

“Structural Changes – a quantitative approach”

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Proposed Study - Global Economy

Many structural changes in the global economy are due to the rise of emerging markets. In this study we will discuss structural changes in economies, debate and propose a quantitative approach to identify possible trading opportunities.

Background

For the last 10 years emerging markets have consistently outperformed developed nations. They have steadily reduced their reliance on single trading partners and on developed nations as a group. Instead emerging markets increasingly trade with each other (such that China is now the biggest trading partner of many countries). Their rise has increased global supply and demand for primary, secondary and tertiary goods, as well as services.

This has impacted price levels in 2 opposing ways:

Increased global supply of goods and services has led to lower prices, particularly of manufactured goods.

On the other hand, increased global demand of goods and services has led to higher prices, particularly of commodities.

However, the overall effect has been to reduce the power of developed nations to effect global markets.

In the 1990's and early 2000's the global supply of goods and services was growing faster than the global demand, leading to lower prices.

In the major developed economies, this had 2 effects:

Decreased prices on goods for consumption lead to improved standards of living.

Decreased prices on goods as production inputs boosted productivity. These productivity boosts were most realised in countries with flexible capital and labour markets, (such as US and UK), less so in those with rigid markets, (such as France and Japan).

For the emerging markets the effects were different:

Increased production led to strong economic growth.

Increased exports led to positive trade balances.

At the same time, the major developed economies import levels were growing much faster than their export levels, which generated large negative trade balances.

Since then, a growing consumer class in emerging markets has led to the global demand for goods and services growing faster than the global supply.

This has led to a reversal of the earlier trend:

Increased prices on commodities and goods for consumption is decreasing standards of living.

Increased prices on commodities and other production inputs have dampened productivity growth.

Both of these effects have made it increasingly difficult for central banks to effectively target growth and inflation, due to the increasing global impact on their domestic economies.

Propositions

UK inflation levels are becoming less responsive to changes in the BOE base rate, due to a loss of pricing power arising from growing Emerging Markets share of global supply. (Proposition I)

The contribution of EM to Global supply & demand is growing in relation to the contribution of the major developed countries.

A relative change in money supply and trading volume changes the liquidity of FX trading. This should cause a change in FX Rate volatilities.

In addition, the relative increase in demand for EM currencies, due to the diversification of trading partners and higher trading volumes has increased the liquidity of EM FX trading.

This increased liquidity would cause a decrease in EM FX volatility, relative to the FX volatility of developed countries. (Proposition II)

Approach

Proposition I:

-Measure sensitivity of Inflation to interest rates changes

By confirming two conditions:

1) Developed nations loss of Pricing Power

Method: Compare (G7 Exports / World Exports) and (G7 Imports /World Imports) against (EM Exports / World Exports) and (EM Imports /World Imports). To support our argument, the G7 ratios should be decreasing over time, while the EM ratios are increasing.

Data required: G7 Exports / Imports, EM Exports / Imports.

2) The contribution of IR to inflation should be decreasing to support the argument.

Method: Perform a series of regressions, calibrate so that output of Inflation is close to real Inflation values.

Run Chow test to confirm the structural change, and then identify the exact change on the IR contribution to inflation.

Data required: GDP, IR, Trade Balance, Inflation, Import Prices, FX rates, Unemployment, Net Lending.

Proposition II:

-Analyse FX volatilities

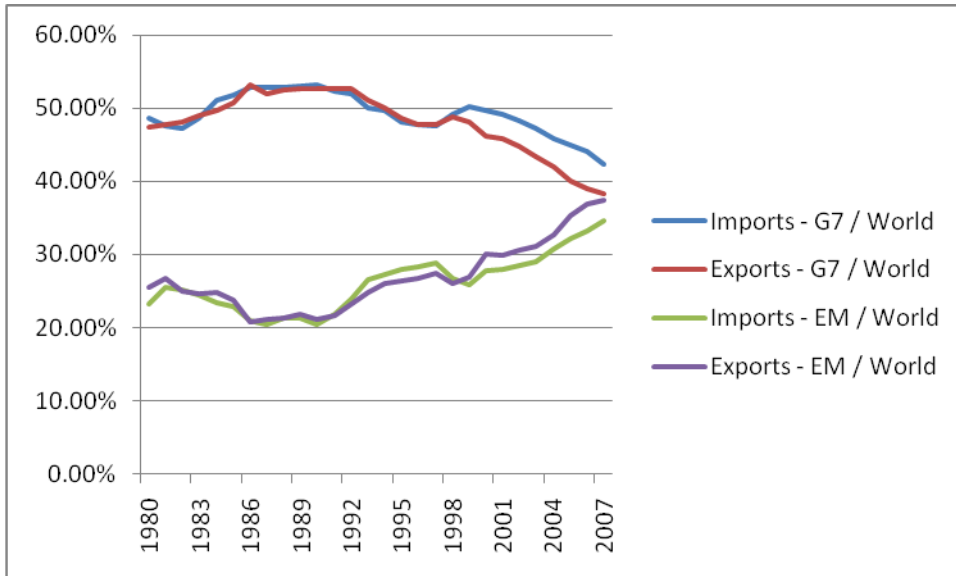
Method: Measure intra-emerging market vols (such as BRL-RUB, RUB-CNY). These should be decreasing relative to intra-developed market FX vols (such as EUR-USD, USD-GBP).

Data required: FX rates, spots and cross currencies

Results

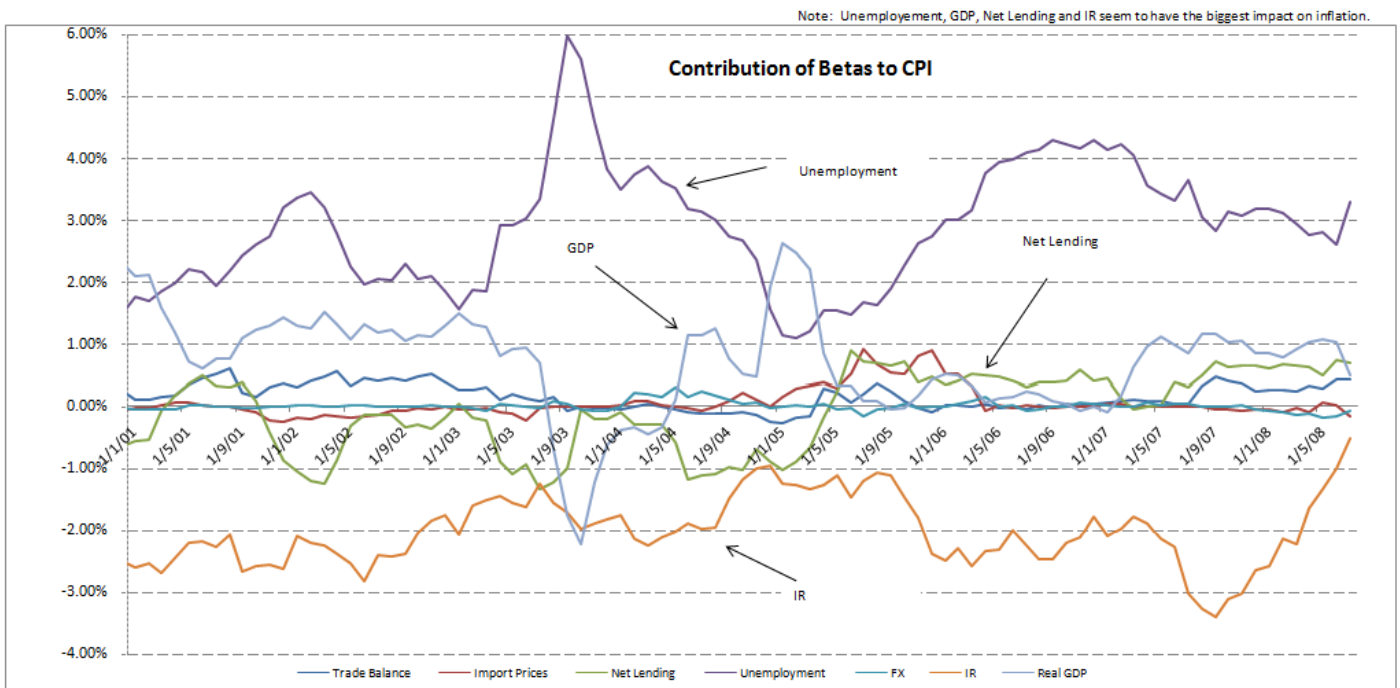
Proposition I:

1) Condition 2: Developed nations loss of Pricing Power – CONFIRMED



(Graph I)

2) Condition 1: the contribution of IR to inflation, should be decreasing – CONFIRMED



(Graph II)

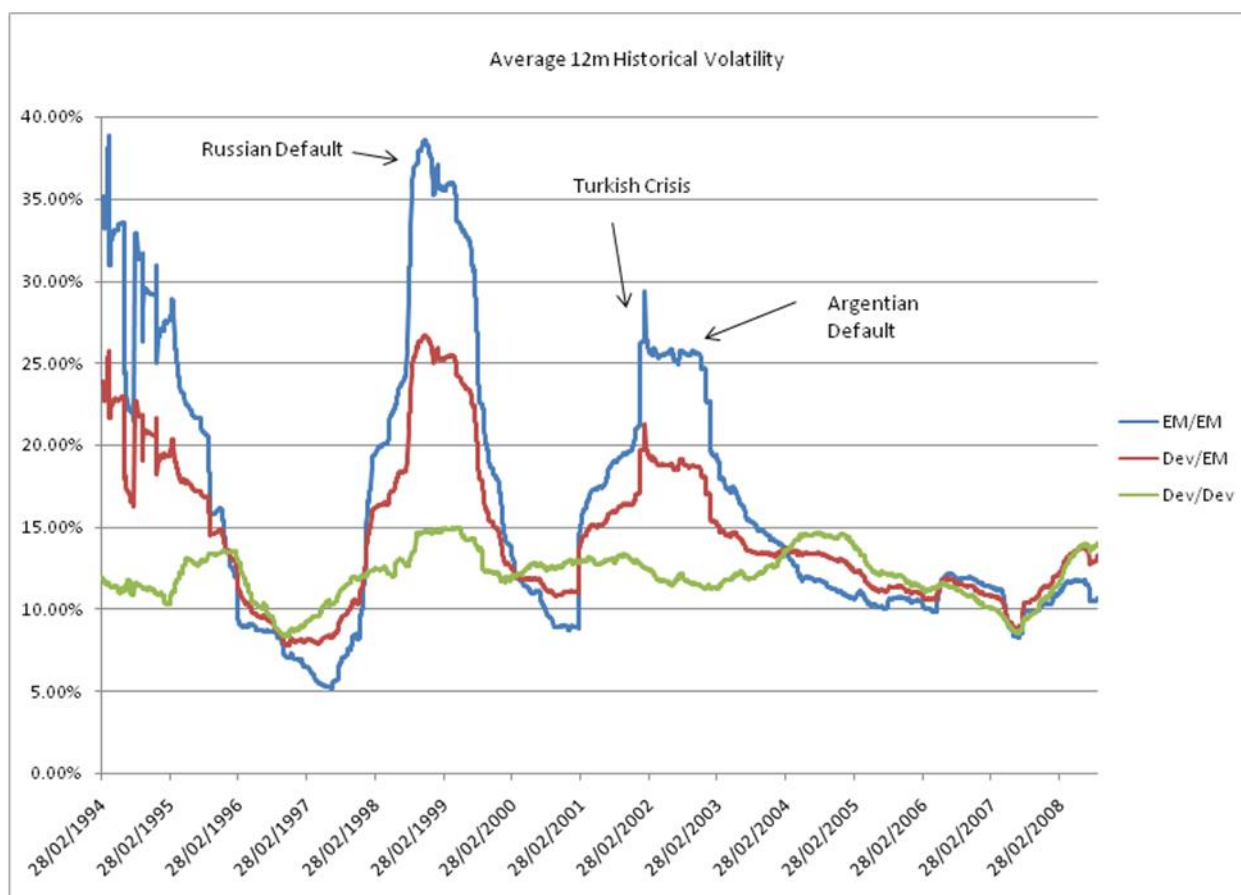
Given the graph above:

We can see that (EM Exports / World Exports) and (EM Imports /World Imports) are increasing functions, whereas (G7 Exports / World Exports) and (G7 Imports /World Imports) are decreasing function.

For the major developed economies, the gap between Imports and Exports (negative trade balance) has been steadily growing, mirrored by the growth in the positive trade balance for emerging markets.

Proposition II:

- 1) Condition: intra-emerging market vols, should be decreasing relative to intra-developed market FX vols -CONFIRMED



(Graph III)

Analysis

-Quantitative:

The quantitative technique adopted to analyse the data was a series of regressions using the OLS method, Ordinary Least Squares. The reason for this is simple, by using a model that assumes homoskedasticity of errors (*) we are forcing our model to fit to the data as though there were no structural changes in that data, such that the errors would be homogeneous across observations. However, our entire argument is based upon there being a structural change between Inflation and IR, and therefore the errors would not behave homogeneously across observations. To verify and quantify the change in the parameter between these two variables we will run a Chow test. This is a particular test for structural change; an econometric test to determine whether the coefficients in a regression model are significantly different in separate subsamples. A standard F test for the equality of two sets of coefficients in linear regression models is called a Chow test. In this test homoskedasticity is again assumed, consistent with our model, in order to determine the change in the parameter vector.

If we were to use the Generalised Least Squares method (GLS), model that assumes heteroskedasticity (**), we would need to estimate Ω consistently, creating restrictions for the weights $\{w_1^2, w_2^2, w_3^2, \dots, w_n^2\}$. If the assumption is incorrect then the estimate of Ω will be very poor and the feasible GLS estimator can give worse results than the OLS estimator.

(*) homoskedasticity, errors are spherical, meaning that the variances are = across observations.

(**) heteroskedasticity, errors are non-spherical, meaning that the variances are different across observations.

-Fundamental & Technical

Although we have performed technical analysis in each individual parameter (beta for all macroeconomic indicators used in the study), the four that seem to have the biggest impact on inflation, are:

- [GDP](#)
- [IR](#)
- [Unemployment](#)
- [Net Lending](#)

➤ [Technical Analysis Result Table](#)

Summary

We briefly discussed the impact of EM growth on developed nations price levels, and real economies. Then we outlined two propositions that resulted from these impacts.

Our first proposition was that UK economy inflation levels are becoming less responsive to changes in the CB interest rate, and that this was due to international forces arising from Emerging markets. Our second proposition was that increased liquidity in EM FX trading would cause a decrease in EM FX Volatility, relative to Developed countries FX Volatility.

For the first proposition two conditions needed to be confirmed; that the contribution of IR to inflation was decreasing, and that the contribution of EM to global Supply and Demand was increasing. These were studied respectively by using regression analysis on a model of inflation, and by charting the contributions of G7 and EM nations to global Supply and Demand.

For the second proposition we needed to confirm that EM FX rates were becoming less volatile. This was done by charting average historical volatilities for G20 FX rates.

The results of the regression analysis shows that UK economy inflation levels are becoming less responsive to real IR, but did not find that this was due to international forces.

In fact, the international variables (Trade Balance, Import Prices and FX) both had relatively small contributions to the level of inflation. Instead domestic forces (GDP, Real IR, Unemployment and Net Lending) have much greater impacts on Inflation. (Graph II)

Charts of G7 exports and imports, and EM exports and imports clearly displayed the rising importance of EM to world markets, and thus developed nations' loss of pricing power. Also, for the major developed economies, the gap between Imports and Exports (negative trade balance) has been steadily growing, mirrored by the growth in the positive trade balance for emerging markets. (Graph I)

For the second proposition, we looked at the average historical volatility of currencies by grouping; EM/EM indicating cross rates between 2 emerging markets (such as RUB/TRY), Dev/EM indicating cross rates between an emerging market and a major developed economy (such as EUR/RUB) and Dev/Dev indicating cross rates between 2 major developed economies (such as GBP/CHF). Here we found that EM/EM FX vols have been steadily decreasing, although they are still highly exposed to extreme events. On the other hand, developed market FX vols have been oscillating, without a long term up or down trend. (Graph III)

Based upon these findings we propose several trading strategies as below:

Proposition 1:

Strategy 1:

Fundamentals:

CPI vs IR Correlation to increase

Strategy Description:

Buy / sell option straddles

Instruments:

- Sell straddle on Index Linked Gilts
- Buy straddle on Inflation Swaptions
- Buy straddle on Gilts

Resulting Exposure:

Long CPI vs IR Correlation

Strategy Goal:

Capture the increasing correlation between IR and Inflation

Watch Trigger:

- Fundamental: BOE to focus on fighting inflation again
- Price Trigger: Standard method

Stop Loss:

- Fundamental: BOE to raise interest rates
- Price Stop-Loss: Standard method

The screenshot displays a trading strategy configuration interface with the following sections:

- Portfolio:** A table for instrument positions and exposures.

Instrument	Position	Rec Leg	Pay Leg	Rec Exposure			Pay Exposure			Net Exposure		
				CPI	IR	Credit Sp	CPI	IR	Credit Sp	CPI	IR	Credit Sp
Gilt	Buy	Fixed Rate			Short						Short	
Total Exposures				Neutral	Short	Neutral	Neutral	Neutral	Neutral	Neutral	Short	Neutral
- Strategy:** Configuration for 'Long Gilt Straddle'.
 - Option Type: Straddle
 - Option Flavour: Vanilla
 - Strike: ATM
 - Position: Buy
- Commands:** Add, Save, Delete, Print, Exit
- Basket Detail:** Summary for 'Long CPI / IR correlation' basket.

Basket Name	Portfolio												Strategy			Correlation			No of Baskets
	Underlying Exposure			Delta			Vega			CPI/IR			CPI/Crd Sp						
Number of Strategies in Basket	CPI	IR	Credit Sp	CPI	IR	Credit Sp	CPI	IR	Credit Sp	CPI/IR	CPI/Crd Sp	IR/Crd Sp	CPI	IR	Credit Sp	No of Baskets			
3	Long	Short	Neutral	Neutral	Neutral	Neutral	Short	Short	Neutral	Long	Neutral	Neutral	Neutral	Neutral	Neutral				
Short II Gilt Straddle	Long	Short	Neutral	Neutral	Neutral	Neutral	Short	Short	Neutral	Long	Neutral	Neutral	Neutral	Neutral	Neutral				
Long Inflation Swaption Straddle	Long	Neutral	Neutral	Neutral	Neutral	Neutral	Long	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral				
Long Gilt Straddle	Neutral	Short	Neutral	Neutral	Neutral	Neutral	Neutral	Long	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral				

Proposition 1:

Strategy 2:

Fundamentals:

Inflation volatility to increase

Strategy Description:

Buy option straddles

Instruments:

Buy straddle on Inflation Swaptions

Resulting Exposure:

Long CPI volatility

Strategy Goal:

Capture the increasing volatility of Inflation

Watch Trigger:

Fundamental: Unemployment to drop / GDP to rise

Price Trigger: Standard method

Stop Loss:

Fundamental: UK to avoid / come out of recession

Price Stop-Loss: Standard method

Portfolio

Instrument	Position	Rec Leg		Rec Exposure			Pay Exposure			Net Exposure		
		CPI	Fixed rate	CPI	IR	Credit Sp	CPI	IR	Credit Sp	CPI	IR	Credit Sp
Infl Zero Swap - fixed	Buy	CPI	Fixed rate	Long	Short			Long		Long	Neutral	
		Total Exposures			Long	Short	Neutral	Neutral	Long	Neutral	Neutral	
Notes												

Strategy

Strategy Name: Long Inflation Swaption Straddle Option Type: Straddle Option Flavour: Vanilla Strike: ATM Position: Buy	Greeks Delta: Neutral Neutral Neutral Vega: Long Neutral Neutral Gamma: <input type="text"/> <input type="text"/> <input type="text"/> Theta: <input type="text"/> <input type="text"/> <input type="text"/> Rho: <input type="text"/> <input type="text"/> <input type="text"/>	Correlation CPI: <input type="text"/> Neutral <input type="text"/> IR: <input type="text"/> <input type="text"/> Neutral Credit Sp: <input type="text"/> <input type="text"/> <input type="text"/>	Commands <input type="button" value="Add"/> <input type="button" value="Save"/> <input type="button" value="Delete"/> <input type="button" value="Print"/> <input type="button" value="Exit"/>
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Basket Detail	Portfolio	Strategy	Correlation	Baskets
Basket Name: Long Inflation Vol	Underlying Exposure	Delta	Vega	No of Baskets
Number of Strategies in Basket: 1	CPI IR Credit Sp CPI IR Credit Sp CPI IR Credit Sp CPI/IR CPI/Crd Sp IR/Crd Sp	CPI IR Credit Sp	CPI IR Credit Sp	<input type="text"/>
Strategy Name	Long Neutral Neutral Neutral Neutral Neutral Long Neutral Neutral Neutral Neutral Neutral	Long Neutral Neutral Neutral Neutral	Neutral Neutral Neutral	
Long Inflation Swaption Straddle	Long Neutral Neutral Neutral Neutral Neutral Long Neutral Neutral Neutral Neutral Neutral	Long Neutral Neutral Neutral Neutral	Neutral Neutral Neutral	

Proposition 1:

Strategy 3:

Fundamentals:

CPI vs Credit Spread Correlation to increase

Strategy Description:

Buy / sell option straddles

Instruments:

Sell straddle on basket of:

- Long Corporate bonds
- Short Gilt bonds
- Rec Inflation / Pay Fix zero swap

Buy straddle on basket of:

- Long Corporate bonds
- Short Gilt bonds

Buy straddle on Inflation Swaptions

Resulting Exposure:

Long CPI vs IR Correlation

Strategy Goal:

Capture the increasing correlation between Credit Spread and Inflation

Watch Trigger:

Fundamental: UK production growth to increase

Price Trigger: Standard method

Stop Loss:

Fundamental: New asset bubble to form

Price Stop-Loss: Standard method

The screenshot displays a financial strategy management interface with three main sections:

- Portfolio:** A table with columns for Instrument, Position, Rec Leg, Pay Leg, Rec Exposure (CPI, IR, Credit Sp), Pay Exposure (CPI, IR, Credit Sp), and Net Exposure (CPI, IR, Credit Sp). It includes a 'Total Exposures' section and a 'Notes' field.
- Strategy:** A form for defining a strategy named 'Long Inflation Swap Straddle'. It includes fields for Option Type (Straddle), Option Flavour (Vanilla), Strike (ATM), and Position (Buy). It also features a 'Greeks' table (Delta, Vega, Gamma, Theta, Rho) and a 'Correlation' table for CPI, IR, and Credit Sp. A 'Commands' panel on the right includes buttons for Add, Save, Delete, Print, and Exit.
- Basket Detail:** A table showing the composition of a basket named 'Long CPI / Cred Spd Correlation'. It lists 3 strategies and their respective exposures across various risk factors (CPI, IR, Credit Sp, etc.).

Proposition 2:

Strategy 1:

Fundamentals:

EM FX volatility of volatility (ξ) to increase.

Strategy Description:

Buy / sell option straddles

Instruments:

Sell ATM vanilla straddles on EM/EM FX volatilities

Buy ATM compound straddles on EM/EM FX volatilities

Resulting Exposure:

Long EM FX volatility of volatility (ξ)

Strategy Goal:

Capture the increasing volatility of volatility in current market, without being directionally exposed to volatility

Watch Trigger:

Fundamental: Capital flows to EM to resume directional growth.

Price Trigger: Standard method

Stop Loss:

Fundamental: World to emerge from global recession.

Price Stop-Loss: Standard method

Portfolio 1					
Underlying	Instrument	Position	Delta	Vega	Eta
EM/EM Fx Rate	Vanilla Call	Short	Short	Short	Neutral
EM/EM Fx Rate	Vanilla Put	Short	Long	Short	Neutral
Net Exposure	Vanilla Straddle	Short	Neutral	Short	Neutral
Portfolio 2					
Underlying	Instrument	Position	Delta	Vega	Eta
EM/EM Fx Rate	Call on Call	Long	Long	Long	Long
EM/EM Fx Rate	Put on Call	Long	Short	Long	Long
EM/EM Fx Rate	Call on Put	Long	Short	Long	Long
EM/EM Fx Rate	Put on Put	Long	Long	Long	Long
Net Exposure	Vanilla Straddle	Long	Neutral	Long	Long
			Delta	Vega	Eta
Total Exposure			Neutral	Neutral	Long