



SOCIETY OF ACTUARIES

**Investment Symposium
March 2010**

A4: Momentum and the Financial Crisis

Ann Tucker

**Moderator
Eric Konigsberg**

MOMENTUM AND THE FINANCIAL CRISIS

Ann H. Tucker, Ph.D.
Center for Quantitative Finance
Dept. Applied Math & Statistics
SUNY Stony Brook

Society of Actuaries
2010 Investment Symposium
New York

Motivation for Study

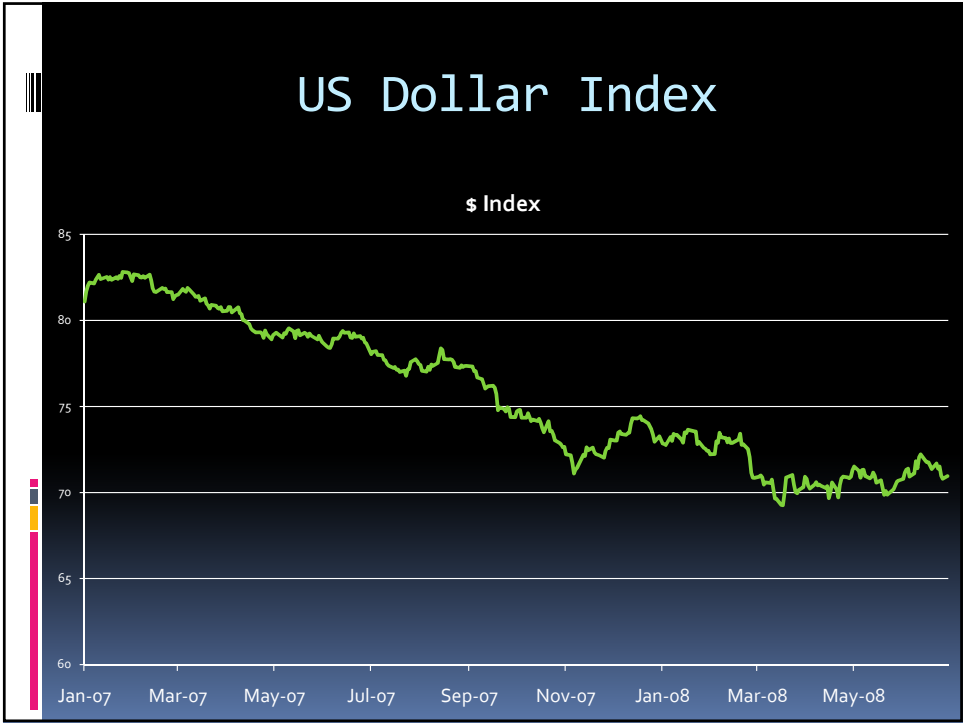
- Portfolio manager of hedge fund of funds in 2008
- Equity Long/Short (Fundamental and Quantitative), Commodities
- Managers report performance drivers monthly, position level details provided
- Surprising number of managers exposed to momentum factor, knowingly or not

Momentum

- Tendency of assets with good performance to continue performing well and assets with bad performance to continue performing poorly
- Jegadeesh, Titman (1993): Investor underreaction to good news
- Hong, Stein (1998): Prices underreact to news because information diffuses slowly across investors
- Rachev, et al. (2007): Use of risk-adjusted criteria, optimized portfolio, distributional properties of stock returns

Dollar Weakness

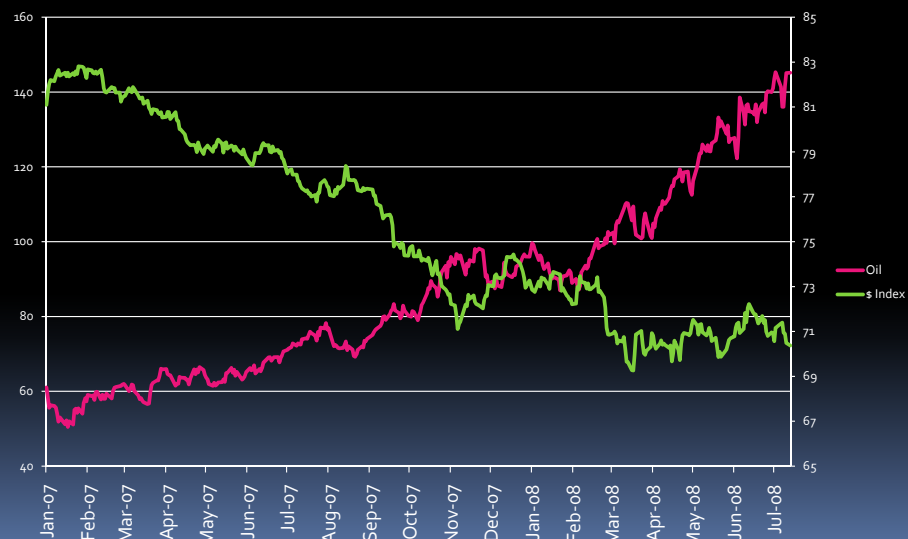
- Widening interest rate differentials between US and other economies – divergent central bank policies
- Evidence of weakness in US economy and financial system
- High oil prices
- Dollar diversification policies – Middle East and Asia
- High growth & inflation in emerging markets



Momentum and the Carry Trade

- Carry trade encouraged by dollar weakness and China's policy of revaluing yuan with low volatility
- Value of yuan is not determined by supply and demand but by Chinese authorities who buy and sell their currency in the FX market (Krugman, NY Times)
- Beneficiaries of carry trade – long crude oil, energy and materials stocks, short financials

Crude Oil



Hedge Fund Assets

- \$2.8T invested in hedge funds at the beginning of 2008 (hedgefund.net)
- \$1.8T invested at the end of 2008
- 36% drop in assets
- Average performance of hedge funds was -18%
- S&P Market Cap \$12.9T on 12/31/07
- Hedge funds use leverage and short

Financial Crisis of 2008

- Equities down globally: S&P 500 -37%, S&P Global 1200 -40%, BRICs -55%
- Equity Volatility: VIX Index at historic high of 80 in November when crisis peaked
- Interest Rates: 10 year yield 4.04% to 2.25%



While the Financial System Melts Down

- US recession begins in January 2008
- But commodities prices are at historic highs
- Decoupling?
- Sharp rise in commodities prices present problems for emerging economies that are net consumers, e.g. China, India
- Chinese government oil subsidy is costly

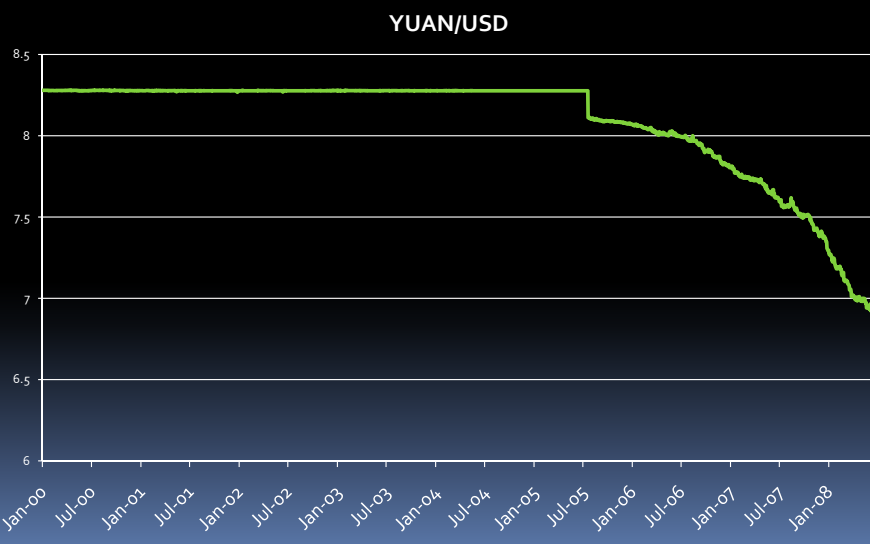
Oil and Baltic Dry Index



China's Currency Policy

- China ended the USD peg in July 2005 and has managed its exchange rate with reference to a trade weighted basket
- Westpac Trade Weighted Yuan Index aims to mimic moves in China's currency basket
- True composition of China's currency basket is unknown
- Beginning in July 2008 China's FX policy suddenly shifts

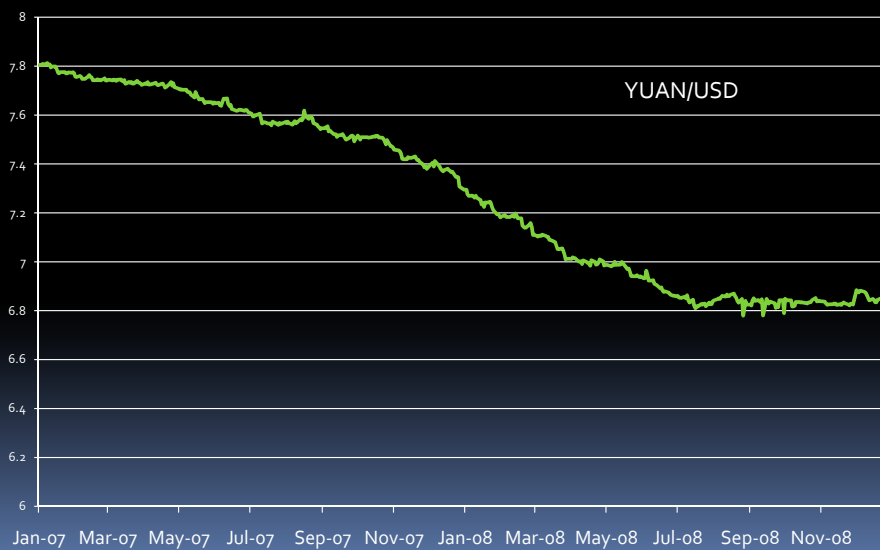
China's USD Peg Ends in 2005



Chinese FX Policy Shifts

- Yuan-USD peg begins in July 2008
- Chinese credited a stable dollar-yuan relationship in helping them get through the 1997-98 Asian crisis
- Yuan strengthens against basket around the same time
- What are the mathematical implications of such a policy

Yuan repegged to USD in July 2008 with low volatility



but strengthens against basket,
also with low volatility



Volatility of Yuan Basket

If we assume that the yuan traded weighted basket is comprised solely of equal weighted dollars, euros, and yen

The volatility of this basket can be represented as

$$\sigma_c = \sqrt{\sigma_{c,d}^2 + \sigma_{c,e}^2 + \sigma_{c,y}^2 + 2\rho_{d,y}\sigma_{c,d}\sigma_{c,y} + 2\rho_{d,e}\sigma_{c,d}\sigma_{c,e} + 2\rho_{e,y}\sigma_{c,e}\sigma_{c,y}}$$

Where c is yuan, d is dollar, e is euro, y is yen

Yuan Pegged to USD with Low Volatility

Because of China's currency management the volatility of the yuan to the dollar has been very low, historically ~2% per year

For our purposes, assume it is zero

Then the expression for yuan volatility becomes

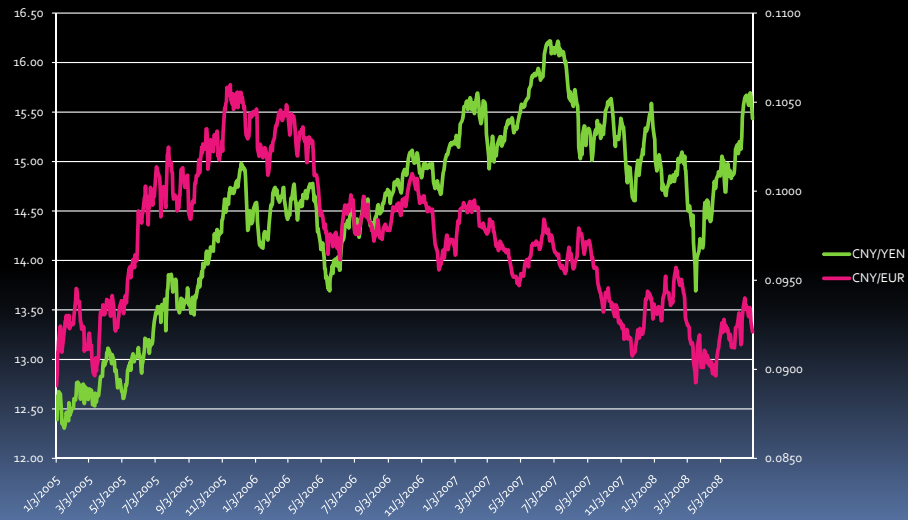
$$\sigma_c = \sqrt{\sigma_{c,e}^2 + \sigma_{c,y}^2 + 2\rho_{e,y}\sigma_{c,e}\sigma_{c,y}}$$

Yuan-Euro Historically More Volatile

- Yuan-Euro and Yuan-Yen volatilities are positive and higher than Yuan-USD
- Given our assumptions, how can the yuan basket volatility be kept low?

$$\sigma_c = \sqrt{\sigma_{c,e}^2 + \sigma_{c,y}^2 + 2\rho_{e,y}\sigma_{c,e}\sigma_{c,y}}$$

Yuan-Euro and Yuan-Yen Cross Prior to Policy Shift



Manipulate Correlations

The only way for China to...

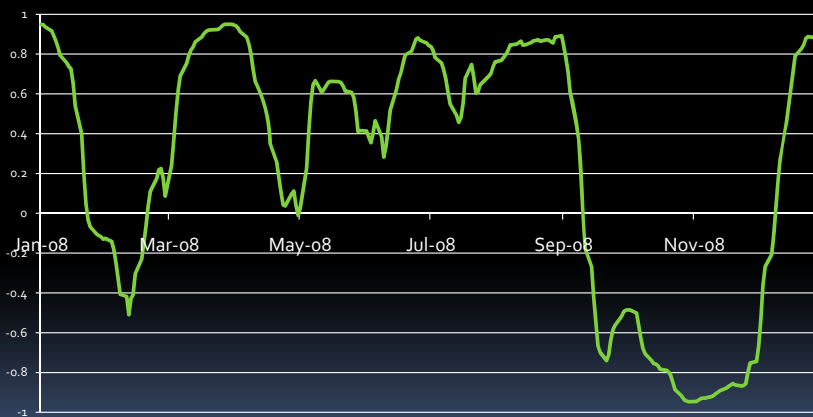
peg the yuan to the dollar and strengthen the yuan against the trade weighted currency basket with low volatility...

Is to strengthen the yuan against the euro and weaken the yuan against the yen in such a way that the correlation of these pairs are as negative as possible

After Policy Shift



Yuan-Yen Yuan-Euro Correlation (30D Realized)

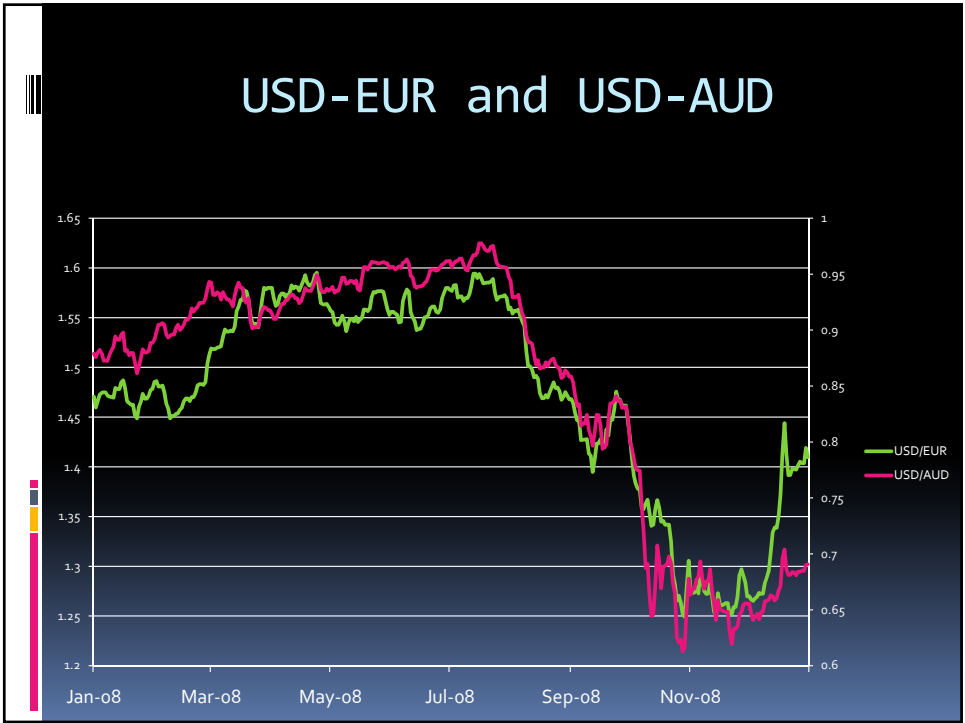
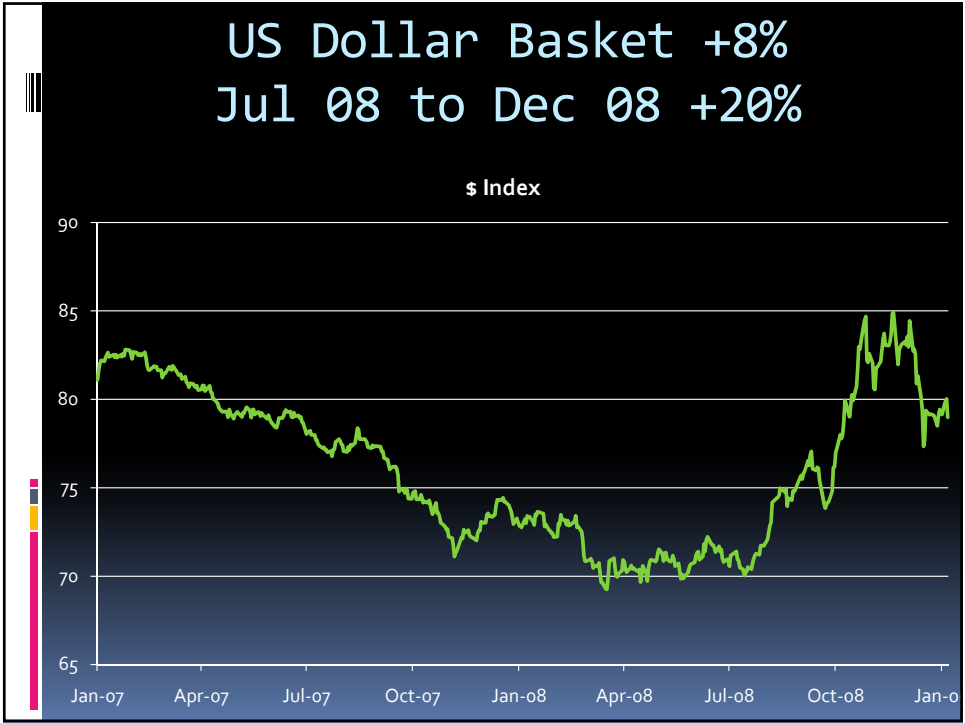


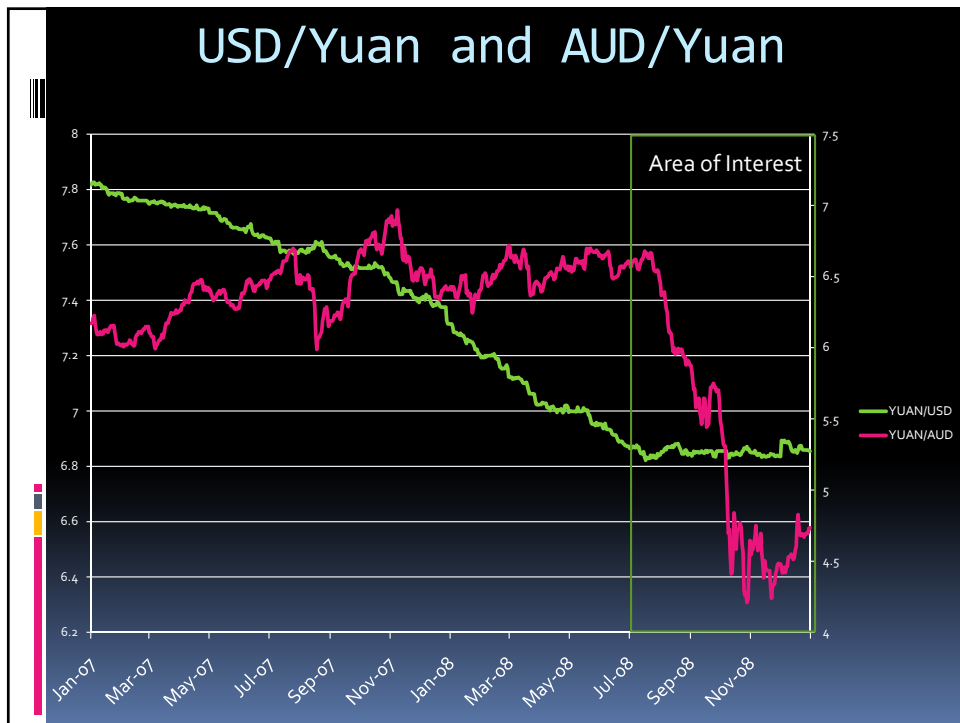
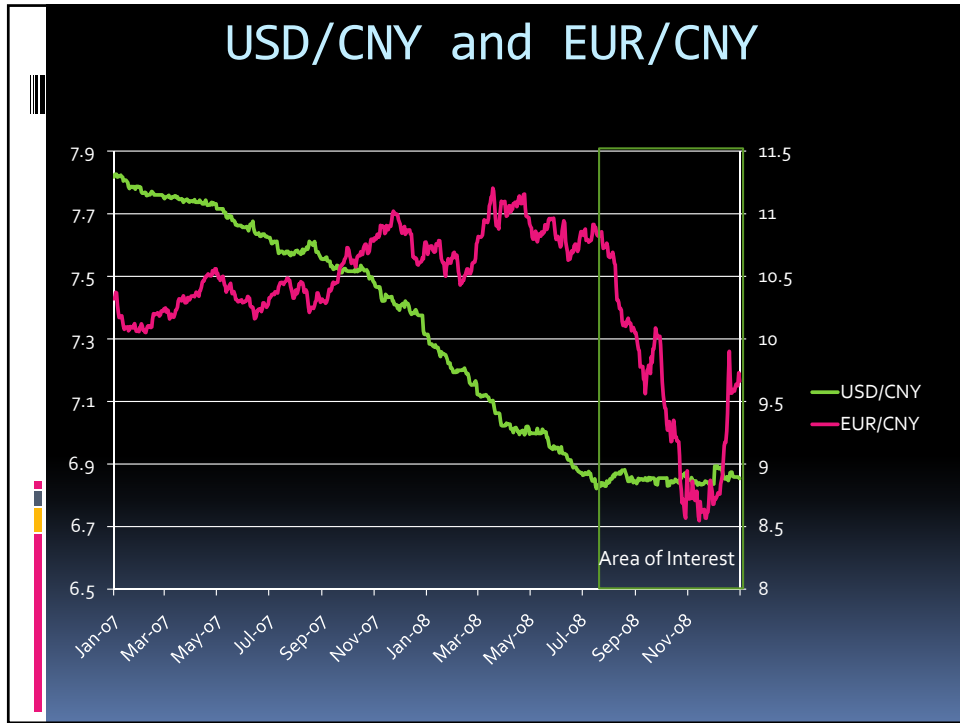
Chinese Currency Policy

- China's policy shift resulted in stronger yen and USD
- Simultaneously blew up the dollar and yen carry trades
- In 2008 the one of the largest carry trades was long commodities, especially crude oil

The Aftermath – July 2008

- Risk of USD and YEN carry trades rises due to correlations, volatilities, and wrong-way moves
- Carry positions must be unwound
- Long commodities (primarily oil), short financial stocks, long energy/material stocks





Consequences of Yuan-Euro and Yuan-Yen Correlation

- Euro-yen cross rate volatility becomes very large: exactly equal to the sum of the yuan-euro and yuan-yen volatilities
- Euro-yen cross comes under intense pressure
- During the market correction this volatility spiked

Euro-Yen Cross Rate Comes Under Pressure



