Is FX Volatility Dead?

Monica Fan (Global Head of FX Strategy)
+44 207 029 7076
monica.fan@rbccm.com

November 29, 2006

RBC Capital Markets

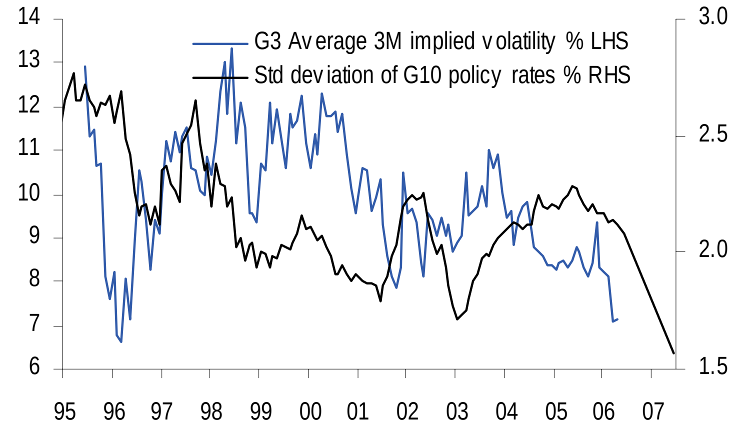
Is the decline in FX volatility structural or cyclical?

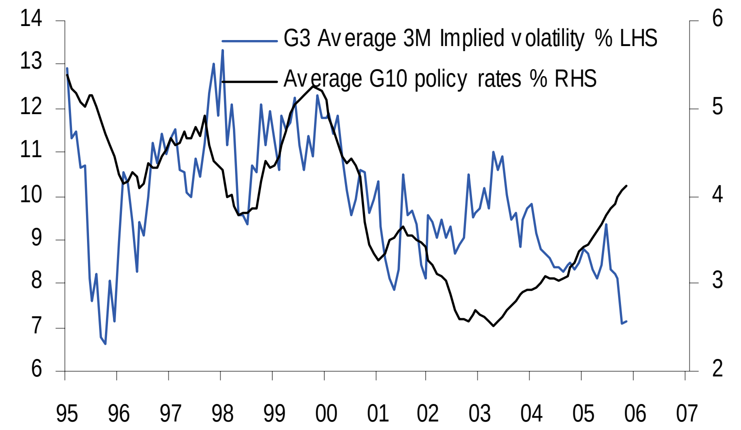
- Cyclical factors
  - Global convergence in interest rates
- Structural factors
  - Increased credibility of central banks has reduced the long term risk premia
  - Globalisation of trade and financial markets
  - Growth in central bank reserves
- Catalysts for a temporary spike in volatility
  - US recession? Equity volatility is countercyclical but FX volatility is not
  - Unwinding of extreme market positions that temper volatility selling
  - Reduction in the number of liquidity providers

Cyclical factors: Global convergence in interest rates

RBC Capital Markets

Convergence, not level, of rates is driving down FX vols





Source: RBC Capital Markets, Bloomberg

- Since 1998 G3 FX vols have fallen from 13.0 to 7.5.
- Convergence in global rates – standard deviation is forecast to fall from 2.1 to 1.6 by the end of 2007 – will contribute to a reduction of FX volatility.
- Positive correlation between the level of G10 rates and FX volatility has broken down since 2000.

G10 Interest rates will converge further in 2007

	Official Rates: Current	Official Rates: Dec-07 (f)
US	5.25%	4.75%
Eurozone	3.25%	3.75%
Japan	0.25%	1.50%
UK	5.00%	4.50%
Canada	4.25%	4.00%
Australia	6.25%	6.25%
New Zealand	7.25%	6.00%
Sweden	2.75%	3.75%
Norway	3.25%	4.50%
Switzerland	1.75%	2.25%
Minimum (Maximum)	0.25% (7.25%)	1.50% (6.25%)

Source: RBC Capital Markets, (f) RBC forecast

Structural factors: Increased central bank credibility

G10 Inflation targets are centred around 2%

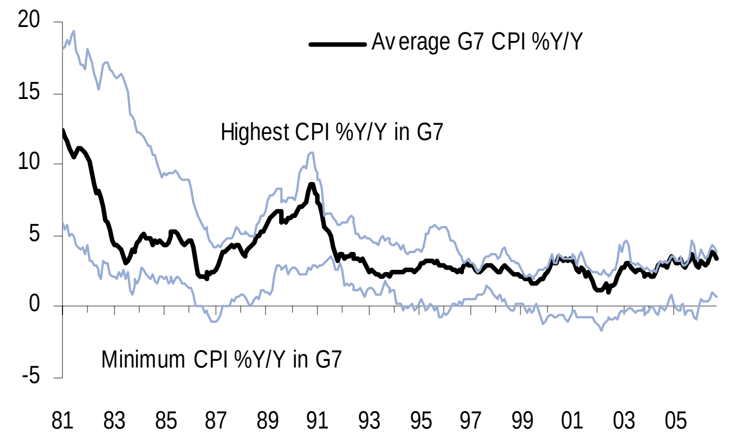
	Date Introduction Target	Inflation Target	
US	"Price stability"	Core inflation of 1-2%	
Eurozone	January 1999	HICP	< 2.0%
Japan	May 2006	CPI	< 2.0%
UK	October 1992	HICP	< 2.0%
Canada	February 1991	CPI	1.0-3.0%
Australia	April 1993	CPI	2.0-3.0%
New Zealand	March 1990	CPI	1.0-3.0%
Sweden	January 1993	CPI-UNDIX	2.0$\underline{+}$1%
Norway	March 2001	CPI-ATE	< 2.50%
Switzerland	January 2000	CPI	< 2.0%
Average Target		2.0%	

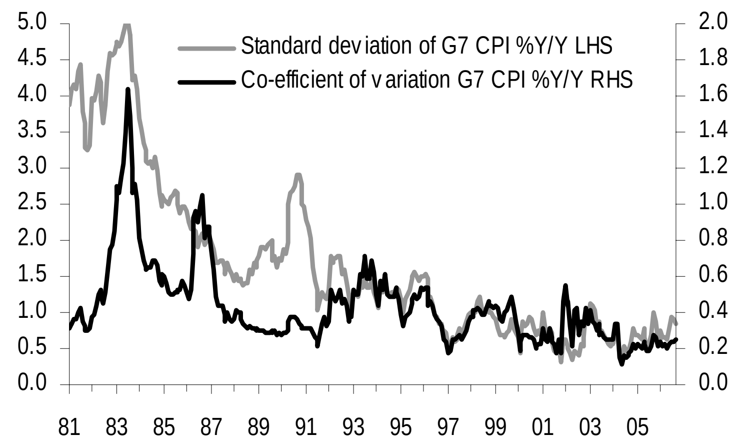
Sources: Federal Reserve, ECB, BoJ, BoE, BoC, RBA, RBNZ, Riksbank, Norges Bank and SNB

- The "Great Moderation" ended in the 1980's.
- But inflation targeting started in the 1990's and global inflation targets are now centred around 2%.
- Central bank credibility has increased through greater transparency of inflation targets, policy bias, the publication of central banks interest rate projections, and the shift towards gradualism.
- G20 Finance Ministers talk about the undesirability of "excess volatility and disorderly movements in exchange rates"

Structural factors: Reduction of long-term risk premia

The level and volatility of G7 inflation have declined

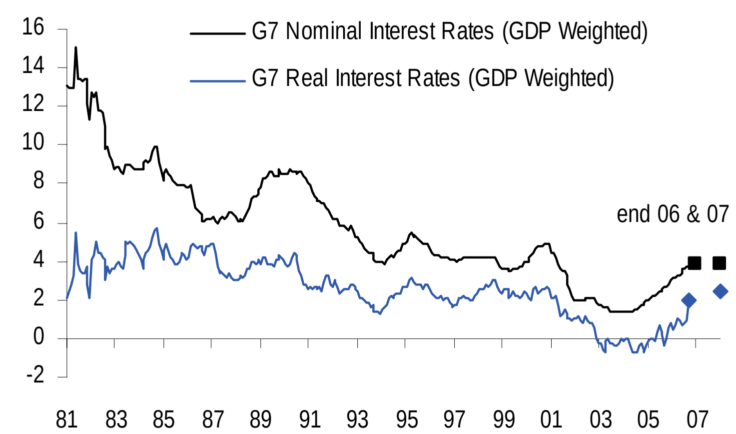




Source: RBC Capital Markets, Bloomberg

- Bulk of the decline in inflation occurred in the 1980's.
- But the standard deviation and co-efficient of variation of inflation has fallen from 0.8 to 0.2 since the 1990's and confirms that increased central bank credibility has contributed to a reduction in long-term risk premia.

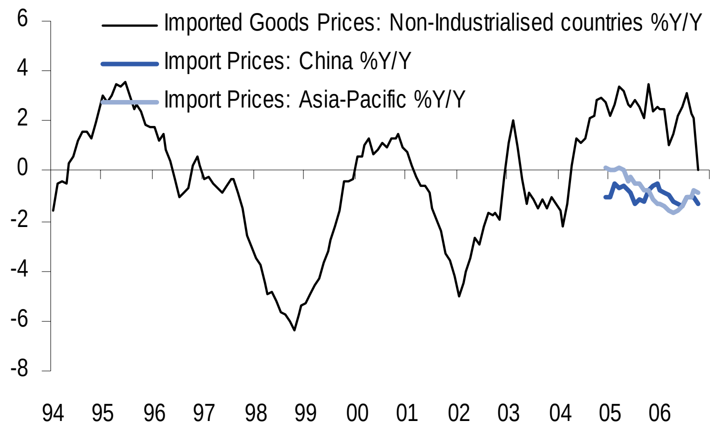
Real and nominal rates have peaked below the 1990's



Source: RBC Capital Markets, Bloomberg

Structural factors: Globalisation of trade

Asian goods deflation have contributed to lower prices



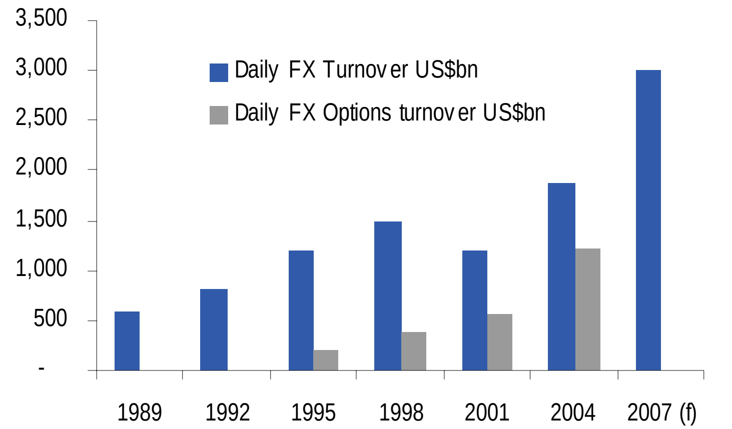
Source: RBC Capital Markets, Bloomberg

- Central banks can only claim part of the credit for reducing inflation.
- Emergence of Asian and other emerging market manufacturers have contributed to a long term reduction in US import prices.

Structural factors: Globalisation of finance

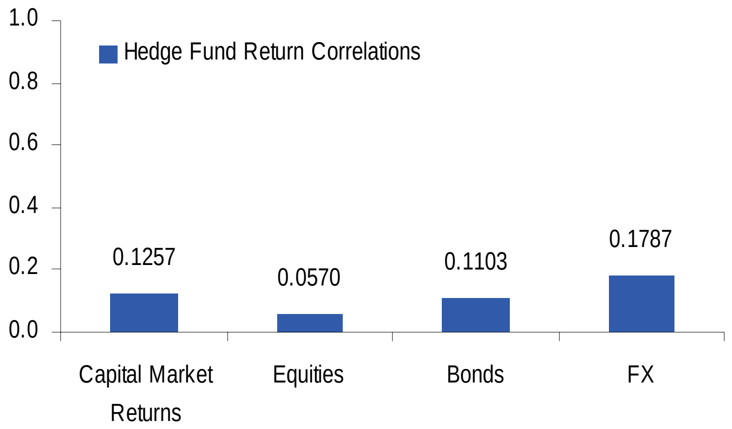
RBC Capital Markets

Liquidity in FX market and use of options has surged



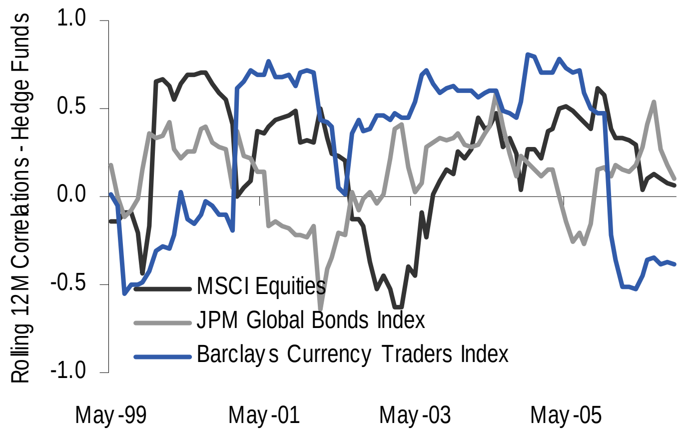
- Growth in hedge funds i.e. liquidity providers has reduced the impact of any single shock. Contrast the implosion of LTCM and Amaranth.
- Hedge fund returns are lowly correlated to equities, bonds and FX in long term and have diversified the available investment strategies, despite periodic herding.

Hedge fund returns are lowly correlated to other assets



Source: RBC Capital Markets, Bloomberg

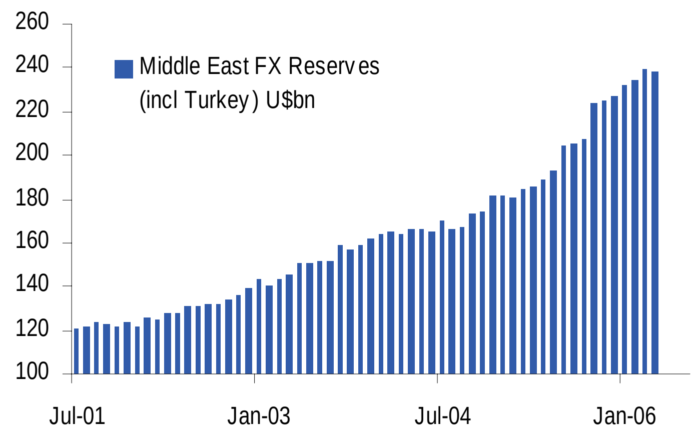
Correlation of hedge returns with bonds, equities & FX



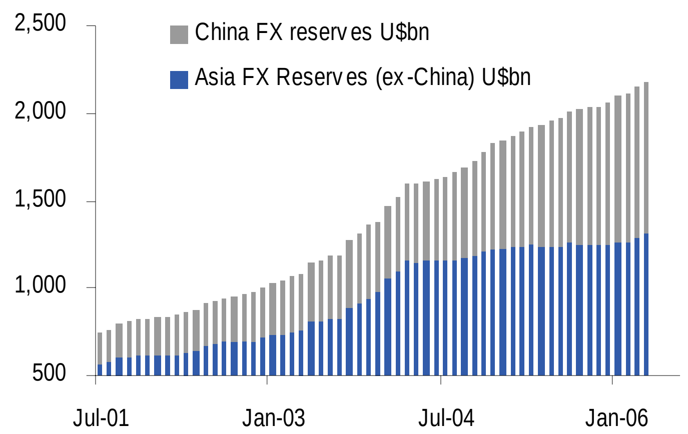
Source: RBC Capital Markets, Bloomberg

Structural factors: Growth in central bank reserves

Growth in Middle Eastern FX reserves has been rapid



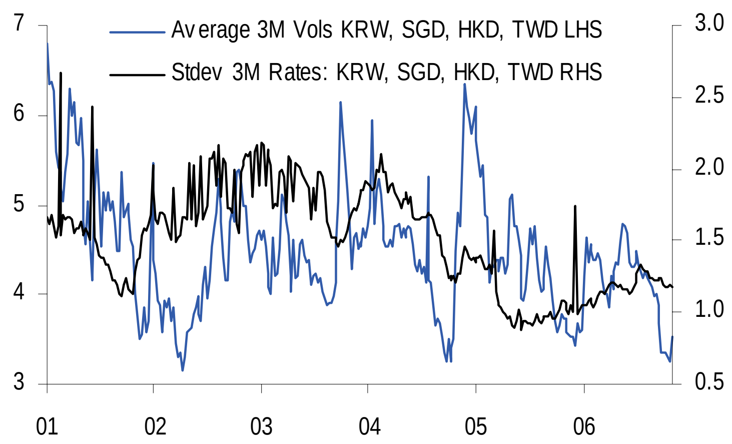
Growth in FX reserves have reduced G3 FX vols



Source: RBC Capital Markets, Bloomberg

- FX reserves have grown rapidly since 2000, particularly in the Middle East and Asia.
- Growth in reserves of G3 currencies has contributed to a reduction in G3 FX volatility as central bank have less volatile trading strategies.
- Asian FX volatility, however, remains cyclical.

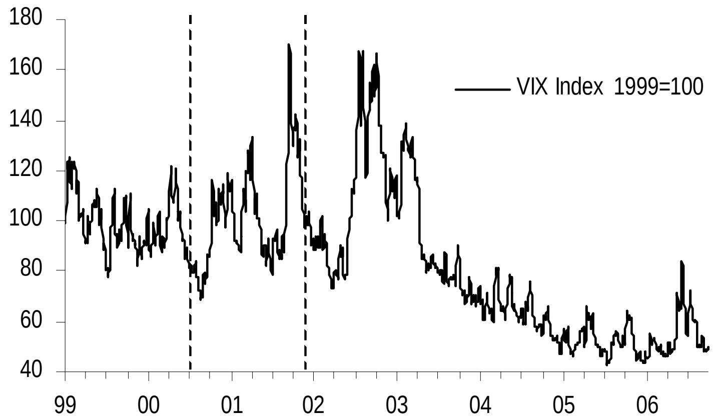
But Asian FX vols remain very cyclical

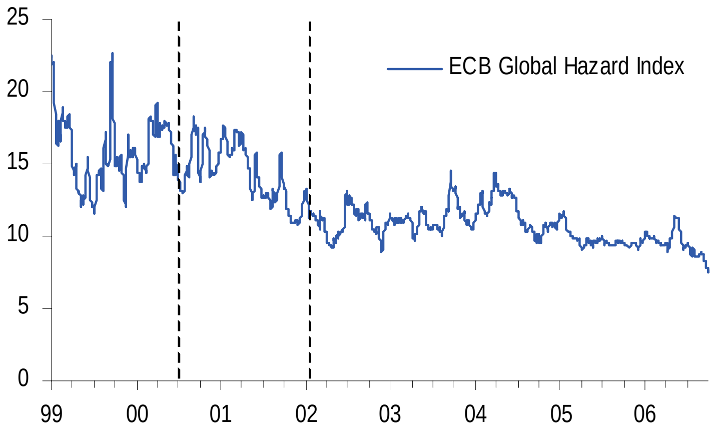


Source: RBC Capital Markets, Bloomberg

Risk factors: What goes up must come down

Equity vols are countercyclical but FX vols are not





Source: RBC Capital Markets, Bloomberg, ECB

- Well established that equity and bond vols are counter-cyclical, i.e., during recessions or economic slowdowns vols in equities and bonds rise.
- But FX vols continued to trend lower during the 2000-01 US slump. FX vols are not necessarily counter-cyclical.

Triggers for temporary spikes in FX vols

- We expect FX volatility will remain in a downtrend but there are possible triggers for a spike in FX volatility as occurred in May 2006:
  - Unwinding of extreme market positions, for example, in EUR/JPY.
  - Declines in FX volatility have been compounded by investment strategies that persistently sell FX vols. An unwinding of extreme market positions could temper the magnitude of vol selling strategies.
  - Reduction of FX liquidity, not from higher global rates, but from reduced number of liquidity providers, especially hedge funds, would increase vols.
- Increases in volatility are only likely to be sustained if there is a loss of credibility in central bank policy, i.e., central banks appear to be behind the curve.

Disclaimer

The information contained in this report has been compiled by RBC Capital Markets ("RBC CM") from sources believed to be reliable, but no representation or warranty, express or implied, is made by Royal Bank of Canada, RBC CM, its affiliates or any other person as to its accuracy, completeness or correctness. RBC Capital Markets is a business name used by subsidiaries of the Royal Bank of Canada including RBC Dominion Securities Inc., RBC Capital Markets Corporation, Royal Bank of Canada Europe Limited and Royal Bank of Canada - Sydney Branch. All opinions and estimates contained in this report constitute RBC CM's judgment as of the date of this report, are subject to change without notice and are provided in good faith but without legal responsibility. This report is not an offer to sell or a solicitation of an offer to buy any securities. RBC CM and its affiliates may have an investment banking or other relationship with some or all of the issuers mentioned herein and may trade in any of the securities mentioned herein either for their own account or the accounts of their customers. Accordingly, the entities constituting RBC CM or their affiliates may at any time have a long or short position in any such security or option thereon. Every province in Canada, state in the U.S., and most countries throughout the world have their own laws regulating the types of securities and other investment products which may be offered to their residents, as well as the process for doing so. As a result, the securities discussed in this report may not be eligible for sale in some jurisdictions. This report is not, and under no circumstances should be construed as, a solicitation to act as securities broker or dealer in any jurisdiction by any person or company that is not legally permitted to carry on the business of a securities broker or dealer in that jurisdiction. This material is prepared for general circulation to clients and does not have regard to the particular circumstances or needs of any specific person who may read it. To the full extent permitted by law neither RBC CM or any of its affiliates, nor any other person, accepts any liability whatsoever for any direct or consequential loss arising from any use of this report or the information contained herein. No matter contained in this document may be reproduced or copied by any means without the prior consent of RBC CM. The entities comprising RBC Capital Markets are wholly owned subsidiaries of the Royal Bank of Canada and are members of the RBC Financial Group. Additional information is available on request. To U.S. Residents: This publication has been approved by RBC Capital Markets Corporation, which is a U.S. registered broker-dealer and which accepts responsibility for this report and its dissemination in the United States. Any U.S. recipient of this report that is not a registered broker-dealer or a bank acting in a broker or dealer capacity and that wishes further information regarding, or to effect any transaction in, any of the securities discussed in this report, should contact and place orders with RBC Capital Markets Corporation. To Canadian Residents: This publication has been approved by RBC Dominion Securities Inc. Any Canadian recipient of this report that is not a Designated Institution in Ontario, an Accredited Investor in British Columbia or Alberta or a Sophisticated Purchaser in Quebec (or similar permitted purchaser in any other province) and that wishes further information regarding, or to effect any transaction in, any of the securities discussed in this report should contact and place orders with RBC Dominion Securities Inc., which, without in any way limiting the foregoing, accepts responsibility for this report and its dissemination in Canada. To U.K. Residents: This publication has been approved by Royal Bank of Canada Europe Limited ("RBCEL") which is authorized and regulated by Financial Services Authority ("FSA"), in connection with its distribution in the United Kingdom. This material is not for distribution in the United Kingdom to private customers, as defined under the rules of the FSA. RBCEL accepts responsibility for this report and its dissemination in the United Kingdom. To Persons Receiving This Advice in Australia: This material has been distributed in Australia by Royal Bank of Canada - Sydney Branch (ABN 86 076 940 880). This material has been prepared for general circulation and does not take into account the objectives, financial situation or needs of any recipient. Accordingly, any recipient should, before acting on this material, consider the appropriateness of this material having regard to their objectives, financial situation and needs. If this material relates to the acquisition or possible acquisition of a particular financial product, a recipient in Australia should obtain any relevant disclosure document prepared in respect of that product and consider that document before making any decision about whether to acquire the product. To Hong Kong Residents: This publication is distributed in Hong Kong by RBC Investment Services (Asia) Limited, a licensed corporation under the Securities and Futures Ordinance. This material has been prepared for general circulation and does not take into account the objectives, financial situation, or needs of any recipient. Hong Kong persons wishing to obtain further information on any of the securities mentioned in this publication should contact RBC Investment Services (Asia) Limited at 17/Floor, Cheung Kong Center, 2 Queen's Road Central, Hong Kong (telephone number is 2848-1388).