The Foreign Exchange Market and the Growing Role Of Quantitative Analysis

Stacy Williams

22nd September 2004

HSBC

The Forex market

- **The Forex market is where all buying and selling of world currencies takes place. The product is very simple, but the forces determining prices are highly complex**

- **Market liberalisation (the reduction or elimination of exchange and capital controls) has seen large increases in volume**

- **The market consists of a diffuse world-wide network of bank dealers making markets increasingly via electronic broking systems**

The Market

- **Characteristics**
  - **24-hour trading, 5 days a week (about 9pm London Sunday to 10pm London Friday)**
  - **An extremely liquid market**
  - **Highly developed instruments for controlling risk exposure (forwards, options, futures)**
  - **Tight spreads and zero dealing commission**

The Market

- **Market Turnover**

– **Trade volume in the Forex market is around $1.2 trillion per day. This compares with to the New York Stock Exchange which trades 'only' $25 billion per day**

Global foreign exchange market turnover[1]

Daily averages in April, in billions of US dollars

	1989	1992	1995	1998[2]	2001
Spot transactions	317	394	494	568	387
Outright forwards	27	58	97	128	131
Foreign exchange swaps	190	324	546	734	656
Estimated gaps in reporting	56	44	53	60	26
Total "traditional" turnover	590	820	1,190	1,490	1,200
Memo: Turnover at April 2001 exchange rates[3]	*570*	*750*	*990*	*1,400*	*1,200*

[1] Adjusted for local and cross-border double-counting. [2] Revised since the previous survey. [3] Non-US dollar legs of foreign currency transactions were converted from current US dollar amounts into original currency amounts at average exchange rates for April of each survey year and then reconverted into US dollar amounts at average April 2001 exchange rates.

Table B.1

The Currencies

- **Currency pairs-**

– **Foreign exchange is always traded as one currency in relation to another**

– **These are the most traded currency pairs:**

Currency Pair	Symbol	Terminology	Involvement as proportion of total trade
Euro / US Dollar	EUR-USD	“Euro”	30%
US Dollar / Japanese Yen	USD-JPY	“Dollar Yen”	20%
Pound sterling / US Dollar	GBP-USD	“Cable”	11%
Other pairs	-	-	39%

The Places

- **Geographical distribution of market turnover**

Currency	Share of total trade
United Kingdom	31.1%
United States	15.7%
Japan	9.1%
Singapore	6.2%
Germany	5.4%
Switzerland	4.4%
Hong Kong	4.1%
Other	24.0%

The Players

- Banks (both as market makers and end users)
  - Investment banks
  - Commercial banks
- Hedge funds
- Institutions (asset managers, pension funds)
- Central Banks (reserve management and own currency intervention)
- Corporations (mostly defensive hedging of exposures)
- Private investors/speculators/tourists

Pricing

- **The FX market is the closest real world approximation to the economists' fiction of a 'perfectly competitive' market**
  - **Many buyers and sellers**
  - **no participant can influence the price on a persistent basis - all are 'price takers'**
  - **perfect information**
- **How is the price set?**
  - **Dealers give a two way price acting as principal**
  - **They then manage the risk associated with being given or lifted**
  - **Flows pass round the market until a new end user is found, at the same or a different price**

EBS prices


EBS Rates
Properties
Bloomberg
EUR/USD 1.23 50 51 1.23 53
1.2325 1.2330 1.2358 1.2358
9:29 1.2351 1.2351 9:29
USD/JPY 109. 56 57 109. 58
109.32 109.33 109.62 109.63
9:28 109.57 109.57 9:28
EUR/JPY 135. 32 33 135. 35
134.90 134.90 135.33 135.33
9:28 135.30 135.31 9:28
USD/CHF 1.24 36 38 1.24 39
1.2428 1.2428 1.2455 1.2458
9:28 1.2438 1.2445 9:26
EUR/CHF 1.53 61 62 1.53 64
1.5353 1.5353 1.5372 1.5372
9:28 1.5361 1.5362 9:27
GBP/USD 1.82 20 27 1.82 28
1.8206 1.8212 1.8249 1.8251
9:13 1.8206 1.8223 9:29
EUR/GBP 0.67 75 0 79 5 0.67 800
0.67670 0.67720 0.67765 0.67840
9:25 0.67760 0.67765 9:24
USD/HKD 7.79 92 97 7.79 98
7.7997 10:35

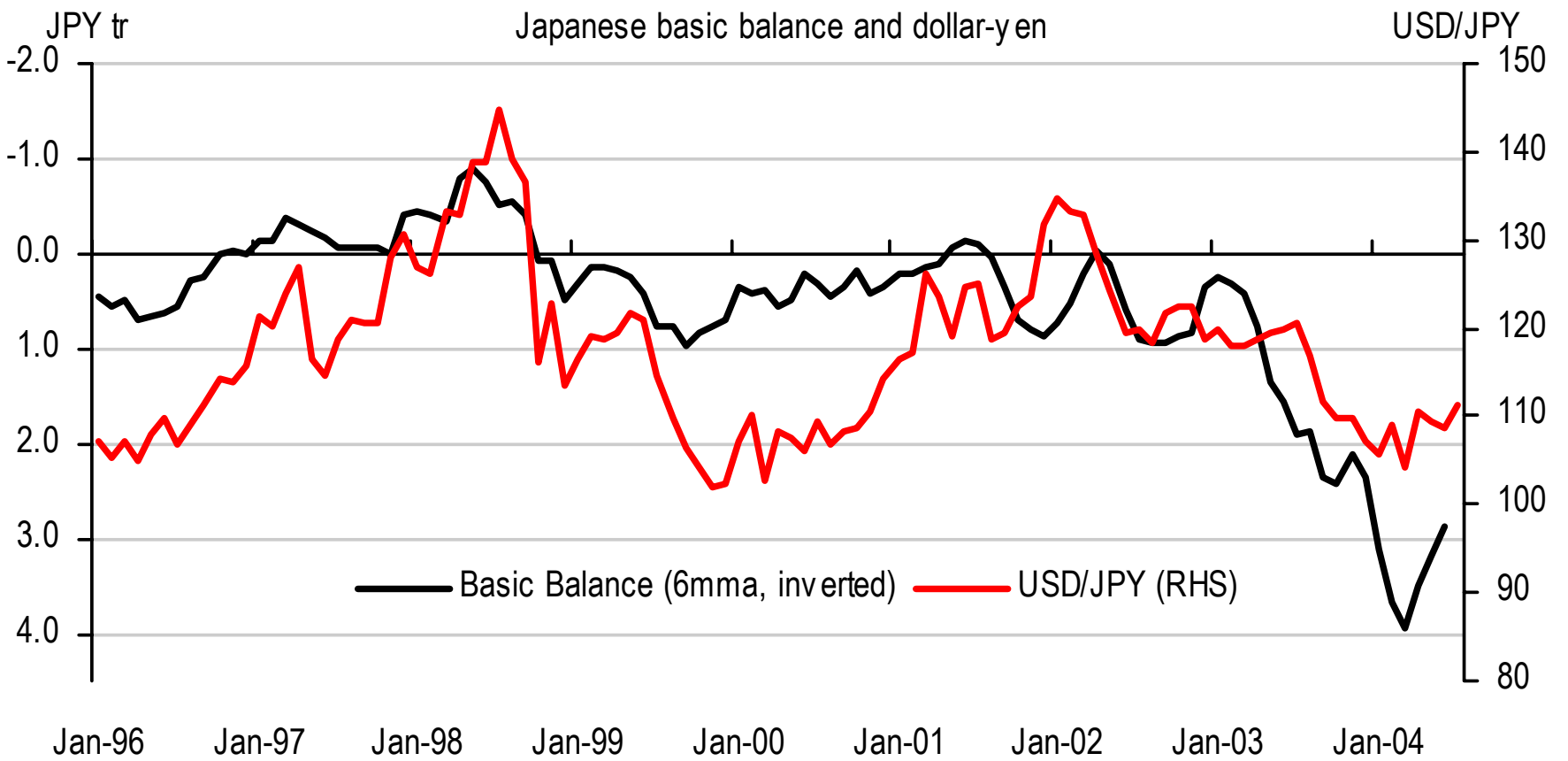
Market share - Euromoney survey

04	03	Bank	Score
1	1	UBS	12.36%
2	3	Deutsche Bank	12.18%
3	2	Citigroup	9.37%
4	4	JPMorgan	5.78%
5	7	**HSBC**	4.89%
6	5	Goldman Sachs	4.54%
7	9	Barclays Capital	4.08%
8	6	CSFB/Credit Suisse Group	3.79%
9	12	RBS	3.51%
10	11	Merrill Lynch	3.49%
11	10	ABN Amro	3.19%
12	15	Dresdner Kleinwort Wasserstein	2.92%
13	8	Morgan Stanley	2.92%
14	18	Lehman Brothers	2.09%
15	14	Bank of America	2.09%
16	16	State Street Bank & Trust	1.86%
17	17	Royal Bank of Canada	1.49%
18	13	BNP Paribas	1.43%
19	19	SEB	1.22%
20	23	Société Générale	1.16%

What does research aim to do?

- **Analysis and forecasting of the FX market that adds value for the bank's customers and traders**
- **The basic question is 'what happens next?'**
- **How can we attempt this?**
  - **Fundamental analysis: macroeconomic and policy analysis**
  - **Technical analysis: analysis of price history**
  - **Quantitative analysis: systematic analysis of relevant data sets**

Example: Fundamental analysis



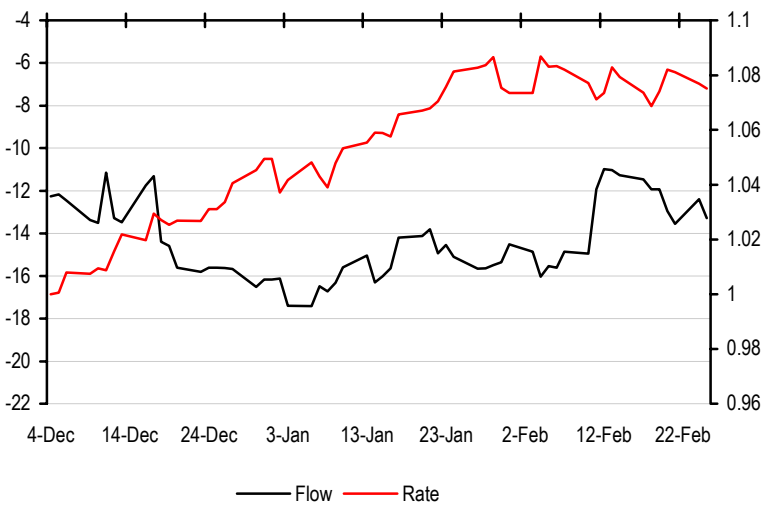
Example: technical analysis

Quantitative analysis

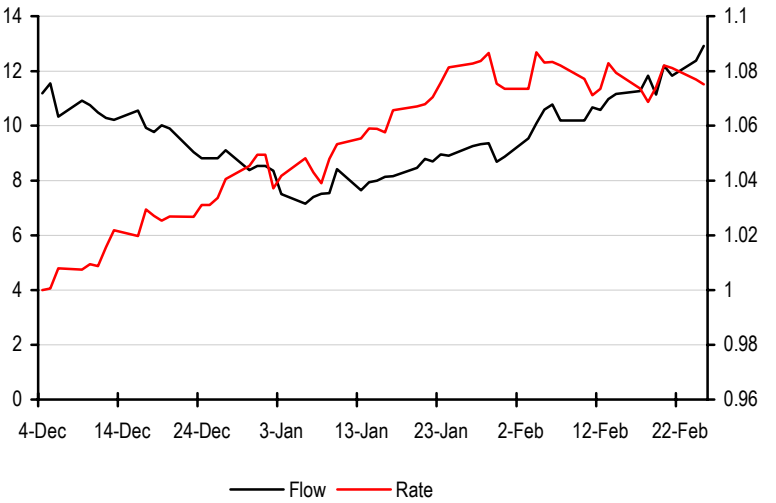
- **FX Flow**
  - **Analysis of proprietary FX transactional data**
  - **Development of a trading model**
- **Economic surprise**
  - **Measurement of the ‘news’ component of macro economic announcements**
  - **Identification of market moving data releases**
- **Currency trees**
  - **Mapping the complex relationships between currency markets**
  - **Identification of changes**

Flow analysis - who's doing what ?

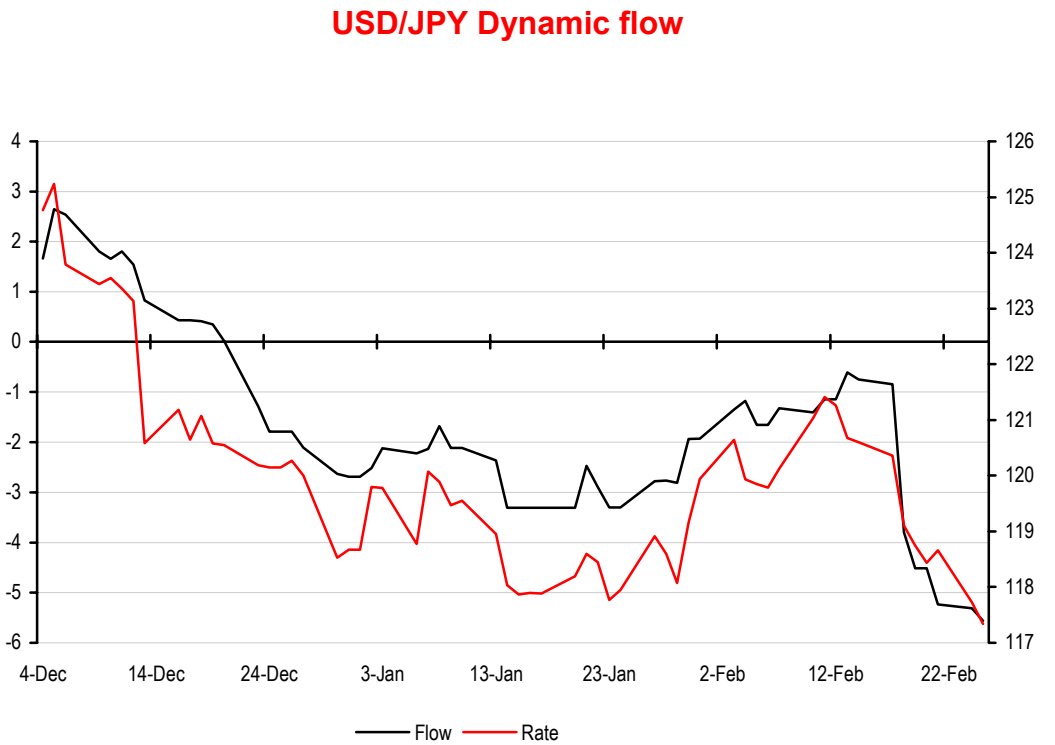
Global Real Money EUR/USD Flow



European Corporate EUR/USD Flow



Which flow to watch - Dynamic Flow



Time structure is evident

- Dynamic flow linearly related to price moves
- Looks like 5/10 days is characteristic of the time structure
- Future price moves are relate to recent flow - (ARMA, lag regression)
- Also looking at GAs
- .....so you can build a trading model

- It needs a lot of infrastructure

Economic surprise

- **Wide range of economic and survey data is published for the major economies most weeks**
- **These data releases clearly have market impact and participants monitor them avidly**
- **Numbers are generally assessed in a relatively ad hoc way - which is individually and immediately**
- **Why not do it systematically**

It’s all in the surprise

- **The absolute level of a number may be most relevant for the economy as a whole - payrolls positive or negative ?**
- **... but markets have already priced in expectations**
- **In the market we care about how far from consensus the release is - the ‘surprise' element**
- **It’s this surprise element which can now systematically monitor**

Economic Data Releases

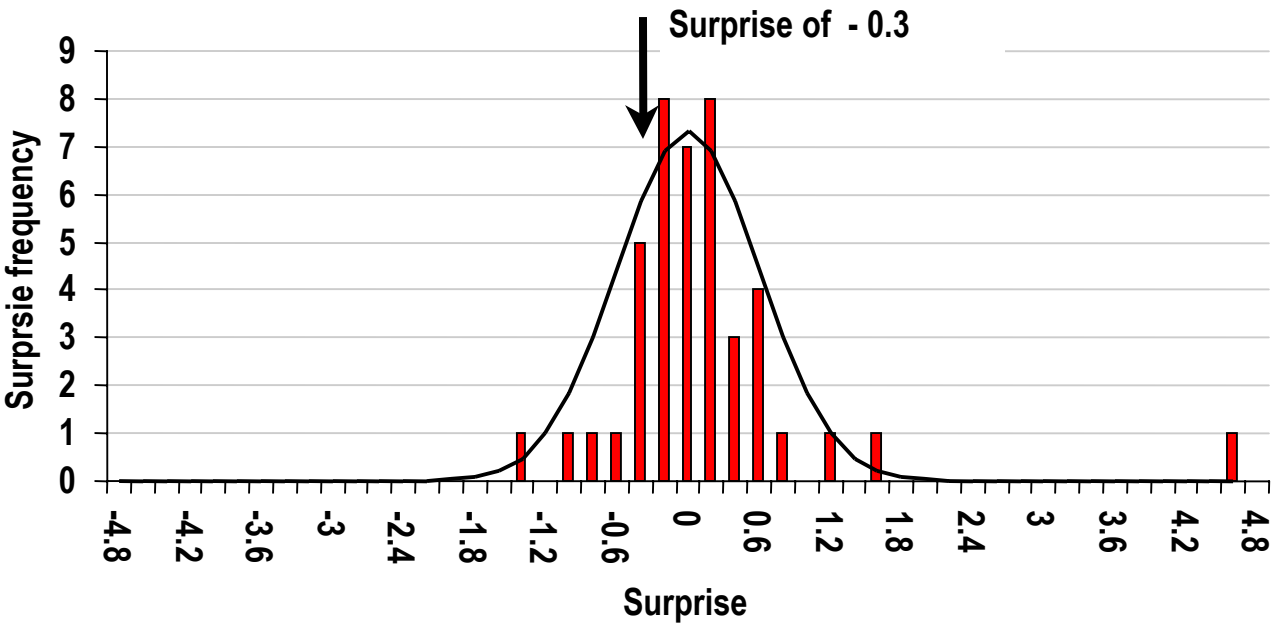
Release
Average Hourly Earnings
Average Weekly Hours
Chicago PMI
Construction Spending
Consumer Confidence
Consumer Credit
CPI
CPI ex. Food & Energy
Durable Goods Order Less Transportation
Durable Goods Orders
Employment Cost Index
Existing Home Sales
GDP Price Deflator
Housing Starts
Import Price Index
Industrial Productions
Initial Jobless Claims
ISM Manufacturing
ISM Non-manufacturing
ISM Prices Paid
New Home Sales
Nonfarm Payrolls
Nonfarm Productivity
Personal Income
Personal Spending
Philadelphia Fed
PPI ex. Food & Energy
Preliminary GDP
Retail Sales Less Autos
Trade Balance
Unemployment Rate

Example - US Advance Retail Sales

- US Advance Retail sales is released monthly
- First release this year - 15th January
- Median BN survey forecast was 0.8
- Actual release was 0.5
- Surprise is - 0.3

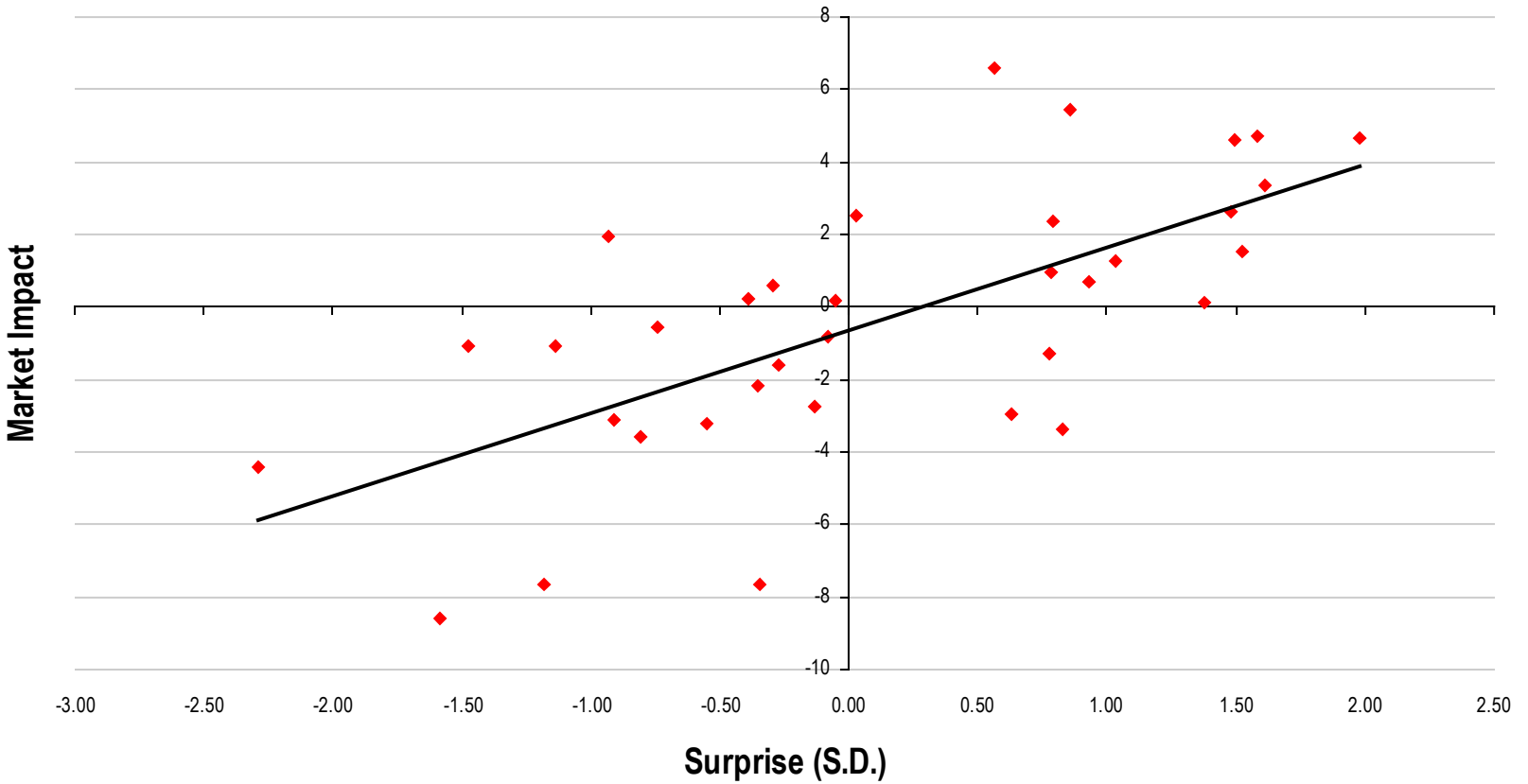
- How surprising is that ?

How surprising ?

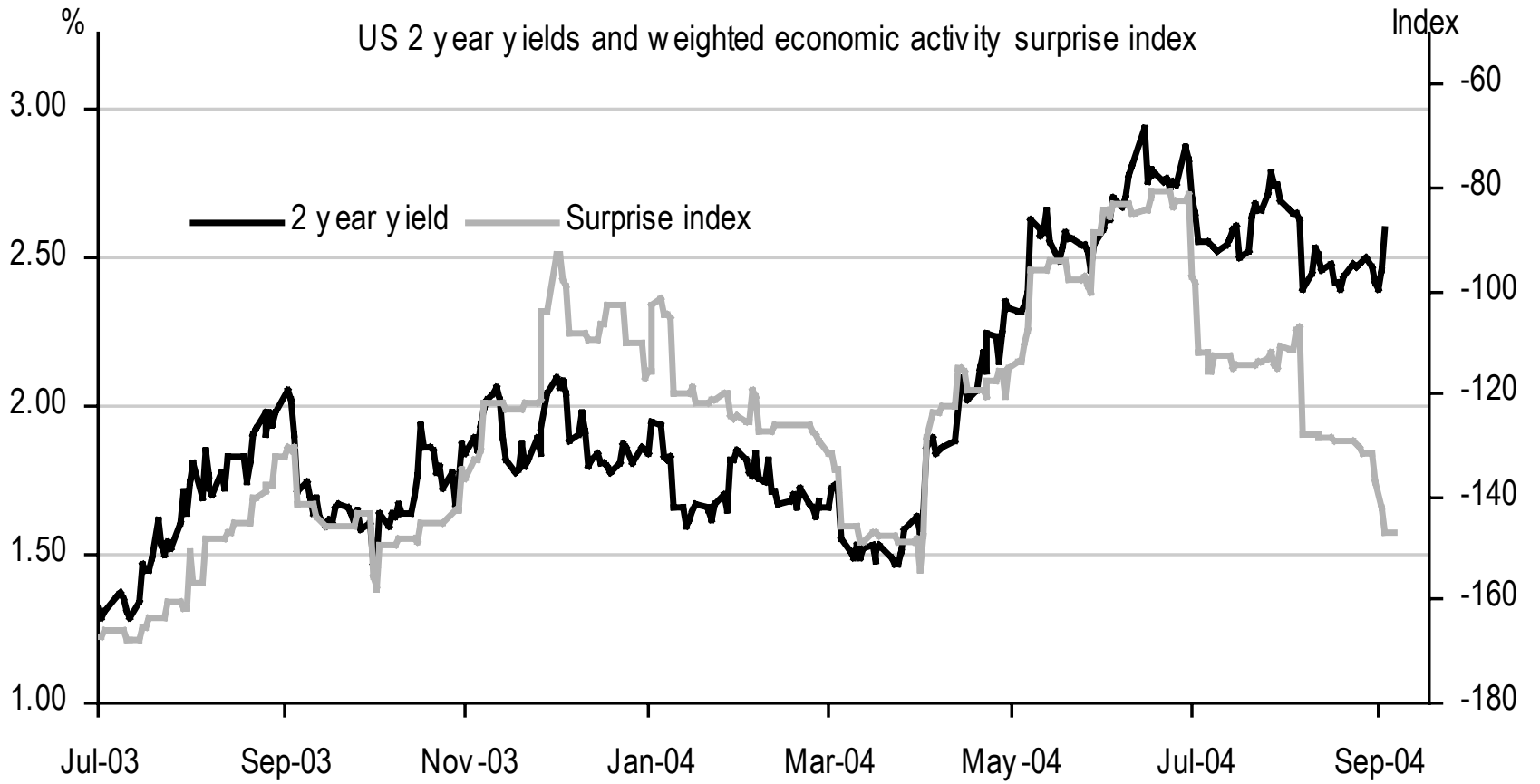


- This is a surprise of - 0.4 SD
- Can now measure the market impact of the surprise

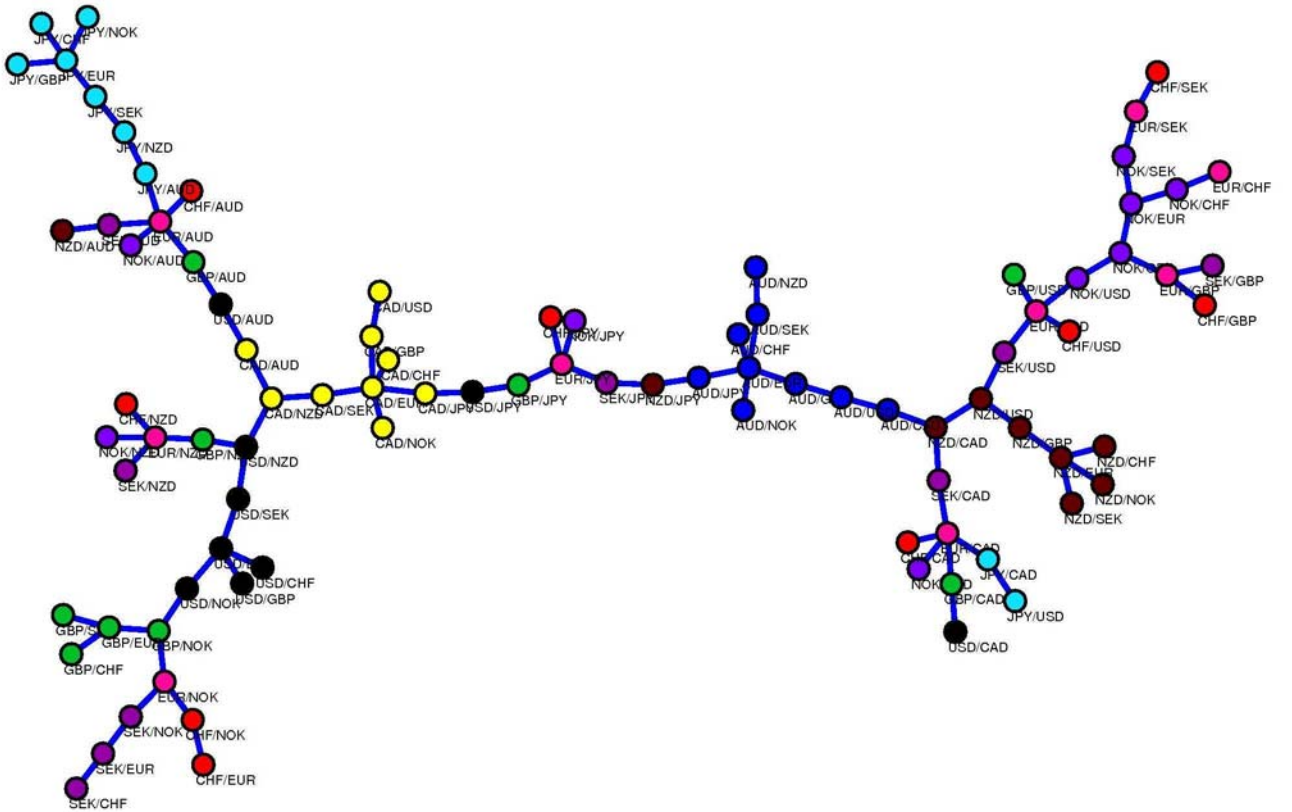
Example: Chicago PMI



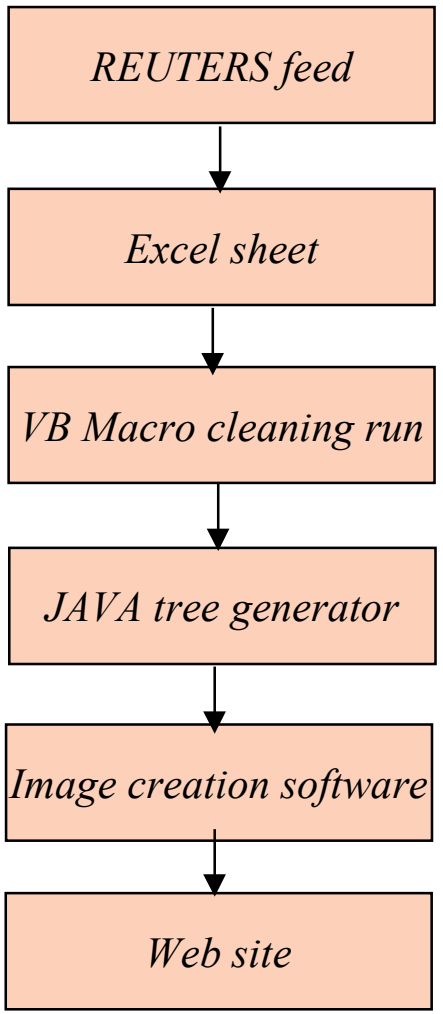
Economic Surprise Indices



Currency trees



Importance of technology



And finally

- Quantitative analysis is being used by FX banks to differentiate themselves in a fiercely competitive market - Euromoney
- FX is amenable to this since it is a simple, highly active market with plenty of data
- Requires a mix of quant skills, market knowledge and significant technology to make it work
- Academic collaborations feed in exciting new ideas to investigate and bring to the market