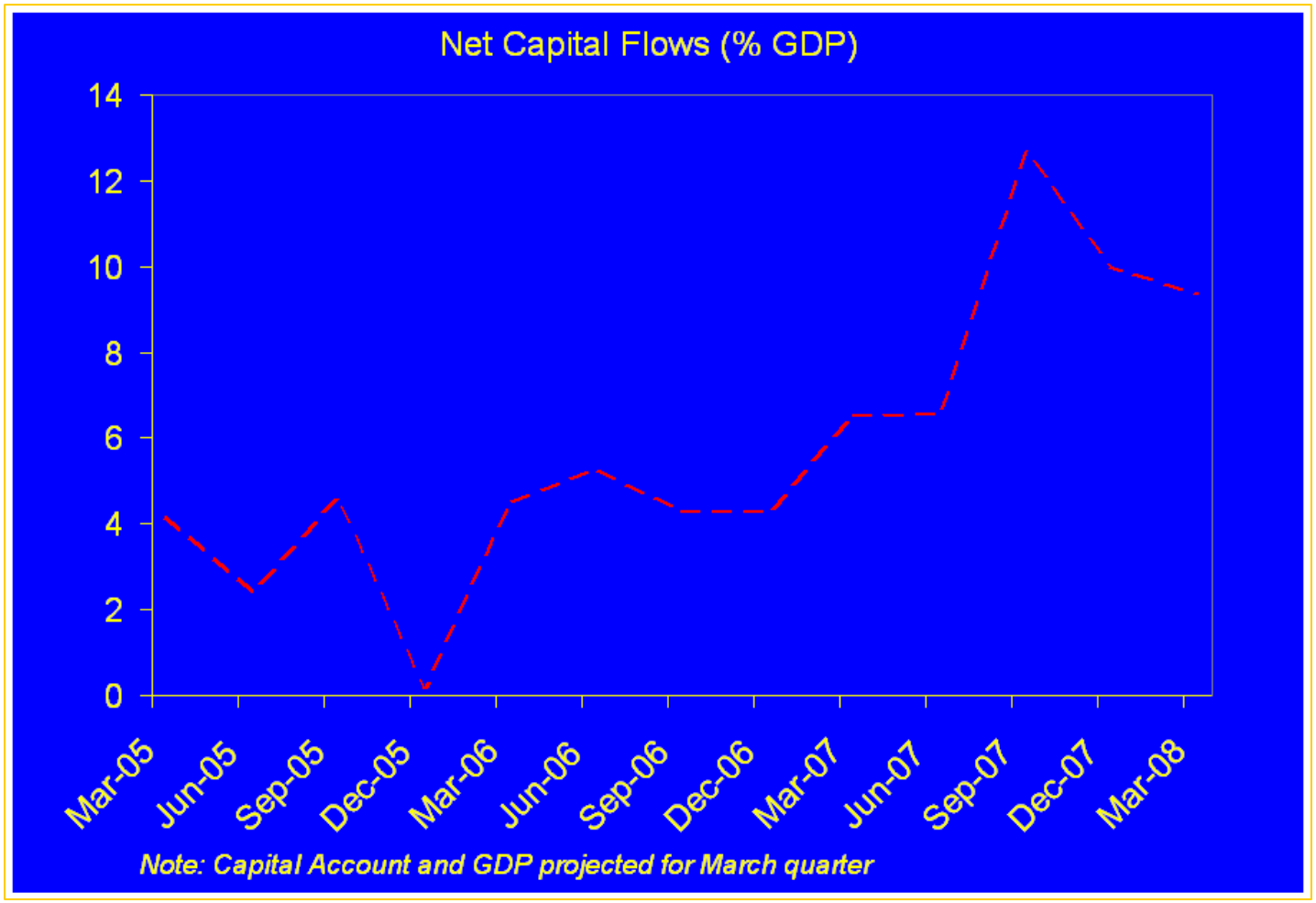
The exchange rate has been appreciating!



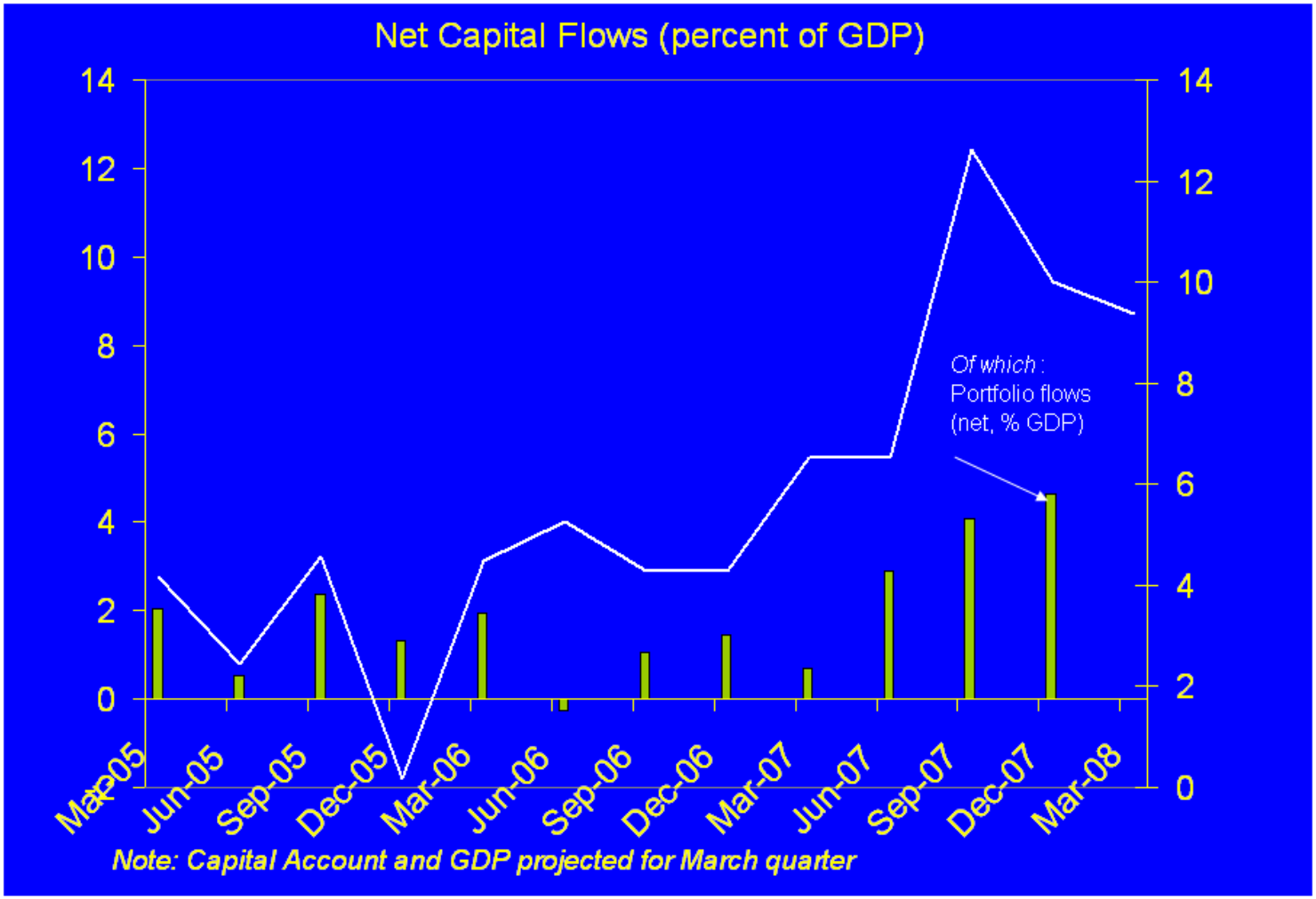


- So, it’s a good question: does the impossible trinity apply to India?
- Let’s look at the data

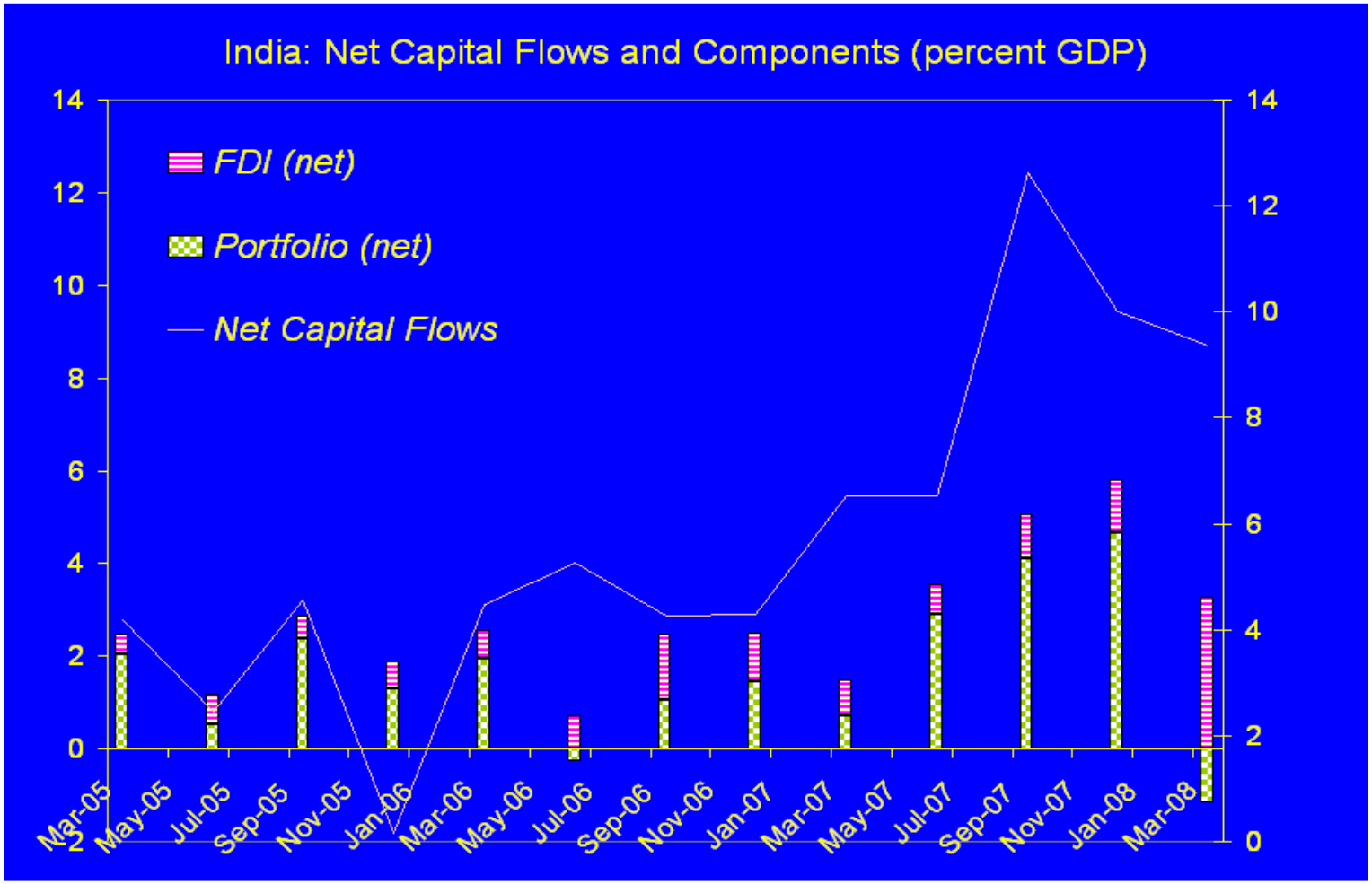
Certainly, capital inflows have been soaring

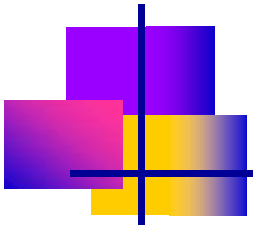


Not just due to FII inflows



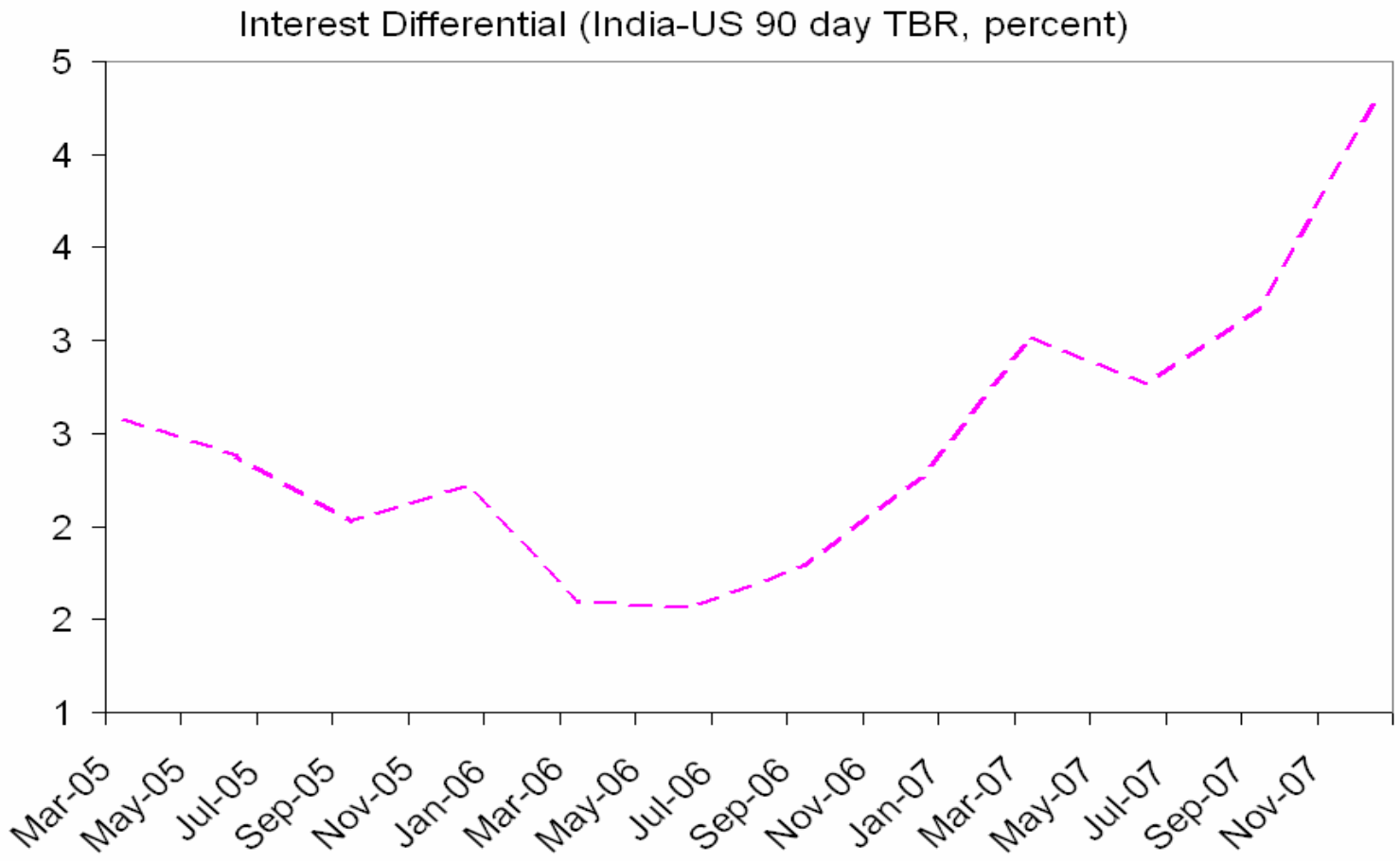
Nor even to FDI+FII!



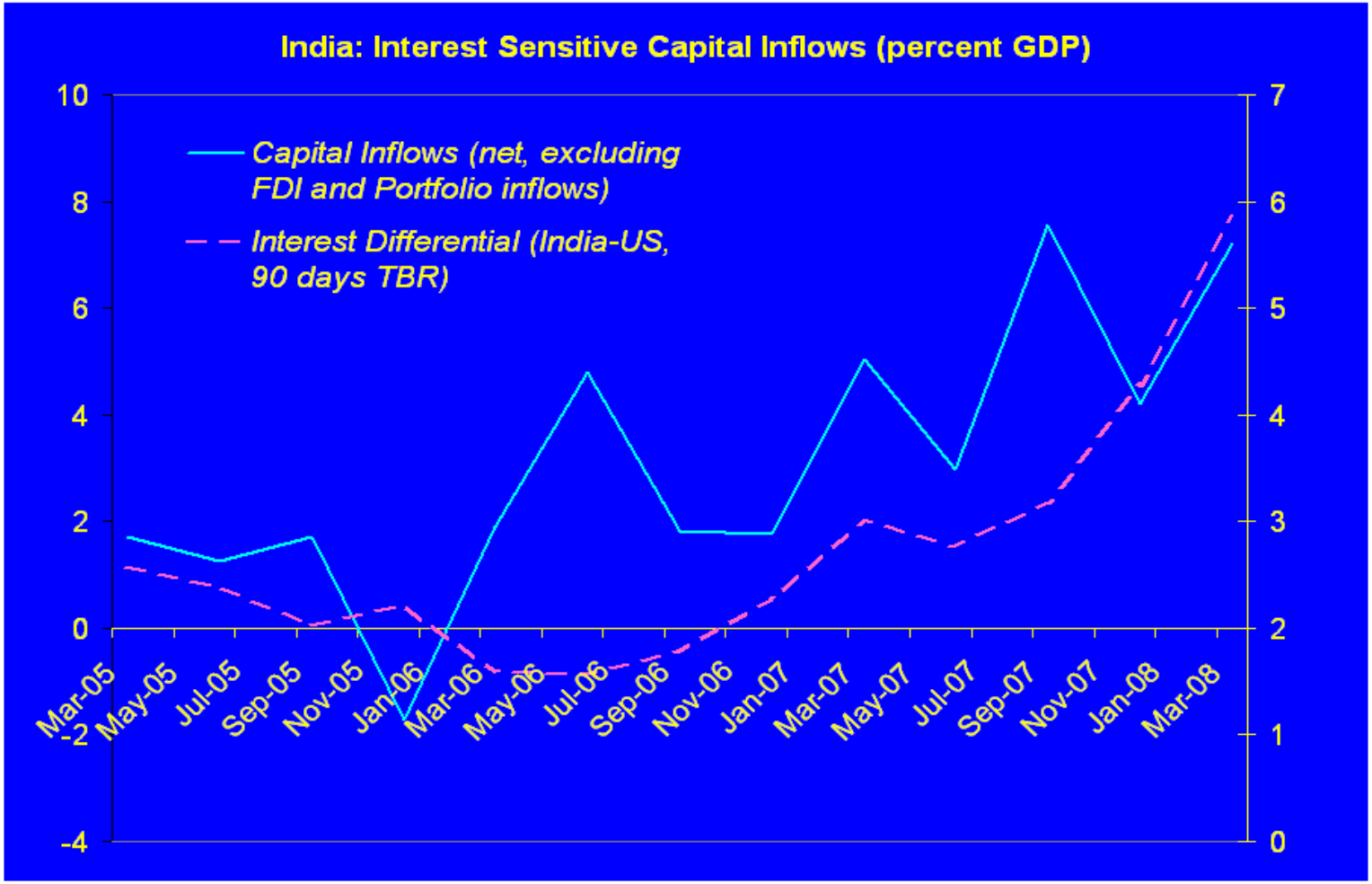


- There seems to be a growing amount of ECBs and other capital
- Is this related to interest differentials, as the trilemma proposes?

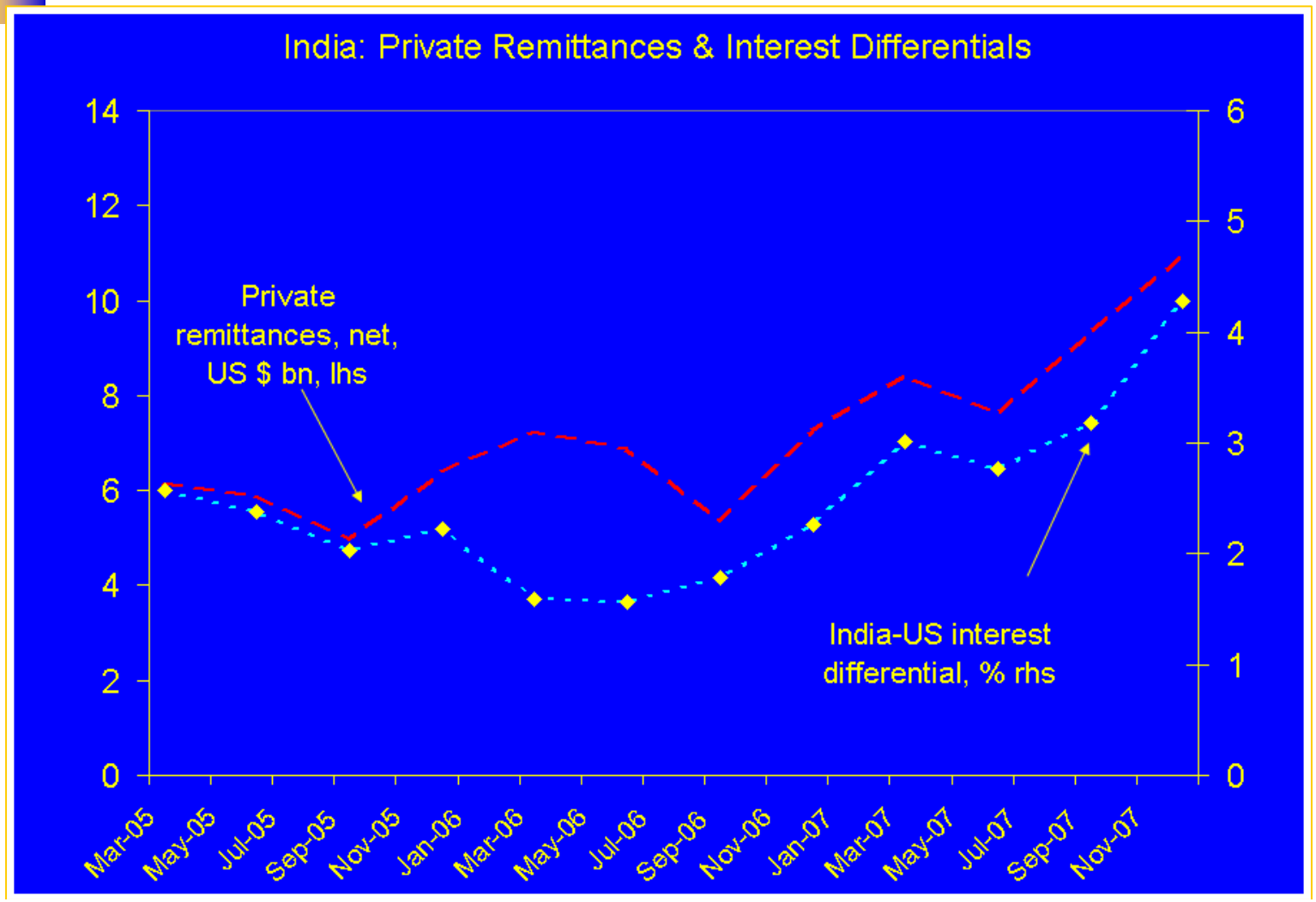
Interest differentials have certainly been rising...



...and they seems to be correlated with capital flows



Same for remittances!



Econometrics suggests this is not a coincidence!

Table 2:Statistical Relationship: Capital Inflows, rupee appreciation, and risk-adjusted carry returns 1/

	Dependent variable							
	Capital inflows 2/				rupee appreciation 3/			
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sharpe ratio (t) 4/	+				+ (***)			
Sharpe ratio (t-1) 4/	+ (**)				+ (***)			
Carry return (t) 4/		+		+		+ (***)		+ (***)
Carry return (t-1) 4/		+ (**)		+		+ (***)		+ (**)
Risk (t) 4/			+ (**)	+ (*)			+	+
Risk (t-1) 4/			-	-			-	-

1/ The table shows the signs of coefficients in a simple OLS regression. Significance is indicated by * (significant at 10 percent level), ** (significant at 5 percent level), and *** (significant at 1 percent level).

2/ Quarterly debt-creating private capital inflows in percent of four-quarter average GDP. Sample 2004q1-2007q4.

3/ The quarter-on-quarter rupee appreciation vis-à-vis the U.S. dollar. Sample 2004q1-2008q1.

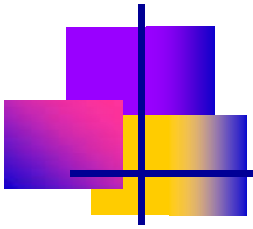
4/ Based on 3-month average of daily carry return and its standard deviation, using data provided by Bloomberg L.P. Sharpe ratio is calculated as carry return/ risk.

What happened to the capital controls?

- As often happens, people have found ways around the controls
  - An NRI living in New York can send money to his brother, and ask him to put it in a fixed-term deposit here
  - A corporate treasurer sitting in Mumbai can ask his overseas suppliers for credit, then use the cash he was going to spend on imports to invest locally instead

And don’t forget the “carry trade”

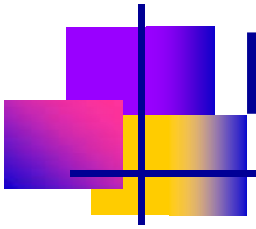
- Investors in search of high returns often borrow in a low-interest rate currency, such as the US dollar, and invest in high-yielding currencies, such as the rupee
- They earn the interest differential – and more, if the rupee appreciates
- This is known as the “carry trade”
- To get around capital controls, investors do the transactions in Singapore
  - Corporate treasurers then arbitrage between offshore and onshore rates



- This suggests that India is indeed caught on the horns of the trilemma

Roadmap of presentation

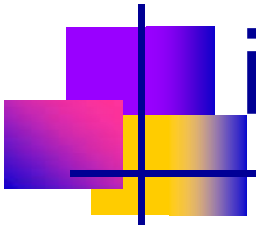
- Is India really caught on the horns of a trilemma?
- Is there a way out?
- Is sterilized intervention sustainable?



Escaping the trilemma

- Does India really have to give up one of its objectives?
  - Inflation
  - Exchange rate
  - Open capital account
- Can’t foreign exchange intervention resolve the trilemma?

The charms of sterilized intervention

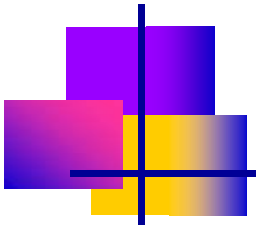


- Indeed, it can
- If high domestic interest rates lead to an influx of capital, central banks can purchase the inflows, thereby keeping the exchange rate stable
- Then, they could issue bonds to ensure that the fx purchases don’t result in an inflationary increase in the money supply
- This policy is called “sterilization”, and it’s quite easy to do!

Sterilization accounting

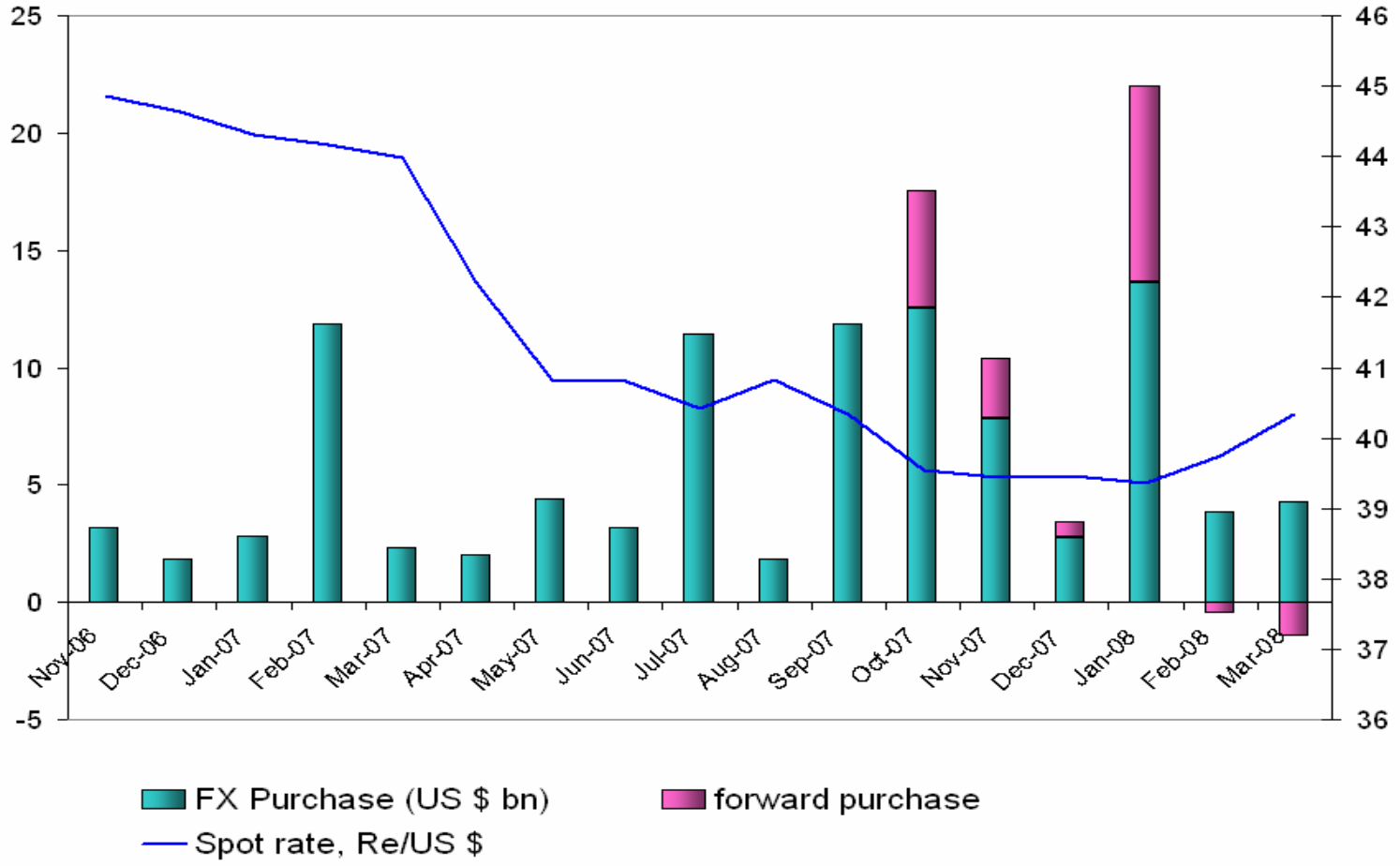
Central Bank: Stylized Balance Sheet

Assets	Liabilities
Net foreign assets ↑	Monetary base
Foreign currency	Currency in circulation
Foreign bonds	Reserve accounts of ↑ ⇣
Gold	commercial banks
Net domestic assets	Net worth
Domestic bonds ⇣	Accumulated surpluses and net
Loans to commercial banks	interest and capital gains

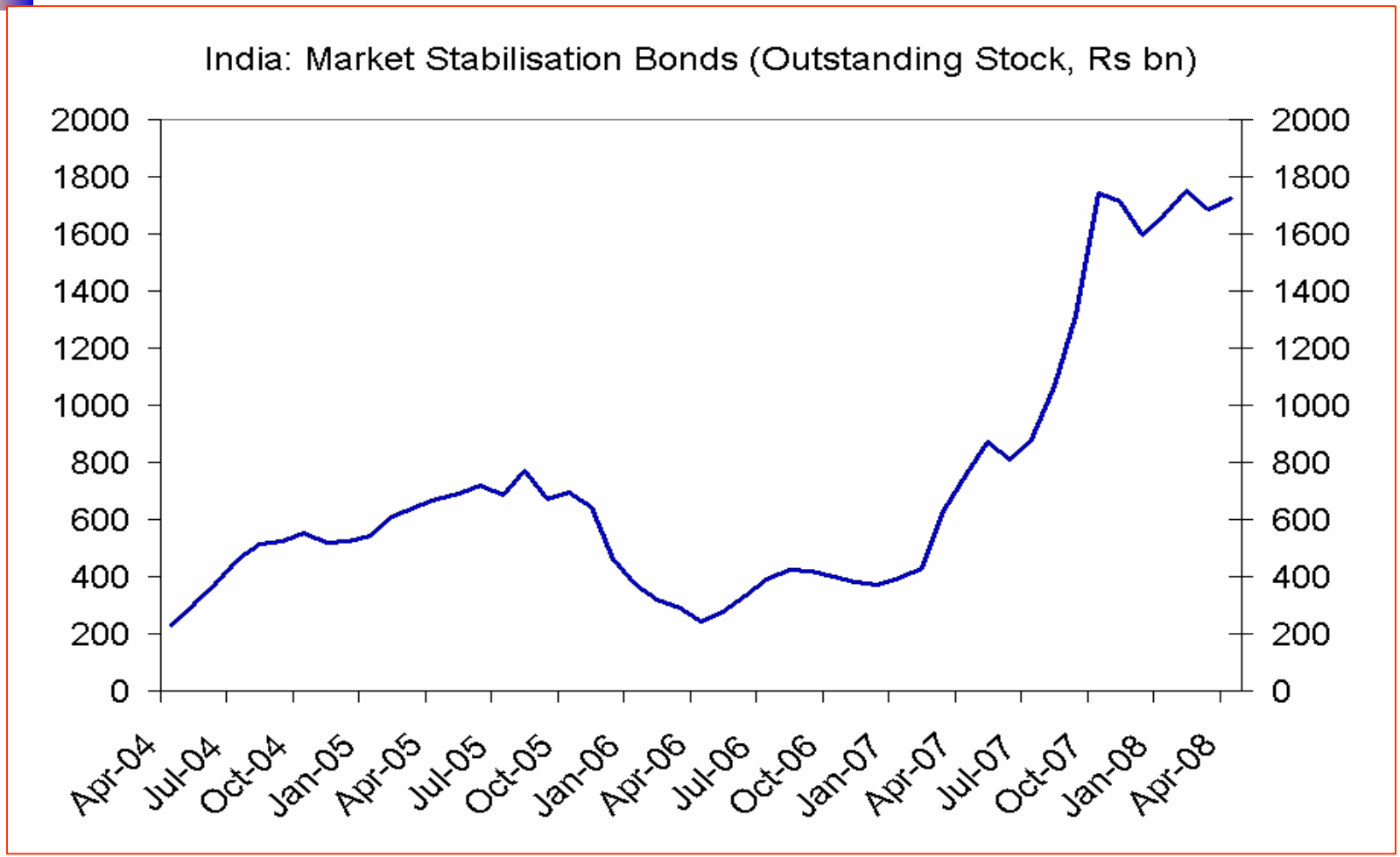


- In fact, this is exactly what the RBI has done over the past few years...

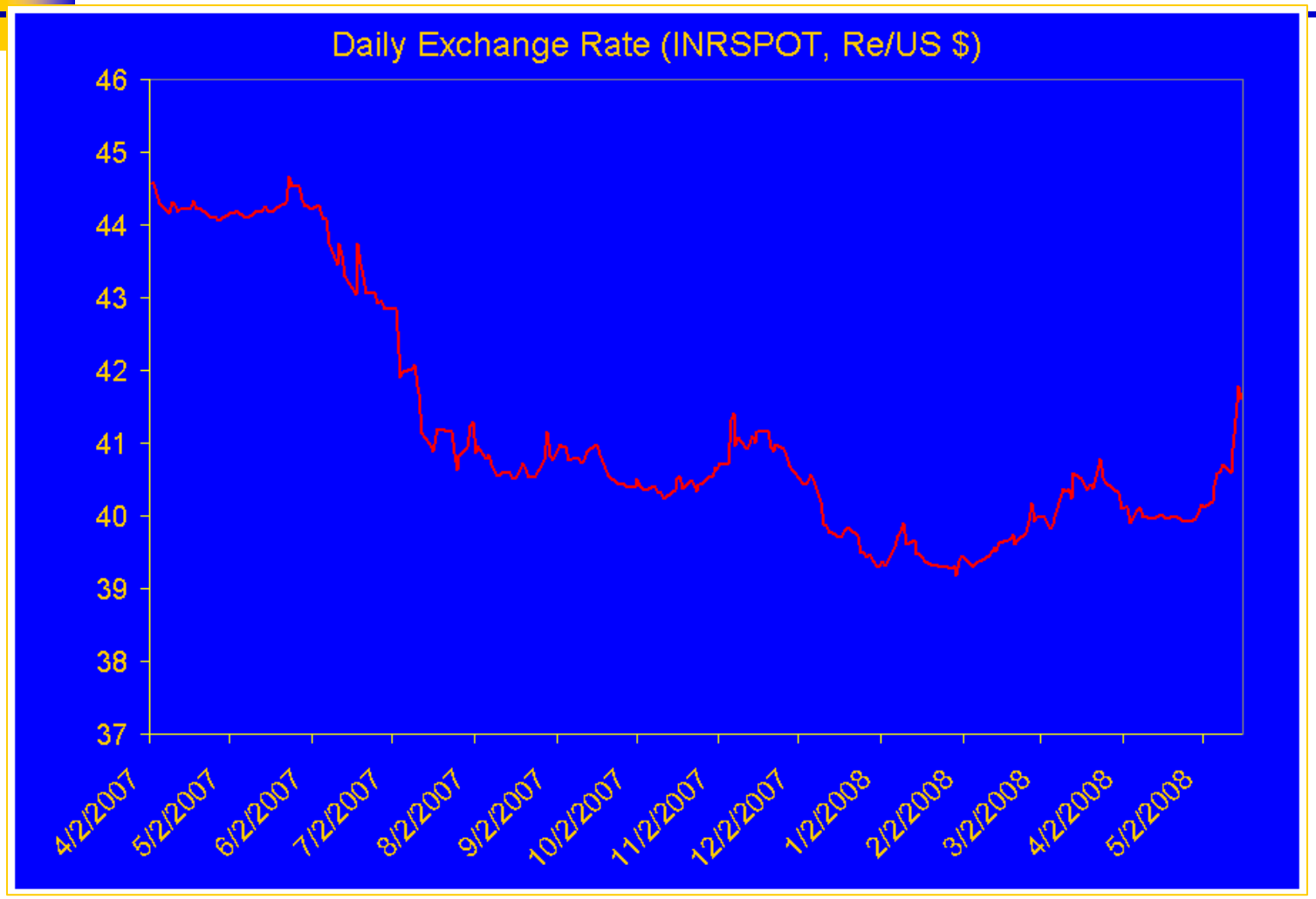
It has intervened...



sterilized with MSS bonds...



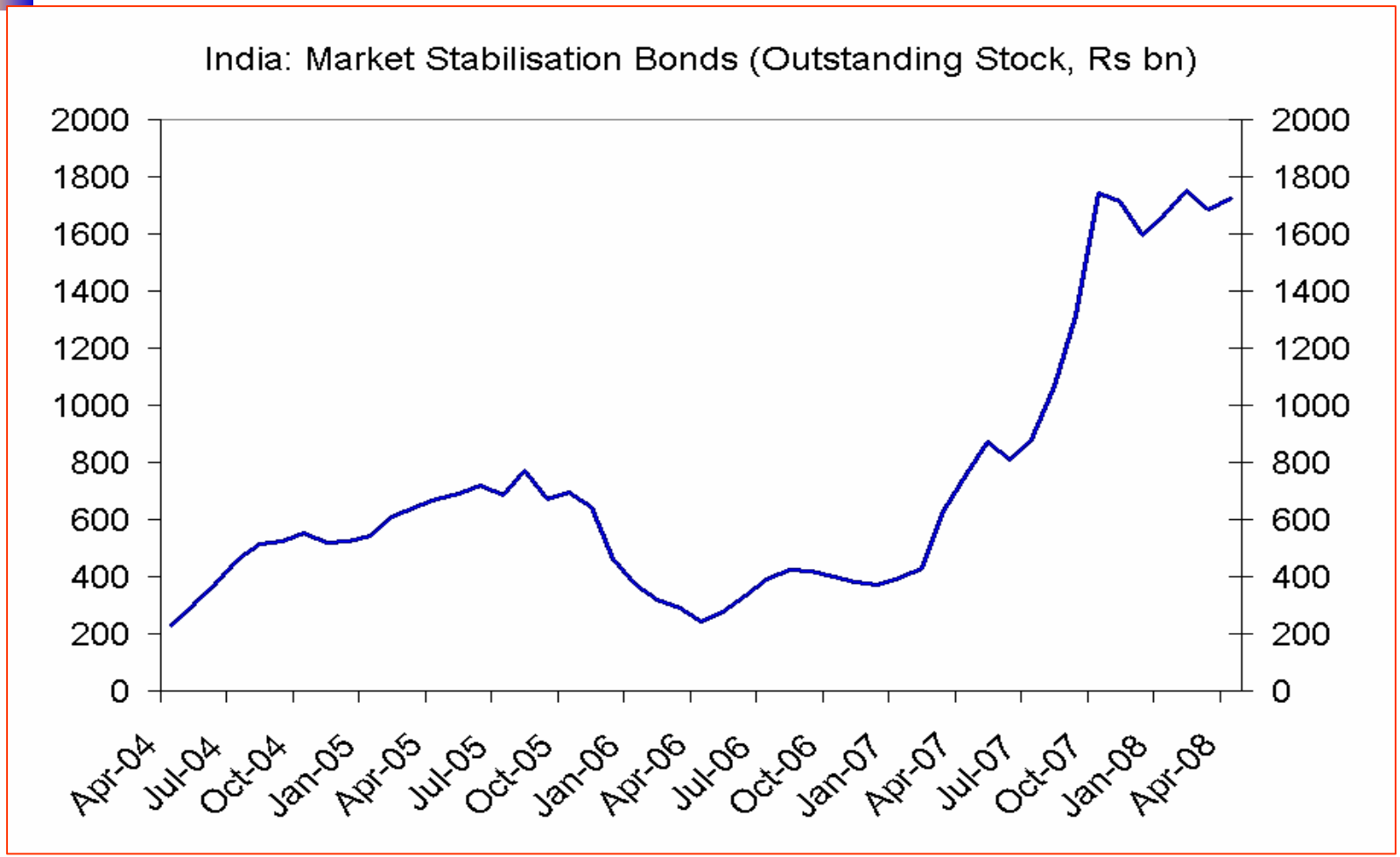
...and kept the exchange rate pretty stable!



Is this the way out?

- So, the RBI seems to have used sterilized intervention effectively, to escape the trilemma
- Are we done?
- Not quite!
- The penultimate graph suggests the problem
- The stock of MSS bonds has risen very rapidly!

Skyrocketing MSS issues ...



...are entailing growing costs

- The interest cost of the MSS amounted to 8,400 crore in 2007/08 and is projected to reach 14,000 crore in this year's budget

- This cost is significant enough – that's 14,000 crore that could have been spent on infrastructure or social programs

Assessing the policy

- But we can’t just look at the costs of the MSS
- We need to take a much broader view
- First, we need to make a comprehensive assessment of the cost of this policy
- Then, we need to balance this cost against the benefits to the wider economy
- Let’s start on the first task by looking at the balance sheet of the RBI

The RBI buys reserves and issues reserve money

Reserve Money : Components and Sources		
		(Rs. crore)
Item		Mar. 31 2008
Reserve Money		**928,317**
Components (i+ii)		
(i)	Currency in Circulation	590,805
(ii)	Deposits with RBI	337,512
Sources (i+ii+iii)		
(i)	MSS Bonds issued by the government	-168,392
(ii)	Net Foreign Exchange Assets of RBI	1,236,130
(iii)	Miscellaneous Others	-139,421

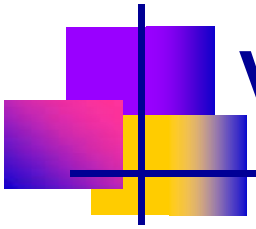
It’s a profitable activity

- The RBI earns interest on its reserves
- It pays no interest on the money it issues (reserve or base money)
- MSS bonds are serviced by the government
- So, the RBI is very profitable!

But sterilization can radically alter the balance sheet!

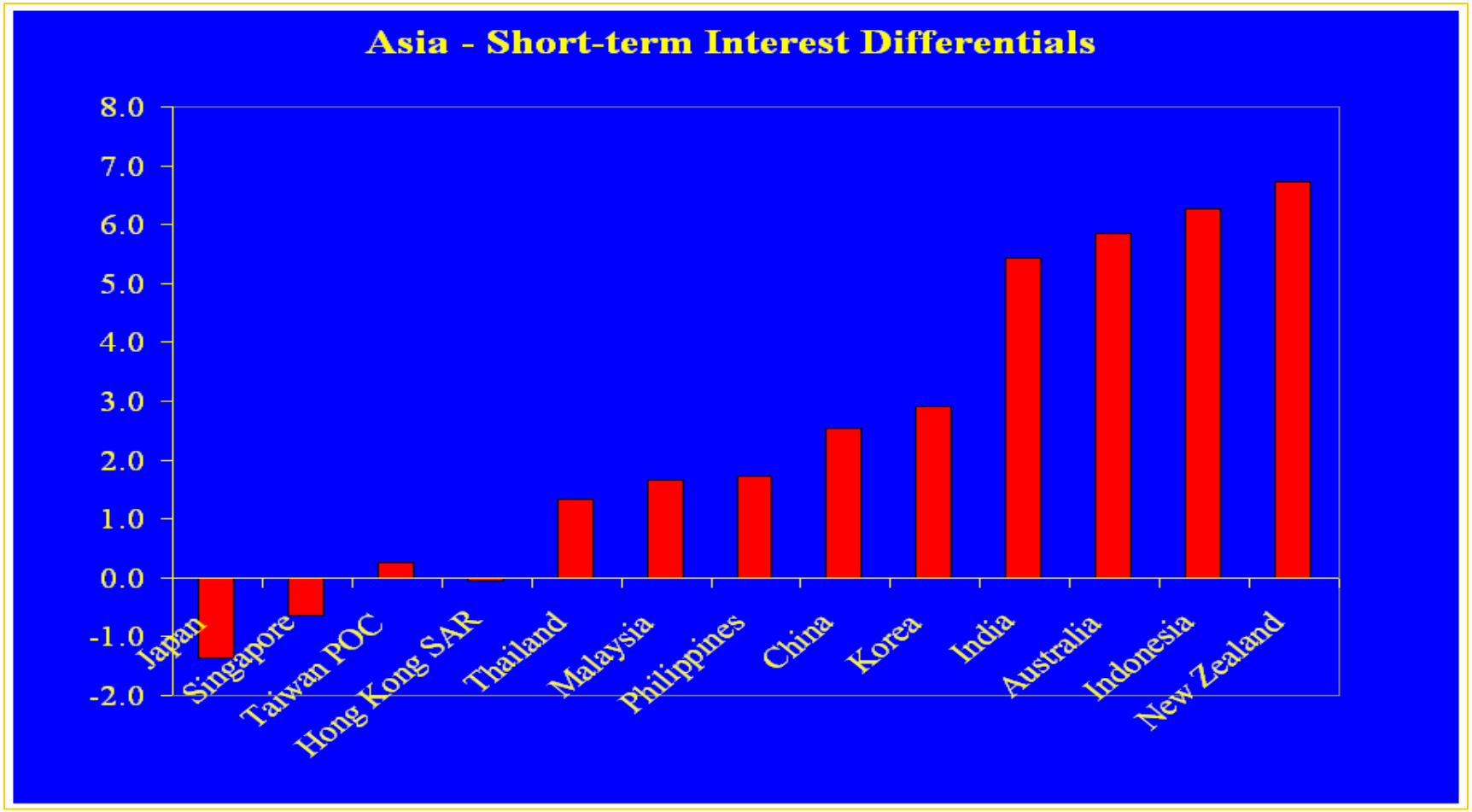
- Assume that the RBI actually had to pay for MSS, so that we can focus on the cost of monetary policy and not worry about which organ of government is actually paying for it
- Then monetary policy could result in losses, since the interest rate paid on MSS, “i” is much higher than what the RBI earns on reserves, “r”

The cost depends on two variables



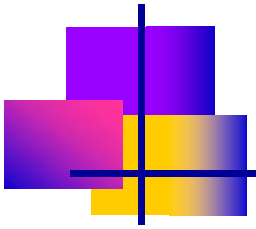
- The extent of the costs depends on the interest differential, i-r
- And the fraction of reserves (R times the exchange rate, E) that has to be sterilized using MSS bonds (L)
  - Define this ratio as “l”=L/RE

India's differentials are amongst the largest in Asia!



A simple calculation

- What would happen if the entire stock of reserves had to be sterilized (l=1)?
- Assume an interest differential of 6 percent (8 percent – 2 percent)
- Since reserves are around $300 billion, the annual cost of sterilization would amount to $18 billion
- That's about 72,000 crore
- This is a huge amount!



- To be clear, we are far from this situation
- But we still need to ask:
- Is this where India is headed?

Roadmap of presentation

- Is India really caught on the horns of a trilemma?
- What is the way out?
- Is sterilized intervention sustainable?

Putting this into equations

- Central bank profits are:

$$\pi = RE(r + e) - iL$$

- Where R is reserves, E is the exchange rate, e is the percentage change in the exchange rate and L is interest bearing liabilities (MSS)

- Positive profits require the following, where l is defined as L/RE

$$i \leq (e + r) / l$$

A numerical example

- Assume based on recent data that r = 2 percent, e = 0, l = 0.15

$$i \leq (e + r) / l$$

- Then i can be as high as 13 percent, without the central bank losing money
- The interest rate on MSS bonds is less than 8 percent
- So, sterilization appears sustainable
- Or is it?

One important caveat

- Note that we have assumed that e = 0
- If the exchange rate appreciates by just 2 percent, the maximum sustainable domestic interest rate goes to 0!
- Look again!

$$i \leq (e + r)/l$$

The balance sheet is very sensitive to the exchange rate!

Reserve Money : Components and Sources		
		(Rs. crore)
Item		Mar. 31 2008
Reserve Money		**928,317**
Components (i+ii)		
(i)	Currency in Circulation	590,805
(ii)	Deposits with RBI	337,512
Sources (i+ii+iii)		
(i)	MSS Bonds issued by the government	-168,392
(ii)	Net Foreign Exchange Assets of RBI	1,236,130
(iii)	Miscellaneous Others	-139,421

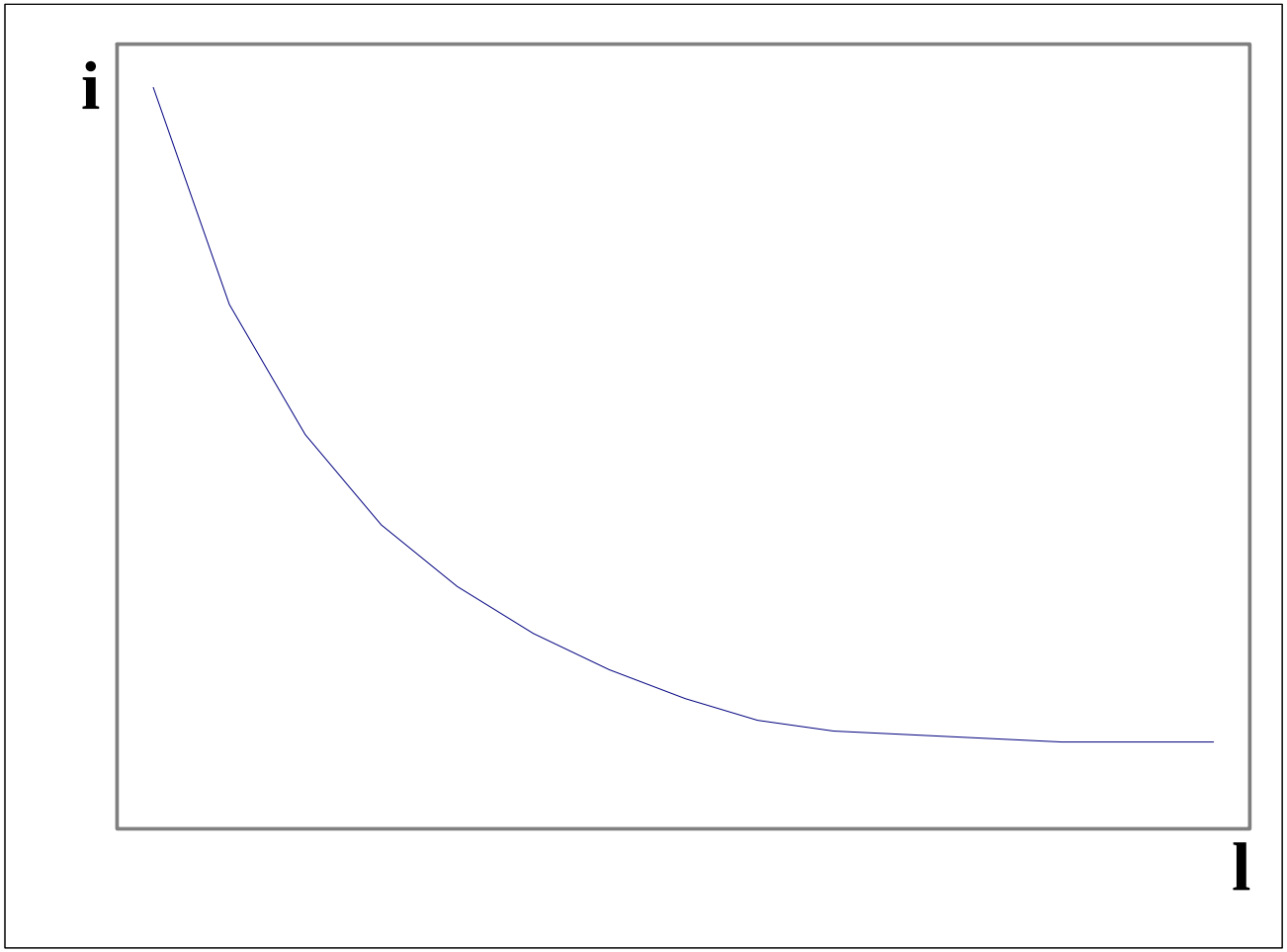
Another caveat

- Look yet again at the equation:

$$i \leq (e + r) / l$$

- The maximum domestic interest rate is a function of l, the ratio of MSS to reserves
  - This ratio measures the extent to which reserves are purchased using bonds rather than reserve money
- If inflows are very heavy, the scope for issuing reserve money will become exhausted and so the ratio will increase

As I increases, monetary autonomy will diminish



When l reaches 1, autonomy disappears completely!

- Consider the equation again:

$$i \leq (e + r)/l$$

- If l=1, that is when all reserves are sterilized, then

$$i \leq r + e$$

- In which case domestic interest rates could exceed foreign interest rates, plus the rate of depreciation

- We are right back in the world of the trilemma, where India loses its ability to choose its interest rate!

So, we need to investigate the dynamics

- We define long run sustainability as the case where l does not increase:

$$d(L/RE) = [dLRE - Ld(RE)]/(RE)_2 \leq 0$$

- Some maths yields this equation:

$$P/R \leq [l/(1-l)]\{(B/L)b - [i-(r+e)]\}$$

- where P is foreign exchange purchases, B is base (reserve) money, and b is the growth in demand for base money

- The equation is complex but the idea is simple:
  - The maximum sustainable fx intervention depends on initial conditions, the growth in base money demand and the size of the interest differential – exactly what we said earlier!

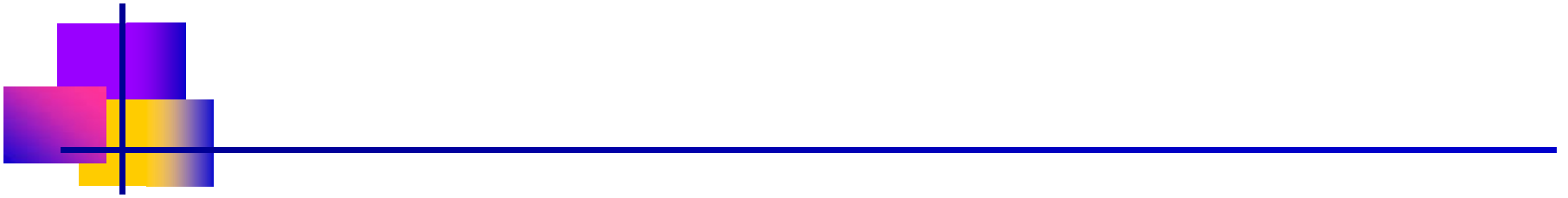
Calibrating the equation

- Here's the equation again:

$$P / R \leq [l /(1-l)]\{(B / L)b - [i - (r + e)]\}$$

- We can use the following ratios, based partly on data from the last fiscal year:
  - l=0.15
  - B/L=5.5
  - b=20 percent (based on nominal GDP growth, plus financial deepening)
  - i=8 percent
  - r=2 percent
  - e=0

- This gives us a maximum fx purchase of around 18 percent of initial reserves
- But the RBI purchased 55 percent of reserves in 2007/08!
- Which suggests that the current stance is not sustainable!



- What can be done?

The RBI can boost the demand for base money

- The RBI can also artificially stimulate the demand for base money
- Sounds strange?
- Not at all!
- This is exactly what happens when the RBI increases the CRR (Cash Reserve Ratio)
- A CRR increase forces banks to place additional reserves at the RBI
- Take another look at the balance sheet

CRR magic at work!

Central Bank: Stylized Balance Sheet

Assets	Liabilities
Net foreign assets ↑	Monetary base
Foreign currency	Currency in circulation
Foreign bonds	Reserve accounts of ↑ ⇣
Gold	commercial banks
Net domestic assets	Net worth
Domestic bonds ⇣	Accumulated surpluses and net
Loans to commercial banks	interest and capital gains

But there's a problem...

- The RBI cannot increase the CRR without limit because the CRR is a tax on banks
- If the RBI earns a profit on the transaction, that means the banks are making a loss
  - Banks are selling an interest earning asset (fx) and receiving a zero-interest deposit
- Banks need to recoup this loss by raising lending rates
- This damages economic growth
- So, let's assume that the RBI can boost base money growth, but only to 30 percent – exactly what it did during 2007/08

Recalibrating the equation

- Here's the equation again:

$$P / R \leq [l /(1-l)]\{(B / L)b - [i - (r + e)]\}$$

- Here are the revised ratios:
  - l=0.15
  - B/L=5.5
  - b=30 percent (assuming further CRR increases)
  - i=8 percent
  - r=2 percent
  - e=0

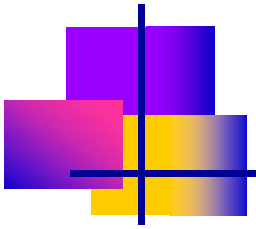
- This gives us a maximum fx purchase of around 28 percent of initial reserves
- It's still not enough!

What's the implication?

- There are two possible ways out:
  - Slow the inflows down
  - Keep sterilizing and pay the costs
- Each strategy has drawbacks

Slowing the inflows

- The most obvious way to slow the inflows is to reduce domestic interest rates
- But that poses a conflict with the inflation objective!
- We are back to the trilemma!



- What about maintaining interest rates at current levels but preventing foreigners from earning the differential – by introducing a “Tobin tax”?

Tobin taxes haven't worked well

- Two countries have tried a "Tobin tax" on inflows
- In Chile, the scheme worked for a while in the 1980s, but then firms found ways around it
- In Thailand (2007), the tax damaged business confidence so badly that the government fell
- The new government immediately repealed the scheme

But allowing greater exchange rate volatility might help

- Foreign investors in Indian assets care about two things:
  - Interest differentials, because they will typically borrow a foreign currency to invest here
  - Exchange rate volatility, because an unexpected appreciation would boost their returns but depreciation could eliminate their profits
- The ratio of reward (interest rate return) to risk (standard deviation of the exchange rate) is known as the Sharpe ratio
- Work by Oura (2008) reveals something interesting...

The Sharpe ratio for the USD "carry trade" is exceptional!

Table 1: Carry Trade Return Decomposition and Sharpe Ratio

	Total return	FX return	Int. diff. return	FX return	Int. diff. return	Stdev.	Sharpe ratio 1/
	(Annualized in percent)			(In percent of total ret.)		(Annu. %)	ratio
			Jan. 00-Apr. 08				
Short USD	5.1	1.1	4.0	21.2	78.8	3.4	1.5
Short JPY	8.2	1.0	7.3	11.7	88.3	10.0	0.9
Short CHF	2.0	-4.0	5.9	-199.9	299.9	10.6	0.2
			Jan. 04-Apr. 08				
Short USD	5.7	3.2	2.5	55.7	44.3	4.3	1.3
Short JPY	8.4	2.4	6.1	28.2	71.7	10.2	0.8
Short CHF	3.6	-1.3	5.0	-37.1	137.1	9.8	0.4

Source: Bloomberg L.P. Using daily (bilateral) carry trade return on FXCT page. Returns from interest spread reflects difference in 3-month deposit rates. Returns are calculated in terms of funding currencies.

1/ Sharpe ratio = total return/ standard deviation

...and high Sharpe ratios generate large capital flows

Table 2:Statistical Relationship: Capital Inflows, rupee appreciation, and risk-adjusted carry returns 1/

	Dependent variable							
	Capital inflows 2/				rupee appreciation 3/			
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sharpe ratio (t) 4/	+				+ (***)			
Sharpe ratio (t-1) 4/	+ (**)				+ (***)			
Carry return (t) 4/		+		+		+ (***)		+ (***)
Carry return (t-1) 4/		+ (**)		+		+ (***)		+ (**)
Risk (t) 4/			+ (**)	+ (*)			+	+
Risk (t-1) 4/			-	-			-	-

1/ The table shows the signs of coefficients in a simple OLS regression. Significance is indicated by * (significant at 10 percent level), ** (significant at 5 percent level), and *** (significant at 1 percent level).

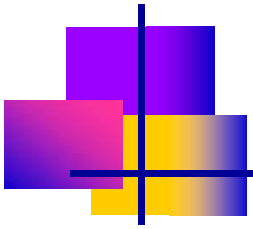
2/ Quarterly debt-creating private capital inflows in percent of four-quarter average GDP. Sample 2004q1-2007q4.

3/ The quarter-on-quarter rupee appreciation vis-à-vis the U.S. dollar. Sample 2004q1-2008q1.

4/ Based on 3-month average of daily carry return and its standard deviation, using data provided by Bloomberg L.P. Sharpe ratio is calculated as carry return/ risk.

Which means allowing more volatility might help

- Allowing greater exchange rate volatility against the US dollar would alter the return/risk calculation, and thereby discourage inflows
- But there are limits to this approach
- The sterilization policy was adopted precisely because policy-makers were concerned about movements in the exchange rate



- We are ready to conclude!

Conclusion/1

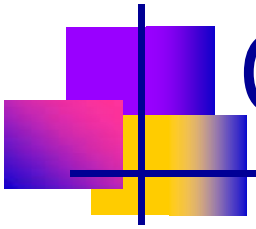
- Monetary policy is indeed on the horns of a trilemma
- The combination of relatively high interest rates, a stable exchange rate, and a reasonably open capital account is leading to very heavy capital inflows, at points exceeding 10 percent of GDP!

Conclusion/2

- For the moment, sterilized intervention is allowing India to side-step the problem
- But the policy is expensive
- And its costs are only likely to grow
- One response could be to discourage inflows by allowing some greater volatility in the US dollar exchange rate
- But this won't change the fundamentals

Conclusion/3

- In the end, the desirability of the sterilization policy depends on whether its benefits really exceed its costs
- We can't answer that question today, as we've only looked at the costs – not the potential benefits
- But it is far from obvious that the benefits exceed those of other spending priorities, such as infrastructure and social programs
- And there's something uncomfortable about offering high interest rates to foreigners, and then taxing the *aam admi* to pay for this



Conclusion/4

- Which brings us to the safest conclusion of all:
- This debate is only going to grow in the coming years!


INTERNATIONAL
MONETARY FUND