Currency Carry Trade

Sources:

Essentials of Investment (8th Edition) by Zvi Bodie, Alex Kane, Alan Marcus; McGraw-Hill Publishers

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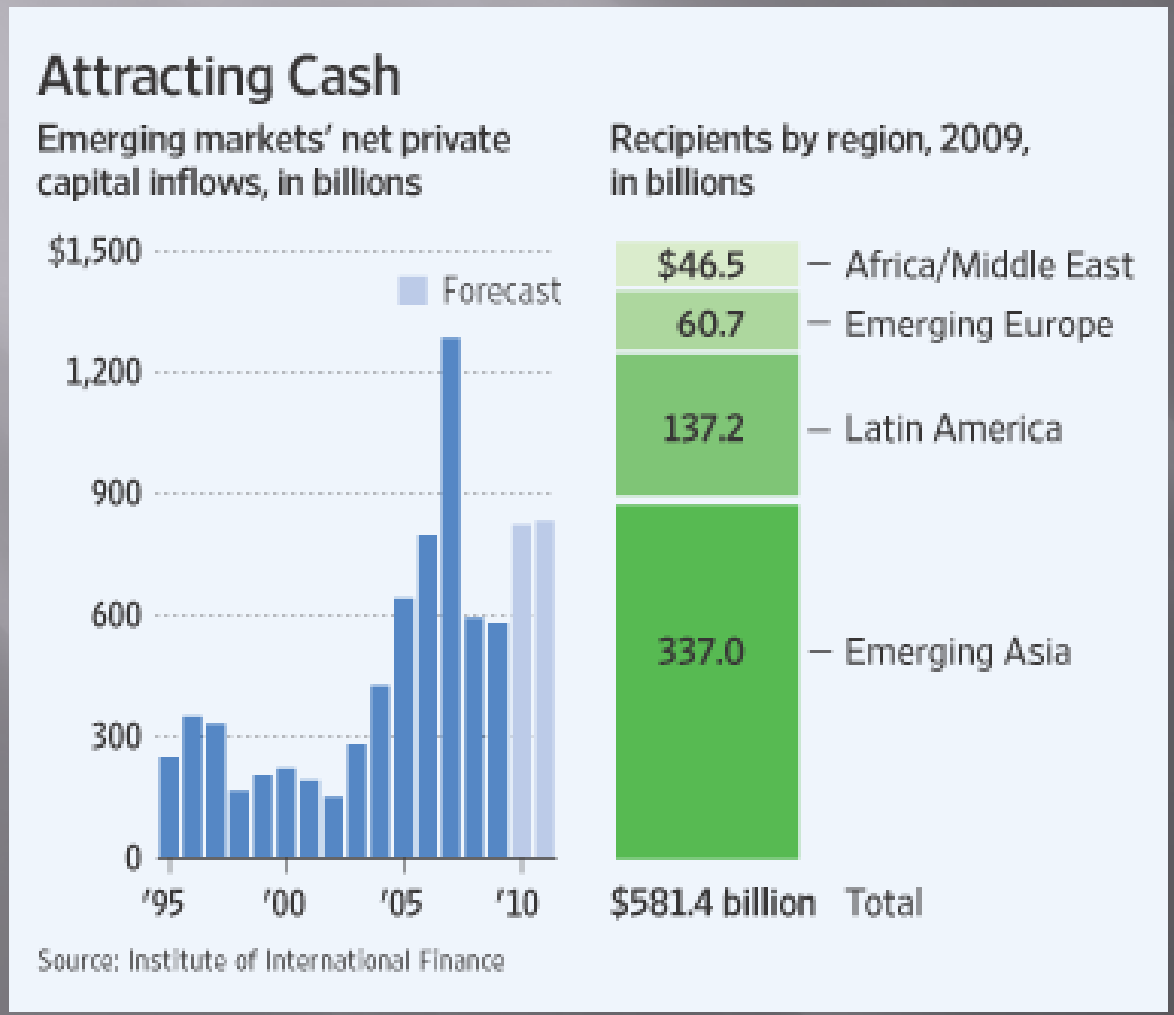
Galati, G., Heath, A. and McGuire, P. (2007), "Evidence of carry trade activity", *BIS Quarterly Review*

Hattori, M. and Shin, H. S. (2009), Yen carry trade and the subprime crisis", IMF Staff Papers, Vol. 56, pp. 384-409.

In the news:

"With economies in the U.S., Japan and Europe feeble and their interest rates low, faster-growing nations like Brazil are attracting a frenzy of investment." *WSJ, Nov. 10, 2010*



- Asset bubble
- Overvalued currencies
- Export loss
- Protectionism (?)

In the news:

Goldman Sachs has dubbed "the most overvalued in the world."

According to GS's model based on factors like trade, inflation and productivity, Brazil's real is 55% stronger than its fair value of 2.65 per dollar.

Brazil's 10.75% overnight interest rate is among the highest in the world. That encourages speculators to borrow in the U.S. and Japan where money is cheap, deposit it in Brazil, and pocket the difference. This so-called **carry trade** pumps up the real by attracting a flood of dollars

In the news:

Strong currency makes commodity exports driving Brazil's growth—soy, iron ore, sugar, beef and coffee—less profitable in international markets.

Anxiety over the currency has reached such a height that a column in the major Brazilian daily O Estado recently warned of "de-industrialization" - what may happen if local factories can no longer compete with foreign imports

Brazil becoming more expensive in dollar terms: a cab ride from Sao Paulo's international airport to the financial district costs $71, compared to around $60 with tip and tolls to go the same distance from New York's JFK airport to Midtown Manhattan.

WSJ. Oct. 20, 2010

Returns with Foreign Exchange

$$1 + r(US) = [1 + r(For)] \times \frac{E_1}{E_0}$$

$r(US)$ = return on the foreign investment in US Dollars

$r(FM)$ = return on the foreign market in local currency

E_0 = original exchange rate

E_1 = subsequent exchange rate

What is Carry Trade?

- **Leveraged** cross-currency position designed to take advantage of interest rate differentials and low volatility.

- Borrow funds at a low interest rate in one currency (the funding currency) and buy a higher-yielding asset in another (the target currency).

Return in carry trade

Explanation: Borrowing X US $ for a year would cost X(1+i).

X US $, converted today to R$ annual bond, would yield next year

$$\frac{X_{\$}}{E_{\$/R\$}} \xrightarrow{\text{after one year}} \frac{X_{\$}}{E_{\$/R\$}}(1+i_{R\$})$$

$$\xrightarrow{\text{in terms of \$ nextyear}} \frac{X_{\$}}{E_{\$/R\$}}(1+i_{R\$})E^{+1}_{\$/R\$}$$

Return in carry trade

$$\frac{X_{\$}}{E_{\$/R\$}}(1+i_{R\$})E^{+1}_{\$/R\$} = X_{\$}(1+i_{R\$})\frac{E^{+1}_{\$/R\$}}{E_{\$/R\$}} =$$

Note that $$X_{\$}(1+i_{R\$})(1+\hat{E}^{+1}_{\$/R\$}) \simeq X_{\$}(1+i_{R\$}+\hat{E}^{+1}_{\$/R\$})$$

$$\textit{where} \quad \hat{E}^{+1}_{\$/R\$} = \frac{E^{+1}_{\$/R\$}}{E_{\$/R\$}} - 1 = \frac{E^{+1}_{\$/R\$} - E_{\$/R\$}}{E_{\$/R\$}}$$

The net return would be

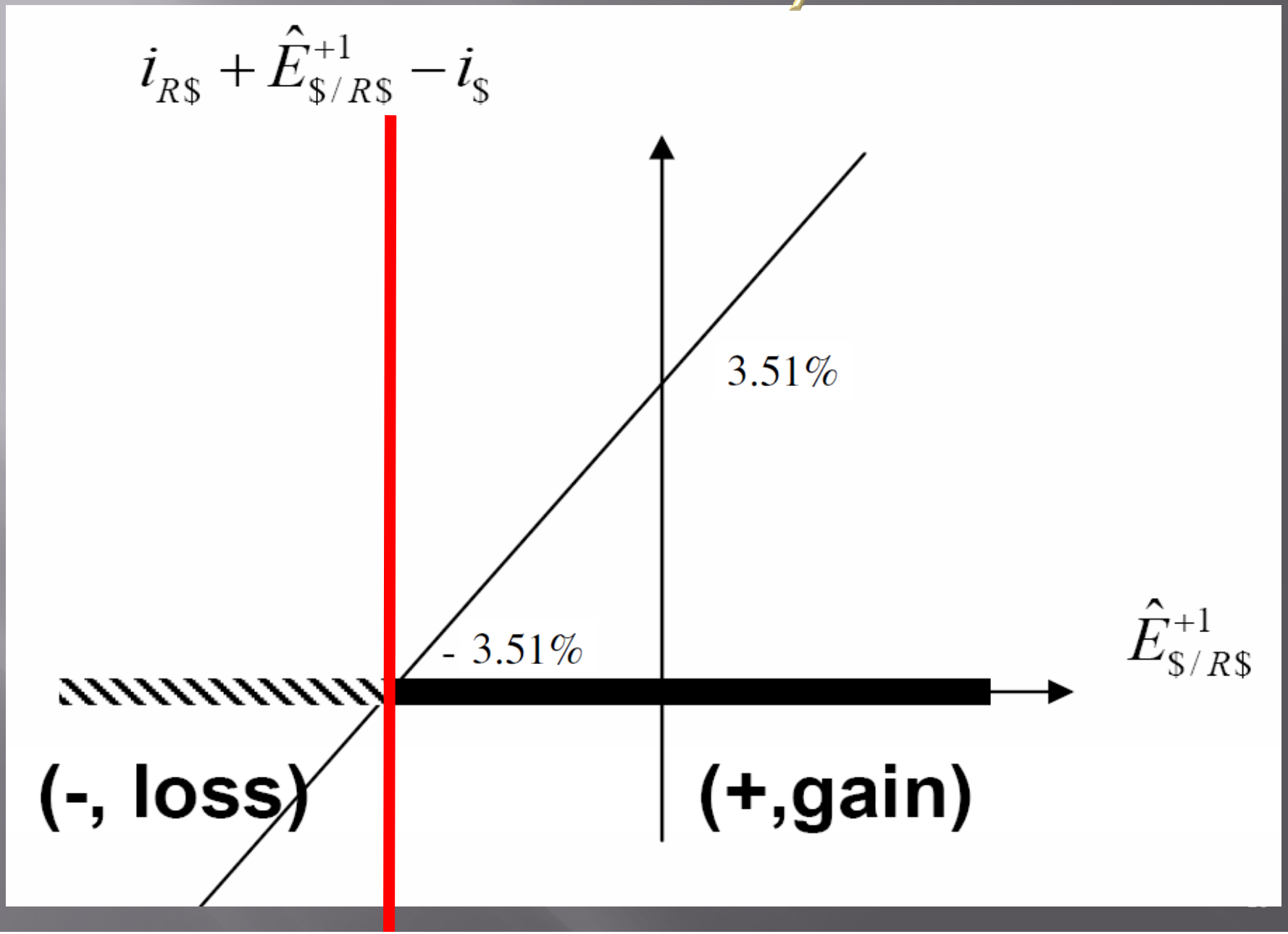
$$X_{\$}(1+i_{R\$}+\hat{E}^{+1}_{\$/R\$}) - X_{\$}(1+i_{\$}) = X_{\$}(i_{R\$}+\hat{E}^{+1}_{\$/R\$} - i_{\$})$$

Per dollar, the return is $i_{R\$}+\hat{E}^{+1}_{\$/R\$} - i_{\$}$.

Yen Carry Trade: 2003-2007

- Suppose the yen LIBOR = 0.24% and U.S. $ LIBOR = 3.75%.
- An astute investor may borrow yen at the yen rate, convert the borrowed funds to dollars and invest at $ LIBOR.
- What can go wrong with this strategy?
  - Default
  - Yen increases in value by ≈ 3.75% - 0.24% = 3.51% or more.

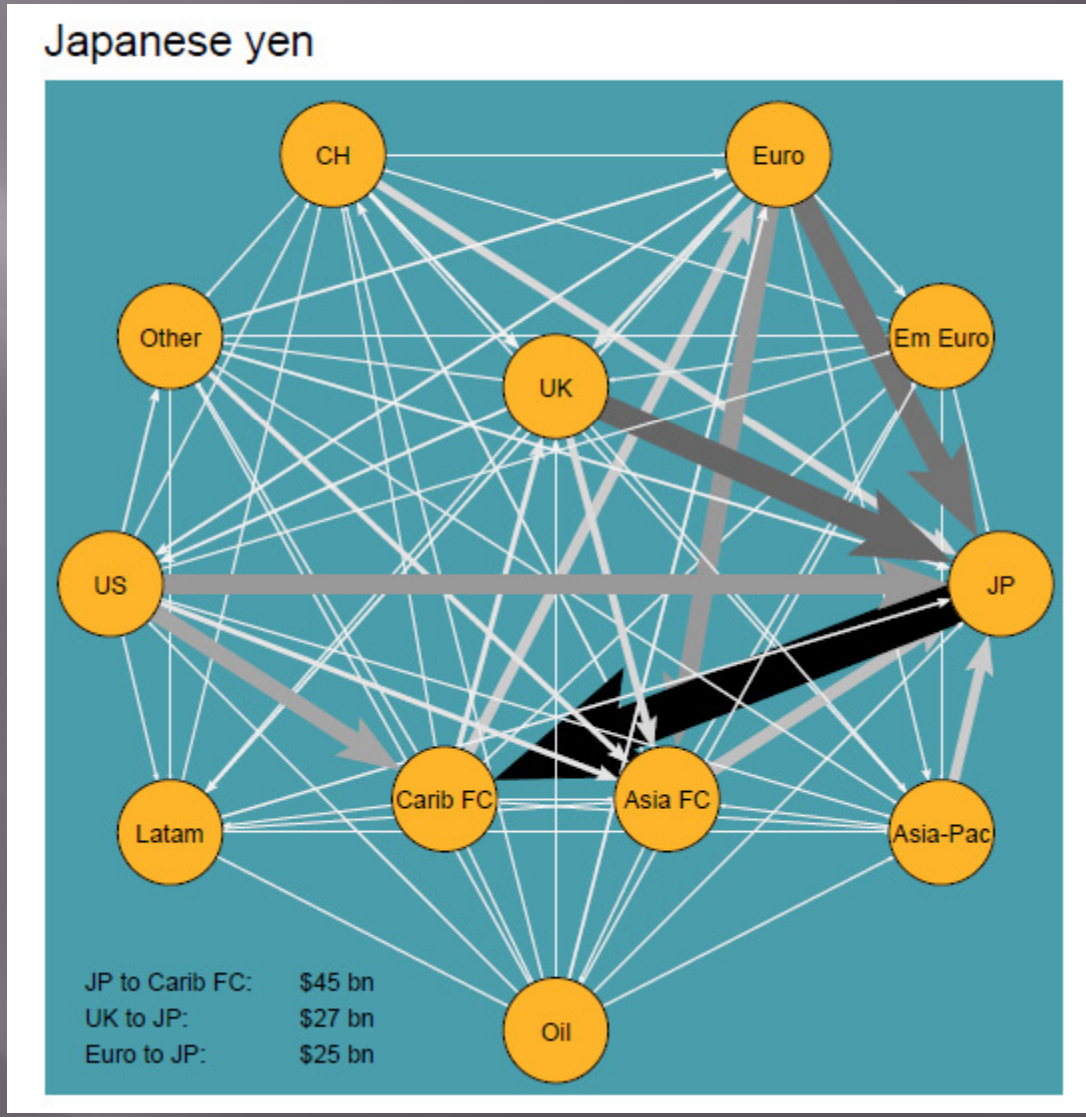
Return in carry trade



Japan's "Zero Rate Policy" & Carry Trade

Cumulative net flows through the banking system: 2002 Q2–2007 Q1

- Offshore financial centers
- Hedge funds and other speculative traders
- Place for activity related to carry trades.



Source: Galati and McGuire (2007)

Covered Interest Parity

The spot-futures exchange rate relationship that prevents arbitrage opportunities.

$$\frac{1+r(US)}{1+r(For)} = \times \frac{F_1}{E_0}$$

If the interest rates and exchange rates are in this relationship no arbitrage is possible.

Covered Interest Arbitrage (1)

U.S. interest rates are 6.15% and British interest rates are at 10% when the exchange rate is $2.00 / £. The one year forward exchange rate for the pound is $1.95/£.

- How can you earn a riskless arbitrage profit based on these quotes?
  1. Borrow $1 at 6.15%: Will owe $1.0615 in one year
  2. Convert $1 to pounds: $1 / $2.00/£ = £0.50
  3. Invest £0.50 at 10%: Will yield £.50 x 1.10 = £0.55.
  4. Sell pound forward at $1.95: £55 x $1.95 = $1.0725
  5. Net: $1.0725 - $1.0615 = $0.011 / dollar

Covered Interest Arbitrage (2)

U.S. interest rates are 6.15% and British interest rates are at 10% when the exchange rate is $2.00 / £. The one year forward exchange rate for the pound is $1.90/£.

- How can you earn a riskless arbitrage profit based on these quotes?
  1. Borrow £1 at 10%: Will owe £1.10 in one year
  2. Convert £1 to $ at $2.00/£ = $2
  3. Invest $2 at 6.15%: Will yield $2 x 1.0615 =$2.123
  4. Buy pound forward at $1.90: Will cost £1.10 x $1.90 = $2.09
  5. Net profit = $2.123 - $2.09 = $0.033

Bias in Forward Rates:

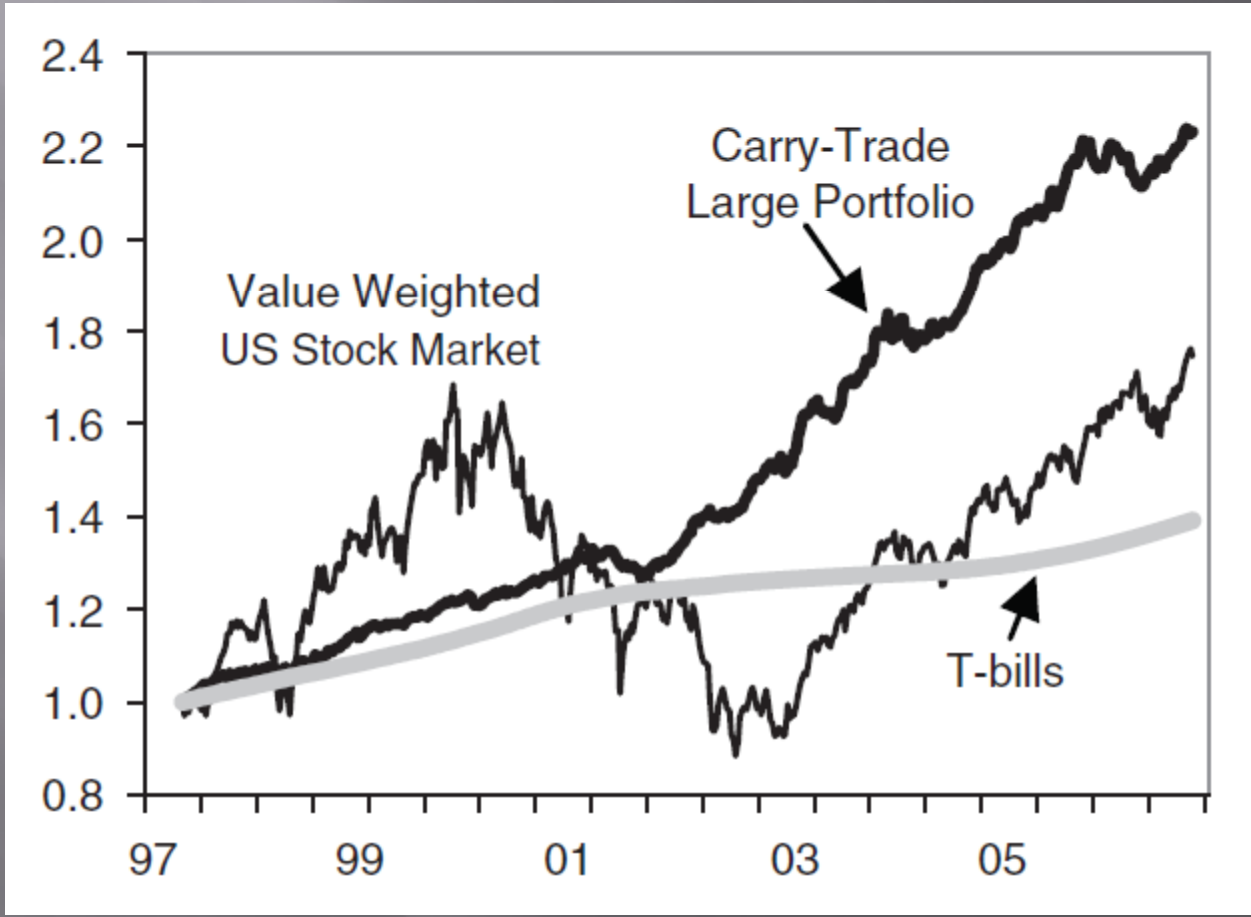
$$F_1 \neq E_1$$

In fact, currencies that are at a forward premium tend to depreciate. This empirical regularity underlies the carry trade.

So, sell forward currencies that are at a forward premium and buying forward currencies that are at a forward discount.

Profitability of Carry Trade:

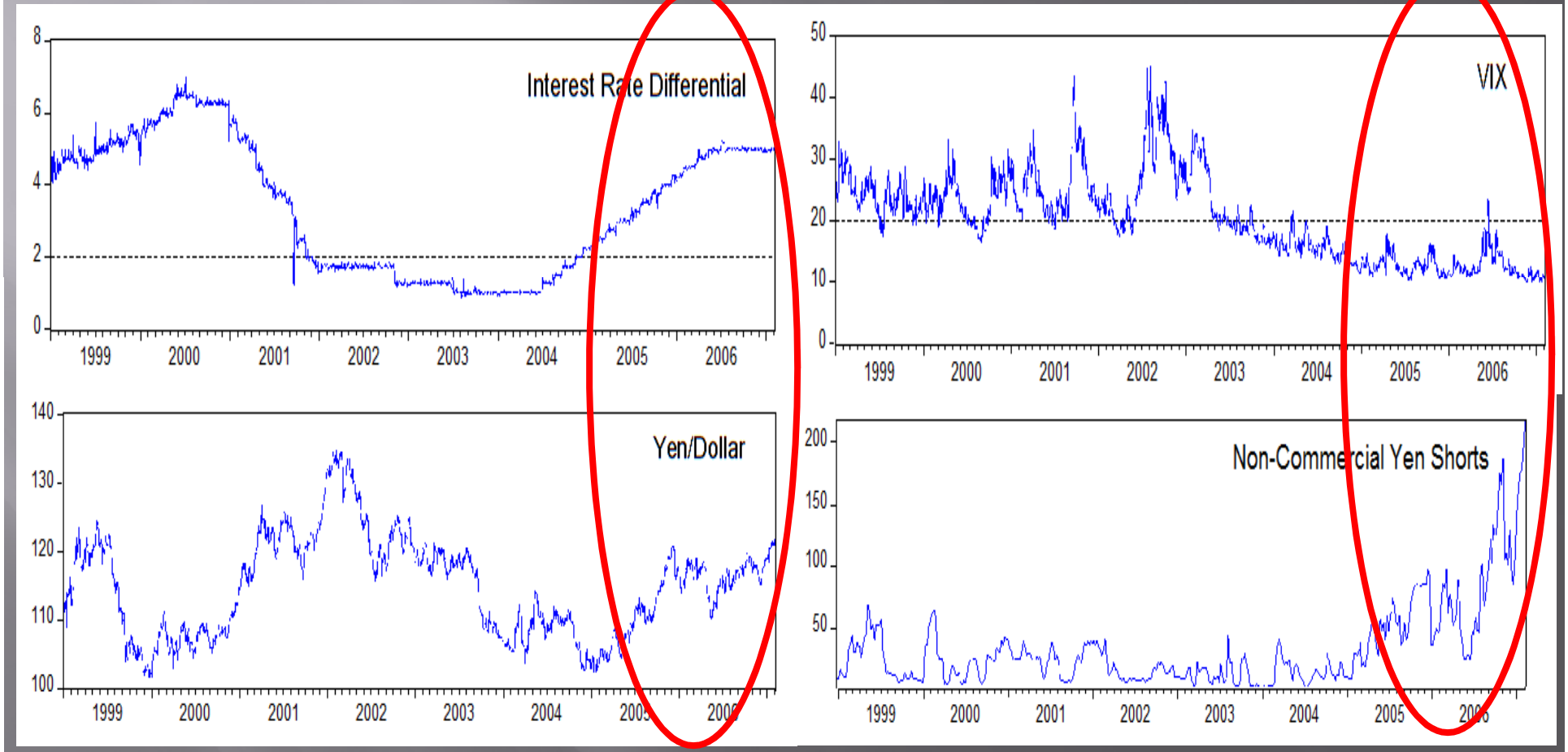
The accumulated value (in US dollars) of beginning with a balance of $1 on 10/29/1997 and rolling over the accumulated value of the investment weekly through 11/8/2006.



Source: Burnside (2007)

Tracking Carry Trade

1. Futures Markets



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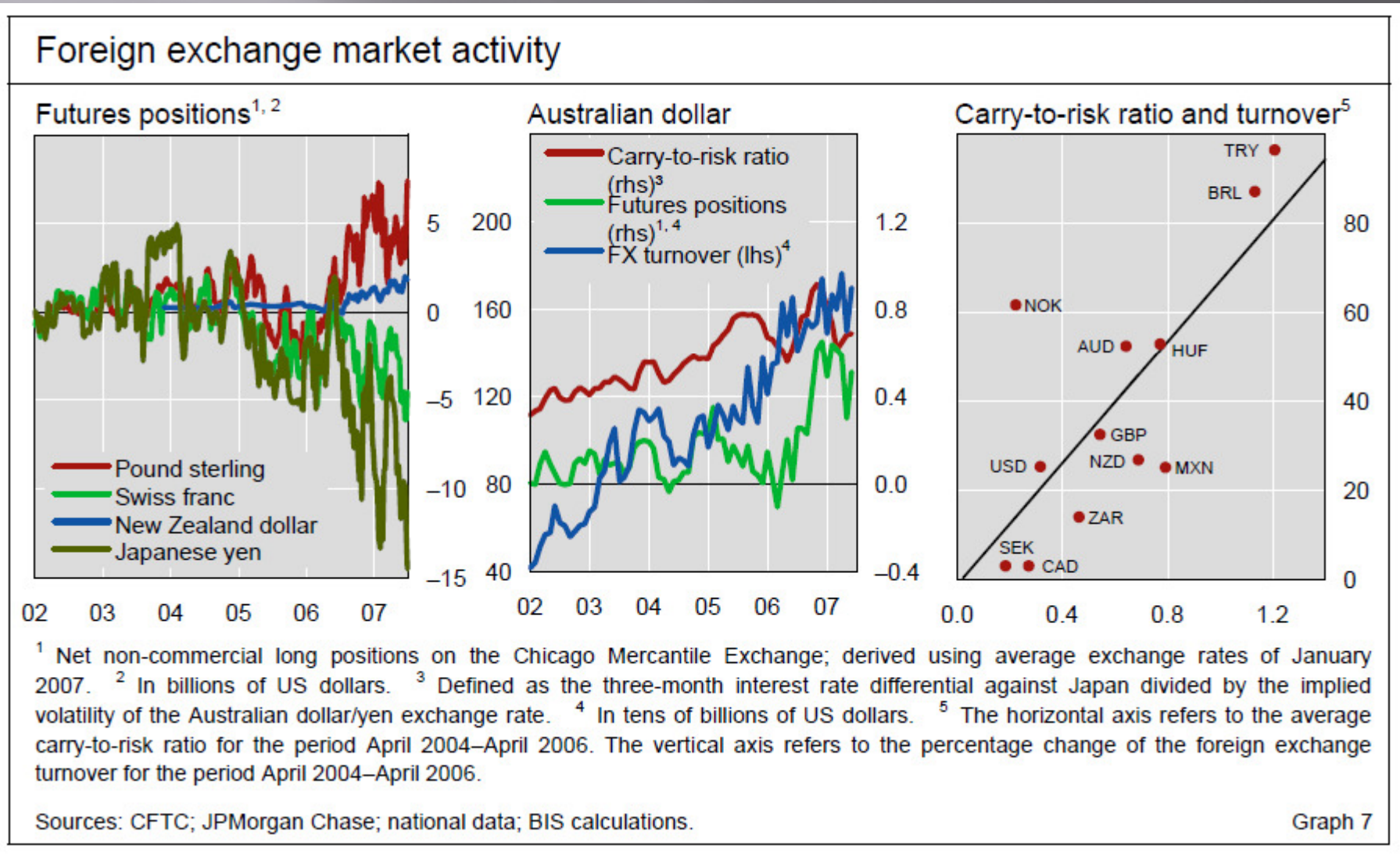


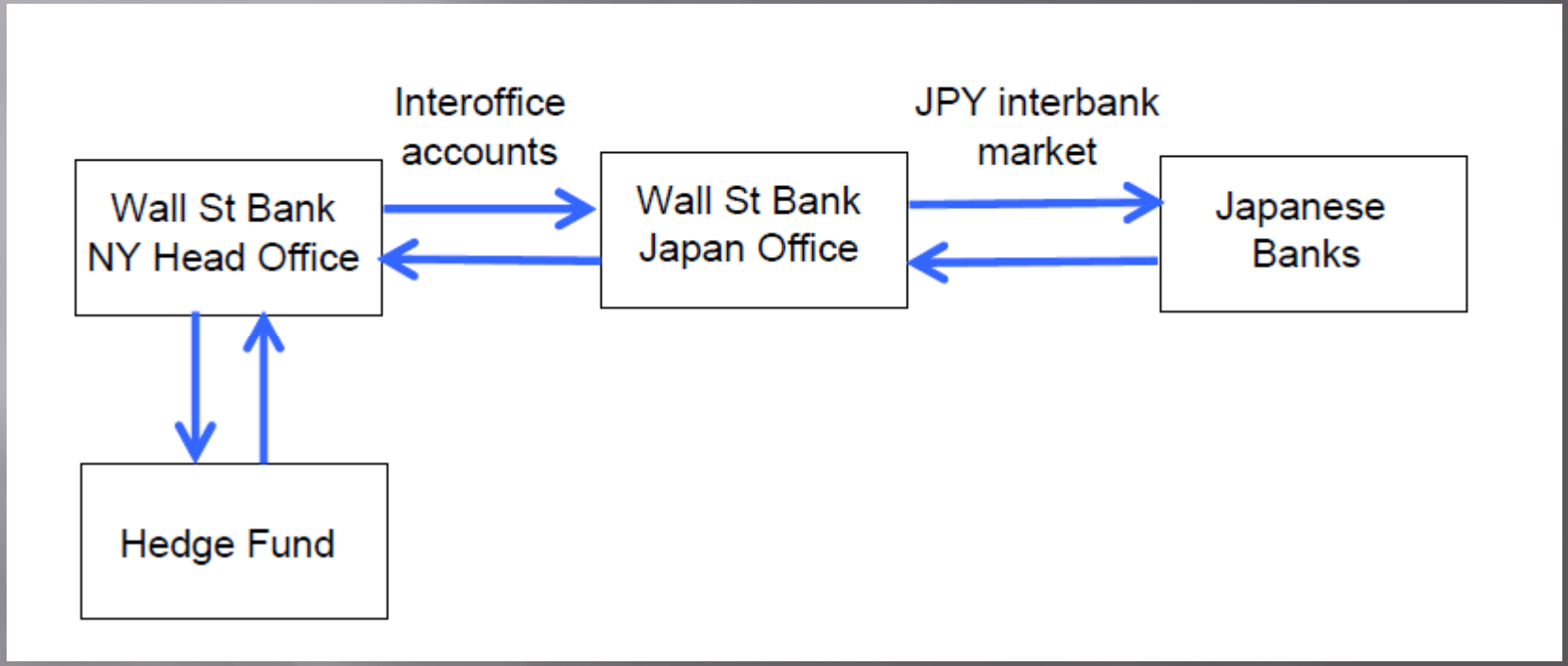
[1] Net non-commercial long positions on the Chicago Mercantile Exchange; derived using average exchange rates of January 2007. [2] In billions of US dollars. [3] Defined as the three-month interest rate differential against Japan divided by the implied volatility of the Australian dollar/yen exchange rate. [4] In tens of billions of US dollars. [5] The horizontal axis refers to the average carry-to-risk ratio for the period April 2004–April 2006. The vertical axis refers to the percentage change of the foreign exchange turnover for the period April 2004–April 2006.

Sources: CFTC; JPMorgan Chase; national data; BIS calculations. Graph 7

Source: Galati and McGuire (2007)

Tracking Carry Trade

2. Inter-Office Accounts of Multinational Banks



The balance sheet trail from a hedge fund in New York to the interbank market in Tokyo. The prime broker to a hedge fund can borrow from Japanese banks in Tokyo to fund the lending to the hedge fund.

Source: Hattori and Shin (2009)

Tracking Carry Trade

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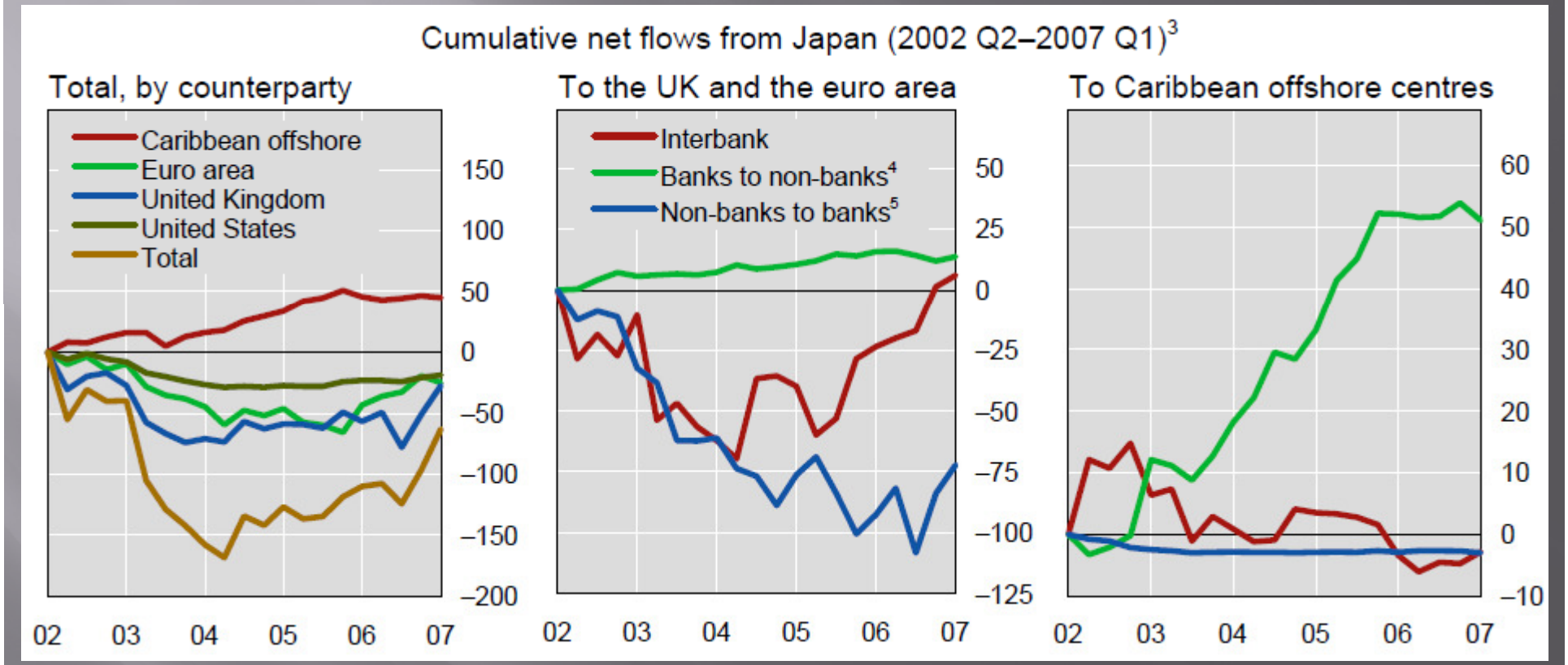
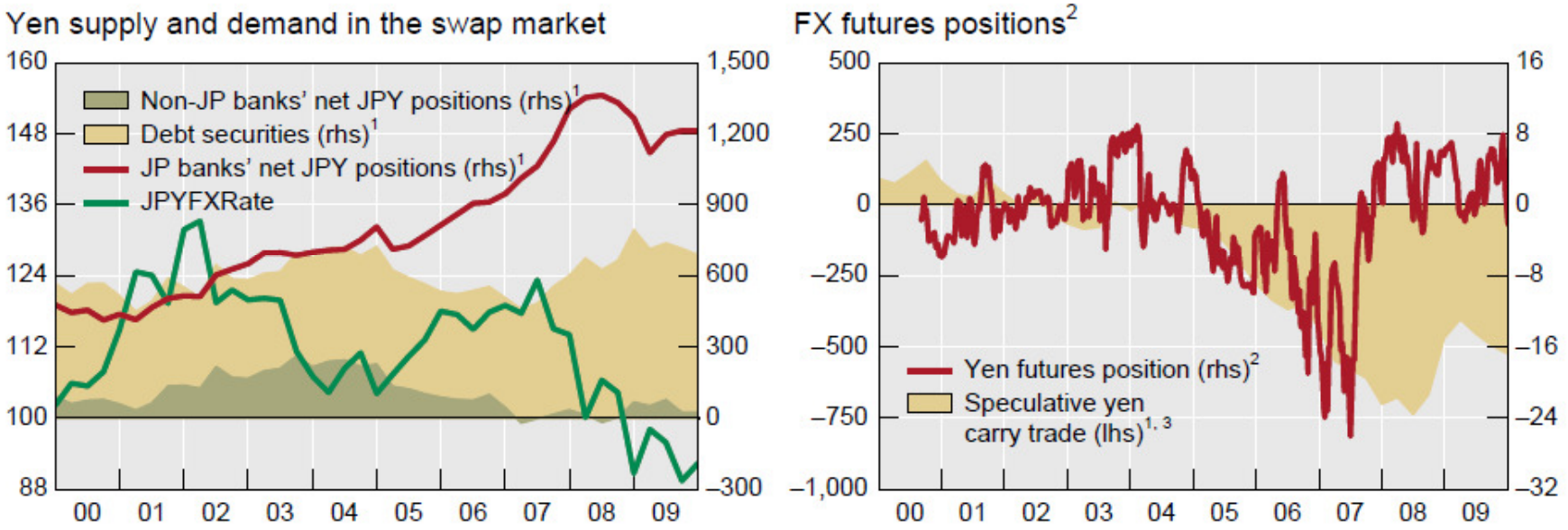


Source: Galati and McGuire (2007)

Tracking Carry Trade

3. FX Swap Market Activity by Hedge Funds

Uncovering the speculative bid in yen carry trades



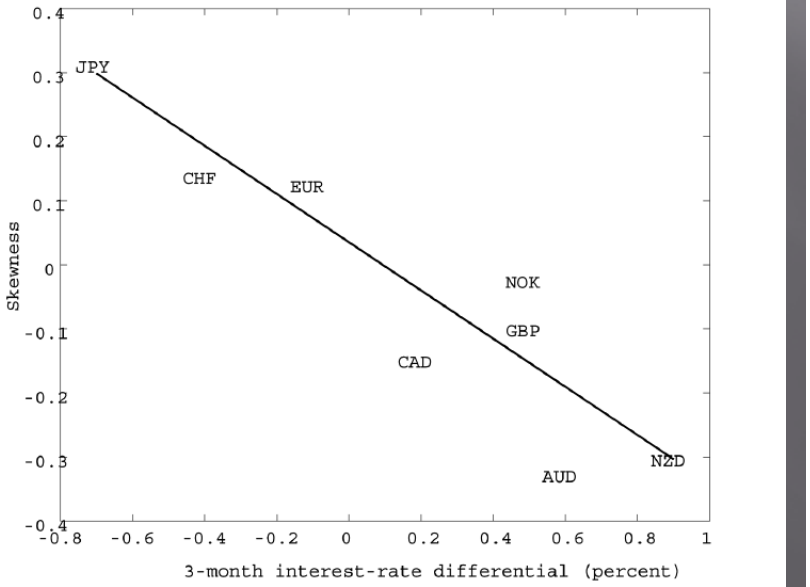
[1] In billions of US dollars. [2] Net non-commercial long positions on the Chicago Mercantile Exchange; derived using average exchange rates of March 2010; in billions of US dollars. [3] Calculated as the (negative of) the gap between Japanese banks' net JPY positions (red line) and the sum of the shaded areas in the left-hand panel.

Sources: CFTC; BIS calculations.

Source: Cecchetti et al. (2010)

Crash Risk in Carry Trade

Fig. 1. U.S. dollar/Japanese yen exchange rate from 1996 to 2000



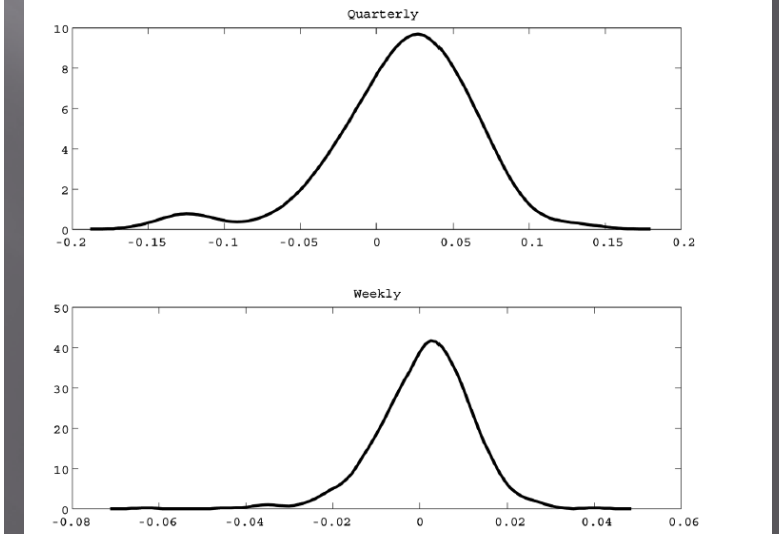
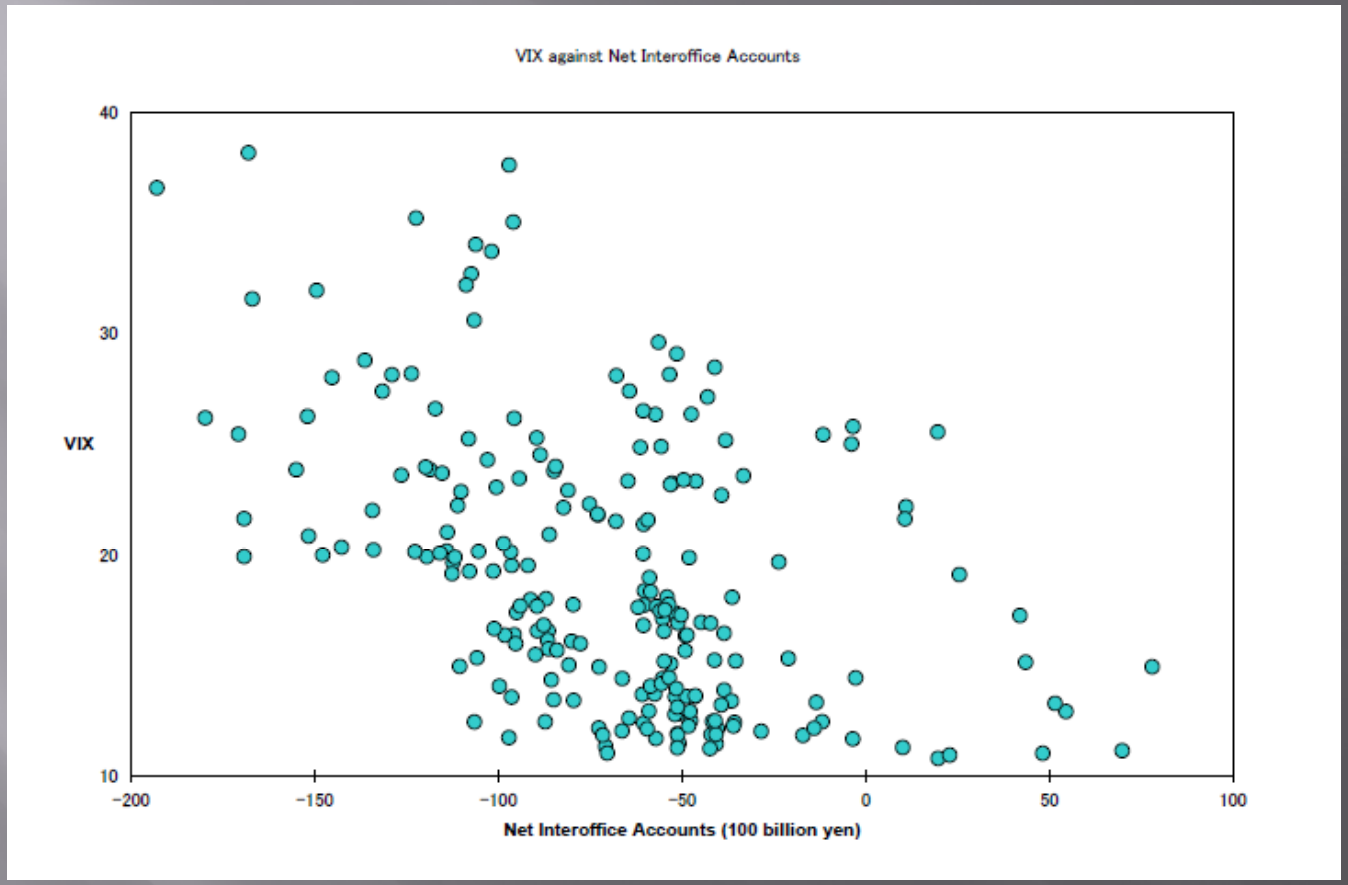


Fig. 4. Kernel density estimates of distribution of excess returns on a carry trade portfolio (long three high interest currencies, short three low interest currencies): top panel shows quarterly, while bottom panel shows weekly excess returns.

Source: Brunnermeier et al. (2009)

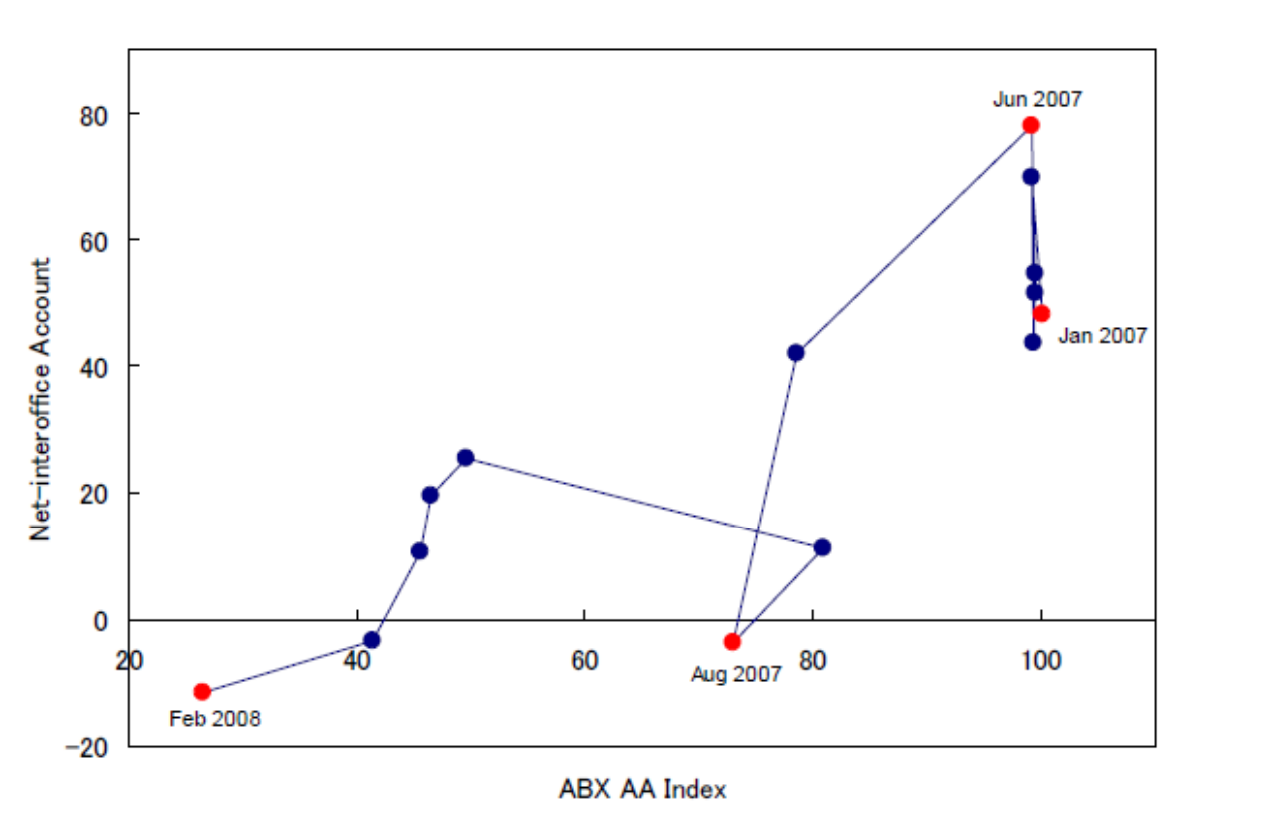
Carry Trade Generates Systemic Risk



The scatter chart of the VIX index of implied volatility derived from options on the US stock market against the net interoffice accounts. There is a negative relationship between the two, suggesting that the yen carry trade is associated with periods of greater risk appetite.

Source: Hattori and Shin (2009)

Carry Trade Generates Systemic Risk



The scatter chart of monthly change in net interoffice accounts and the ABX AA 07-1 index of implied subprime mortgage security prices. There is a negative relationship between the two, suggesting that the carry trade is being unwound as the price of subprime mortgage securities fall .

Source: Hattori and Shin (2009)

Carry Trade Generates Systemic Risk

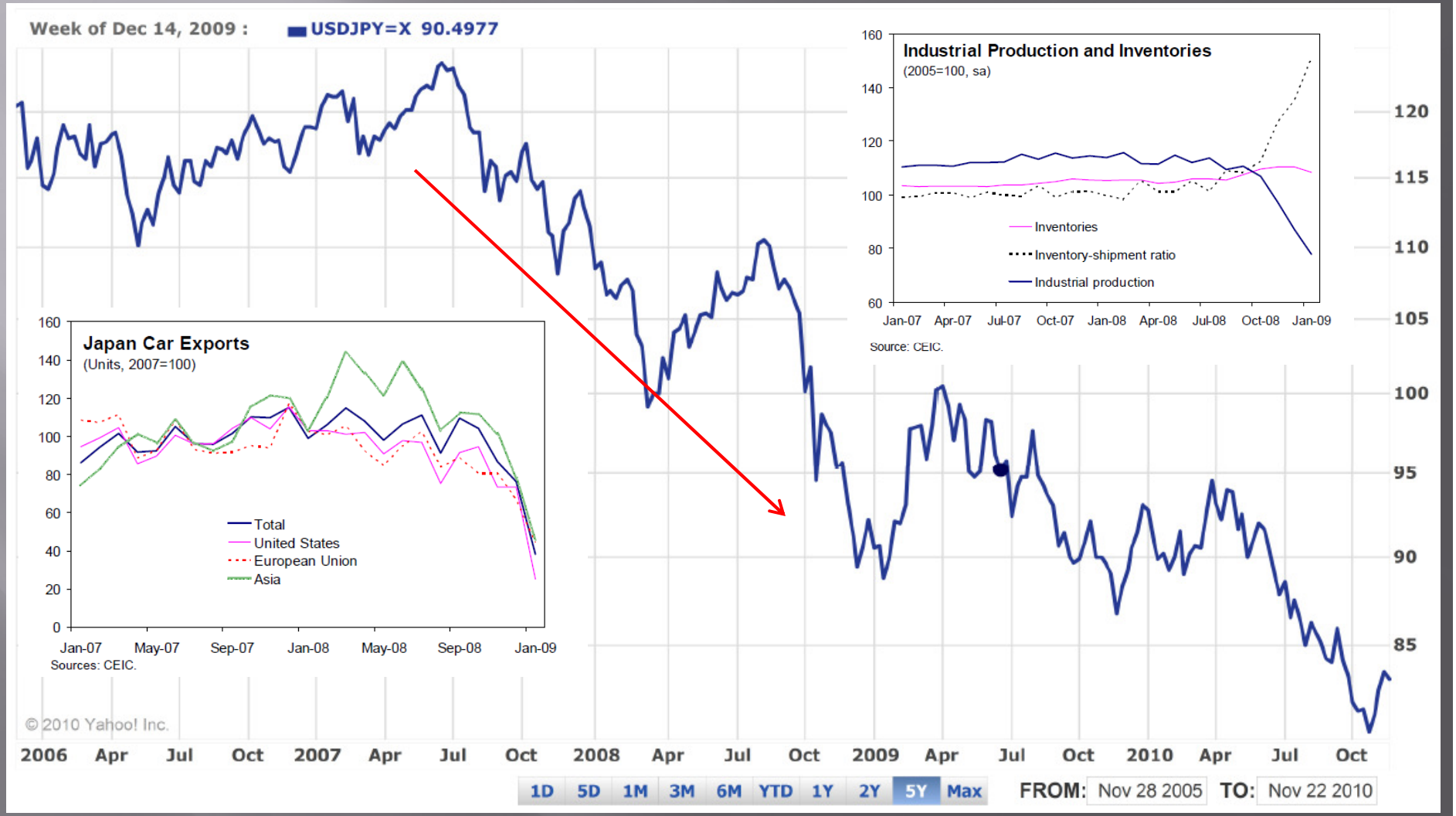
"All liquidity starts in Japan, the world's largest creditor country"
Jesper Koll, chief economist for Japan at Merrill Lynch & Co.

⇨ Liquidity from Japan funds subprime investment

"Japan sits at the epicenter of "bubble-mania" in foreign exchange,..global speculators borrowed $1.2 trillion worth of low-cost Japanese Yen in order to buy higher yielding currencies.. [But,]when carry traders all rush for the exits at the same time, the herd effect can create an avalanche of panic sales on global stock markets." *Global Money Trends, 16 Oct. 2008*

⇨ Collapse of the Housing Bubble in U.S. cripples FX markets, Japans' exports and stock market, and Japan's economy

Carry Trade Generates Systemic Risk



Back to Today:

Brazil :

-considering taxes on some short-term fixed income investments

-raised margin requirement from 3 to 5%

-considering tax break to exporters

Taiwan:

-imposed limits on bond holdings by foreigners

Thailand:

-raised taxes on foreign investment in local bonds

Israel & South Africa :

-buying dollars to keep their currencies from rising.

China :

-raised reserve requirements at banks, a move to slow foreign investment

WSJ. Nov. 10, 2010

Back to Today:

South Korea:

Local banks must limit their forward positions—including all derivatives such as currency swaps and non-deliverable forwards—to 50% of their capital at the end of the preceding month. Foreign banks are required to lower their positions to 250% of their capital, with the authorities eventually planning to reduce their limit to the same one domestic banks are held to.

WSJ. Oct. 5, 2010