**The following presentation was given at:**

# Joint Workshop
# "Affordability, Value for Money and Decision Making"

*Tuesday 18th November 2014*

*BAWA, Filton, Bristol*

# Factoring in the “Cost” factors that are least Controllable

## Treatment of “Costs” in Analysis

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# Agenda

- What is meant by “Costs”
- How are “Costs” used?
- What needs to be made more consistent

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# "What are Costs"?

- A "cost" always requires a definition or a boundary condition, its meaning depends on:
  - Is it a 'Price' including profit and taxes?
  - Whether money is involved in a transaction
  - If money changes hands what else happens?:
    - *Treasury Guide To Economic Appraisal*
    - *JSP507*
    - *National/ International Stuff*
      - Legislation regarding Taxes & Duties
      - National Agreements or Treaties between Countries (import/ export duties)
      - International Legislation relating to Duties, Taxes or other Trade Agreements between Nations
- Of course just because someone buys an item at a 'Price' that may not be the end of the story……..

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# “Cost Definition” 1

- For this presentation “Cost” is defined as a ‘market value’ including all charges with the exception of Value added Tax (VAT):
- VAT is excluded because it should not be used as a discriminator in any cost analysis
- This simple rule creates a major problem for analysts as recourse to catalogues, manufacturers brochures, internet sites and other publications may not reveal what has been included in the “Cost” of the System, Part or Service being investigated
- Such source documentation is notoriously unreliable. VAT at 20% is a value which could skew analysis results if not treated evenly across a dataset

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# “Cost Definition” 2 Data considerations

- Data that must be considered when collecting cost information for inclusion in any analysis where ‘Cost’ is one of the determinants are:
  - Currency used
  - VAT inclusive or not
  - Quantity to which the cost refers
  - Other factors that may be hidden but within the stated cost (warranty, training, spares, services etc)
  - Whether it is an actual ‘selling price’ or a quotation
  - What Date the cost is referred to:
    - *Single date point or*
    - *Average cost over a two year production period (for example)*

 

# “Cost Definition” 3

- We are all Analysts – we know what was in the previous slides, there is nothing new in what I have said…….

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# NORMALISATION OF DATA

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# Why is Normalisation needed?

- All cost data relevant to the analysis should ideally be:
  - In the same Currency & at the same Economic datepoint (past, present or future)
    - *Appropriate Exchange Rates, Indices or acceptance that generic indices can be used as a common treatment for all data*
  - Exclusive of VAT
  - Adjusted to reflect the same quantity, this could be '1 off' or '100 off' as long as the adjustment method (Learner Curves) is clearly described
  - Capable of use as a 'near neighbour'
    - *May require adjustment for weight, payload, range, power output etc to obtain something like the new requirement*
    - *For non-unit costs, non-cost data relating to design methods, performance simulation, software functionality or technology generation may need to be in the dataset to allow adjustment*

***The first bullet seems easy but……..***

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# CONVERSION BETWEEN CURRENCIES

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# Origins of Purchasing Power Parity (PPP)

- **16th Century Spain – University of Salamanca**
  - **Conceptually the School of Salamanca proposed the idea that the same item will have the same price if there are no trade barriers and no transaction costs – this became 'the law of one price', now known as PPP**
- **Today PPP uses a common unit of Currency called the Keary-Khamis dollar or International dollar (USA)**
  - **Depends on finding a price for the same basket of goods in every Country, differences in parity are then explained by:**
    - ***Exchange Rates***
    - ***Differences in GDP***
    - ***Local Inflation Rates***
    - ***Other market issues eg taxes or 'consumption'***
- **The OECD regularly publishes PPP factor information for a range of currencies**

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# Law of One Price

- PPPs and the '**law of one price**' are not the same, there is a difference
  - The law of one price applies to individual commodities
  - Whereas PPP applies to the general price level
- If the law of one price is true for all commodities then PPP is also therefore true; however, when discussing the validity of PPP, some argue that the law of one price does not need to be exactly true for PPP to be valid
- PPP theory states that the exchange rate between one currency and another currency is in equilibrium when their domestic purchasing powers at that rate of exchange are equivalent

 

# Exchange Rates & PPP

- The Exchange Rate reflects transaction values for traded goods ***between*** Countries in contrast to non-traded goods, that is, goods produced for home-country use
- Currencies are traded for other purposes, *e.g.* to buy Capital Assets whose prices vary more than those of physical goods
- Different interest rates, speculation, hedging or interventions by central banks can influence the foreign exchange market
- The PPP method helps avoid possible statistical systematic bias when using Exchange Rates to convert outputs among Countries
  - For example, if incomes and prices measured in a Country currency stay the same, they will be no worse off assuming that imported goods are not essential to the quality of life of individuals
  - Measuring income in different Countries using PPP Exchange Rates helps to avoid this problem

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# Why is PPP preferred?

- The PPP Exchange Rate serves two main functions
  - Useful for making comparisons between Countries because they stay fairly constant from day to day or week to week and only change modestly, if at all, from year to year
  - Exchange Rates tend to move in the general direction of the PPP Exchange Rate and there is some value to knowing in which direction the Exchange Rate is more likely to move in the longer term
- PPP rates facilitate international comparisons of income because market exchange rates are often volatile, being affected by political and financial factors that do not lead to immediate changes in income and tend to systematically understate the standard of living in poor countries

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# Data Normalisation - Costs

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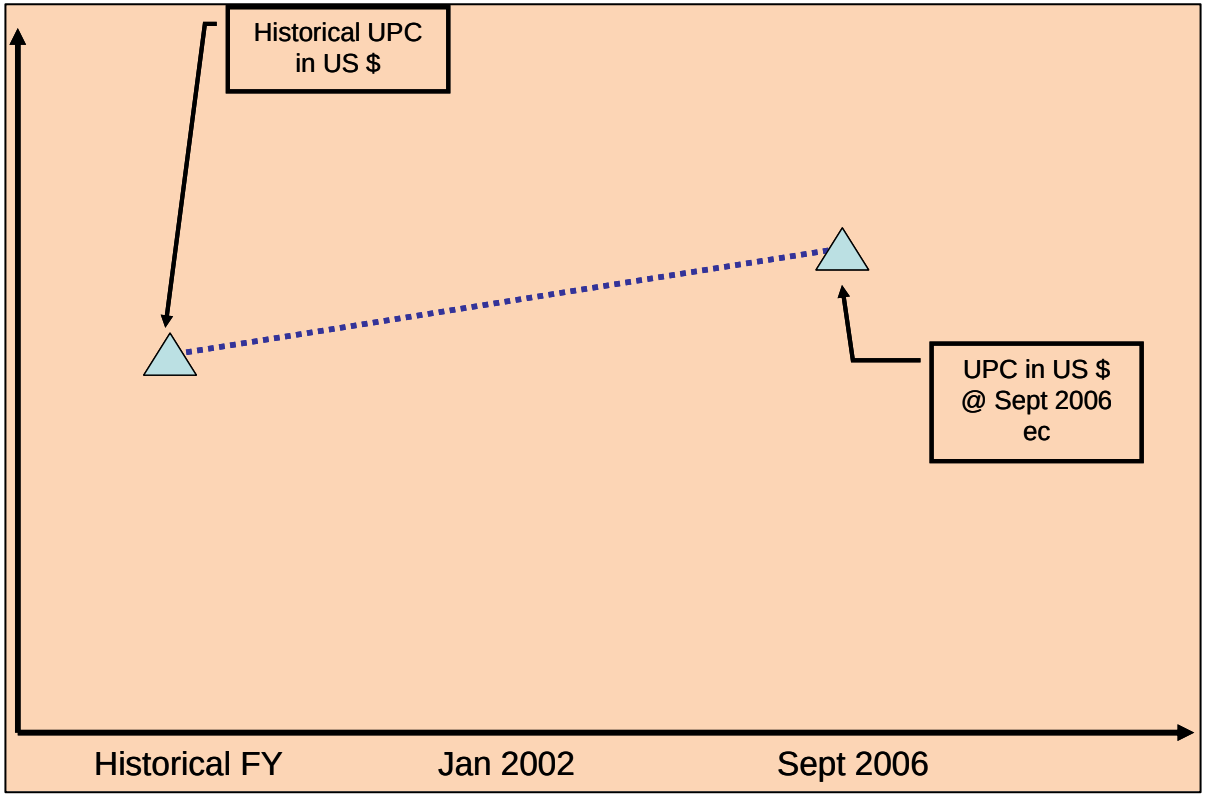
# Data Normalisation - Timeline

- If we have a data item that is not at the right date then it must be **moved in time** to obtain a model input and subsequently to enable movement of other model outputs onto a **different timeline**
- The way in which this is performed may depend on whether the costs are in the **same currency** or not

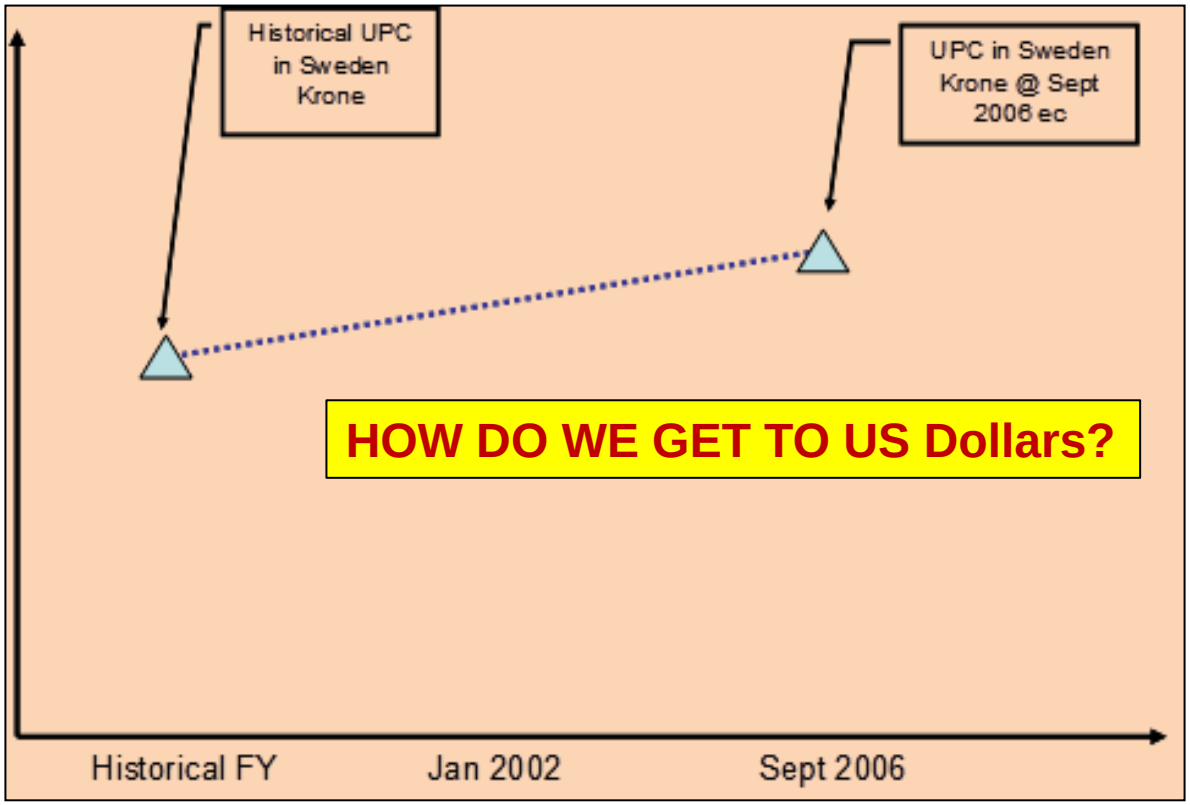
**A simple 'in 1 currency' conversion just requires the RIGHT Escalation (or Index) Table & roll forward or backward calculation to obtain cost at the required new date**



# Data Normalisation - Timeline

- What usually happens when data is collected in one currency but is needed in another?
- Take a European data example where data item costs are required in US Dollars

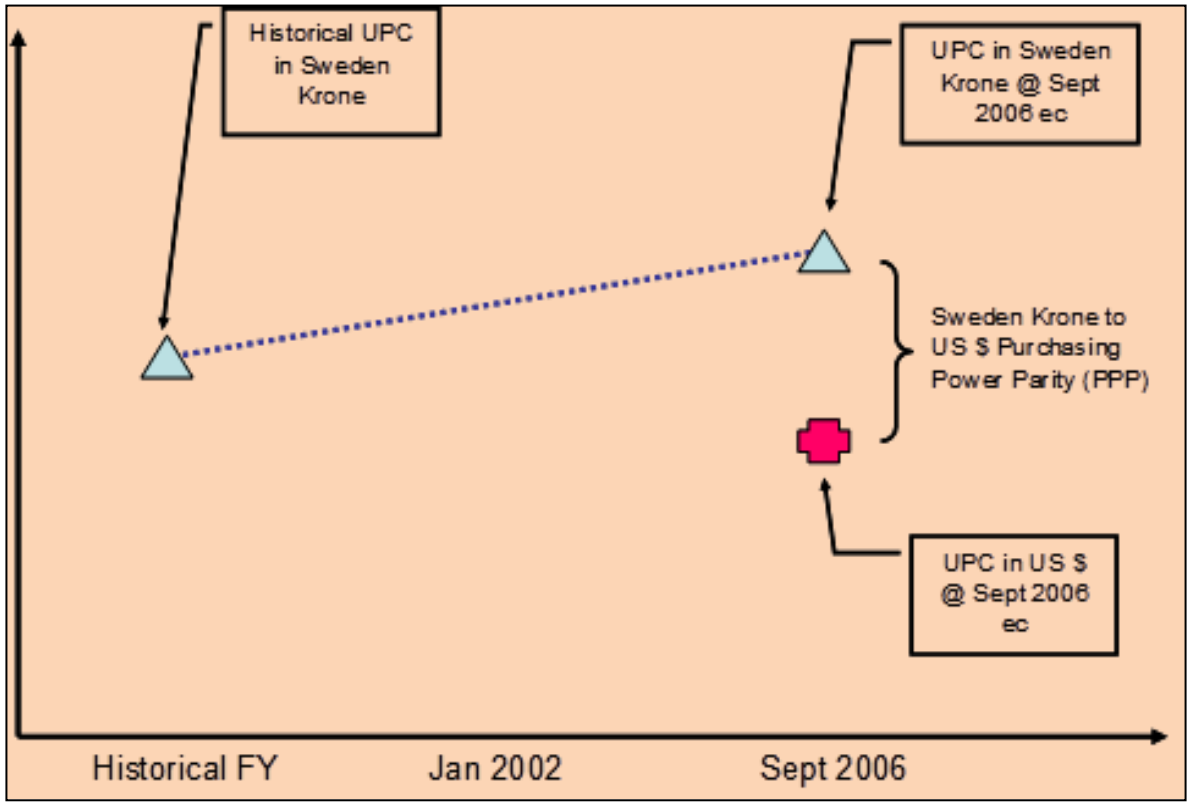
**Roll forward 'in 1 currency' as before, now what??**



# Data Normalisation - Cost

- What usually happens where the data is collected in one currency but is needed in another?
- Take a European example where data item costs are required in US Dollars

**A currency conversion requires the RIGHT Country & Escalation (or Index) Table AND The right PPP Factor for Krone to US$ costs at the reporting date**



# Poor comparisons?

- To compare a price for a common item or basket of goods in different Countries there are two methods often used:
  - By converting the price(s) into a common currency using currency exchange rates, or
  - By converting using the PPP factors
- As an example (from Wikipedia)
  - GDP per Capita in India
    - *converted via nominal exchange rates is approximately US $1,704 but*
    - *converted via PPP is approximately US$3,608*
  - GDP per Capita in Denmark
    - *via exchange rates is approximately US $62,100*
    - *but via PPP US $37,304*
- Both examples have marked differences, the conclusion is that simple cost conversion using only exchange rates will introduce errors into an estimate

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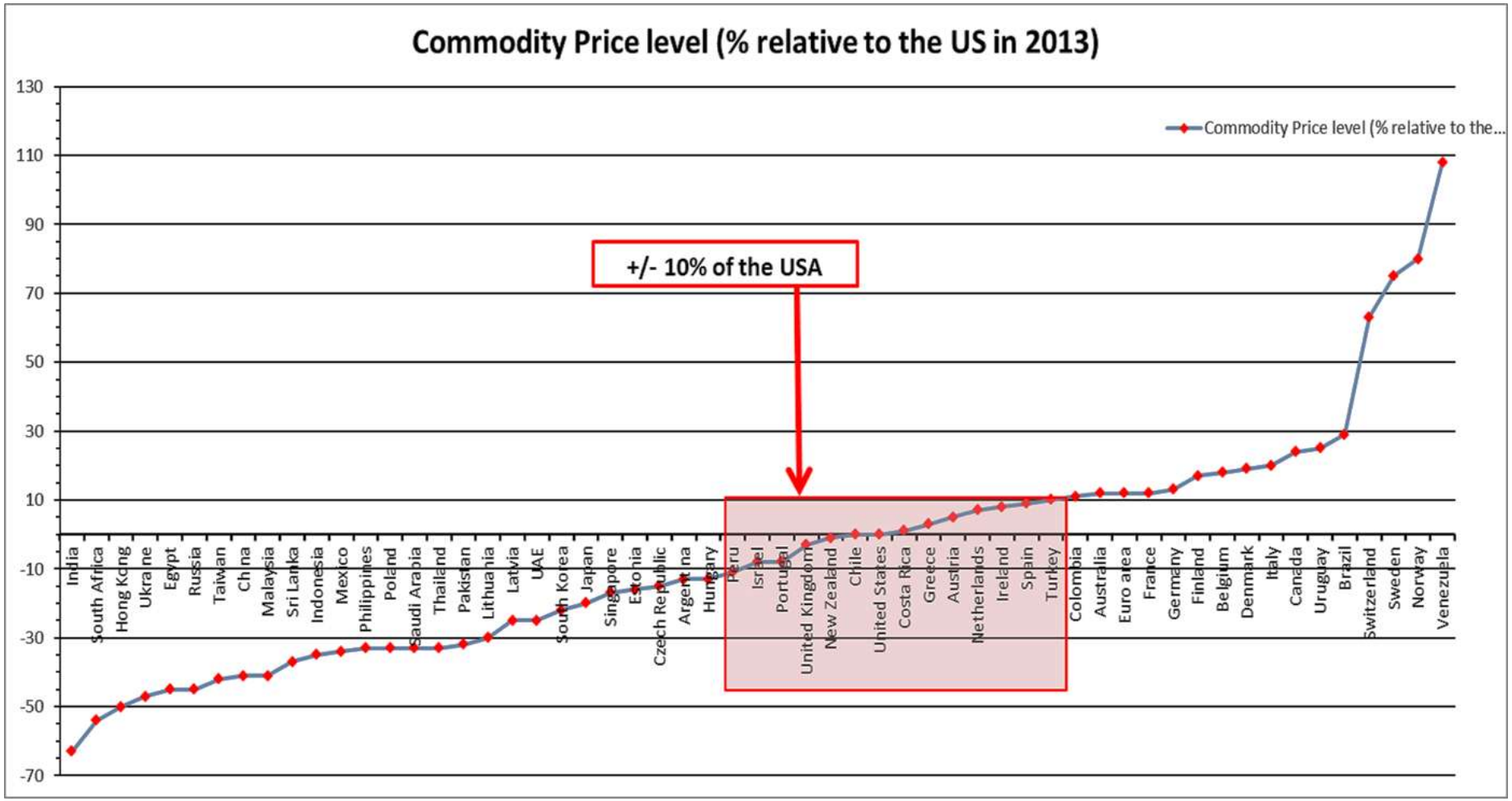
# PPP Measures – Big Mac

- An example of one measure of the law of one price, which underlies PPP, is the Big Mac Index, which compares the prices of a Big Macburger in McDonalds restaurants in different countries. See Slide 20
- The Big Mac Index is useful because although it is based on a single consumer product that may not be typical, it is a relatively standardised product that includes input costs from a wide range of sectors in the local economy, such as
  - Agricultural commodities (beef, bread, lettuce, cheese)
  - Labour (blue and white collar)
  - Advertising
  - Rent and real estate costs
  - Transportation, etc.

# Big Mac Index - PPP & Exchange Rate adjusted

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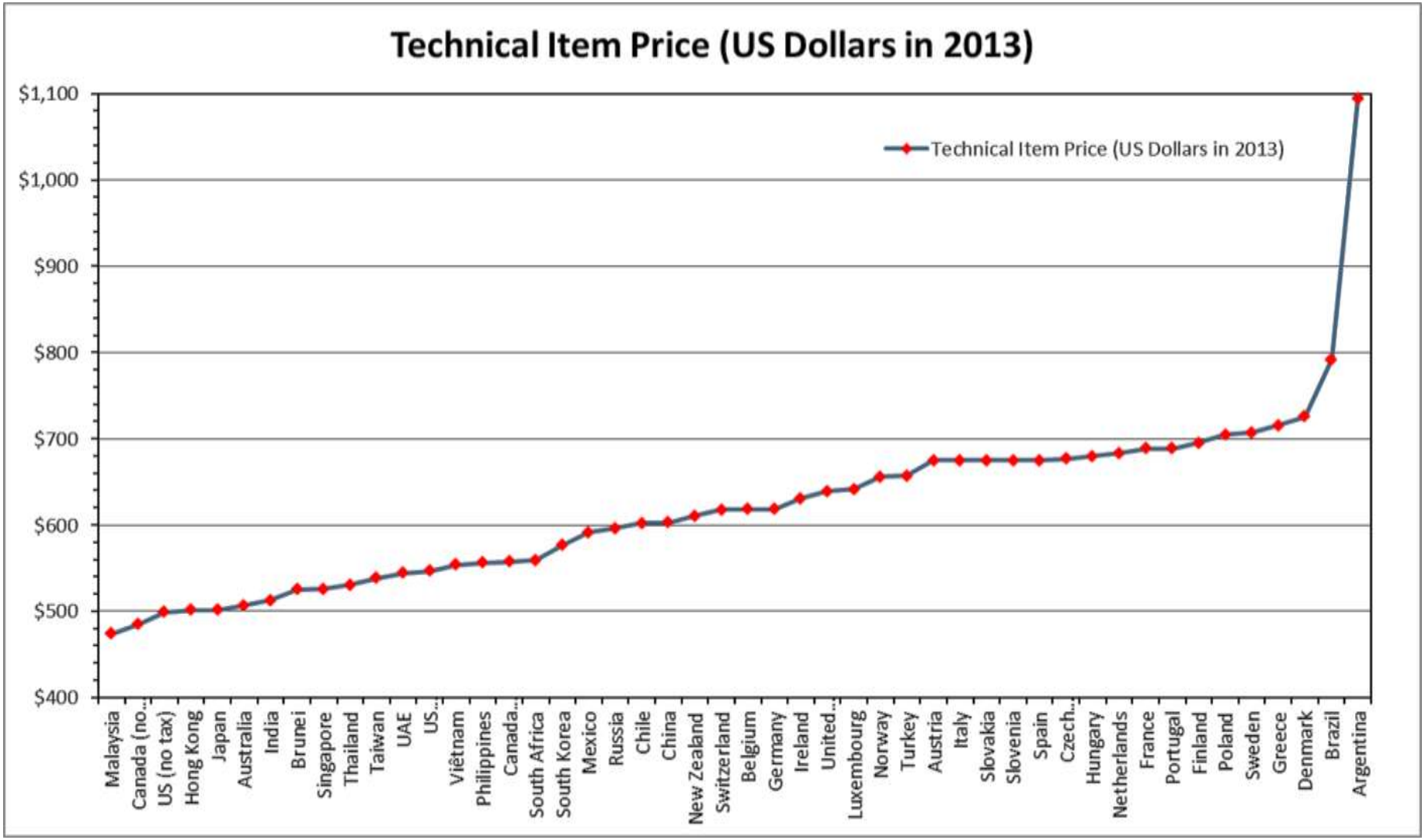
# PPP Measures i-Pad

- The i-Pad index (elaborated by ComSec – an Australian stockbroking firm) compares a reasonably complex consumer high volume electronic item's price in various locations
- Unlike the Big Mac index:
  - each i-Pad is produced in the same place and
  - all iPads (within the same model) have identical performance characteristics
- Price differences (Slide 22) are therefore a function of transportation costs, taxes, and to a lesser extent, the prices that might be realised in individual market locations

# I-PAD Index – PPP & Exchange Rate adjusted

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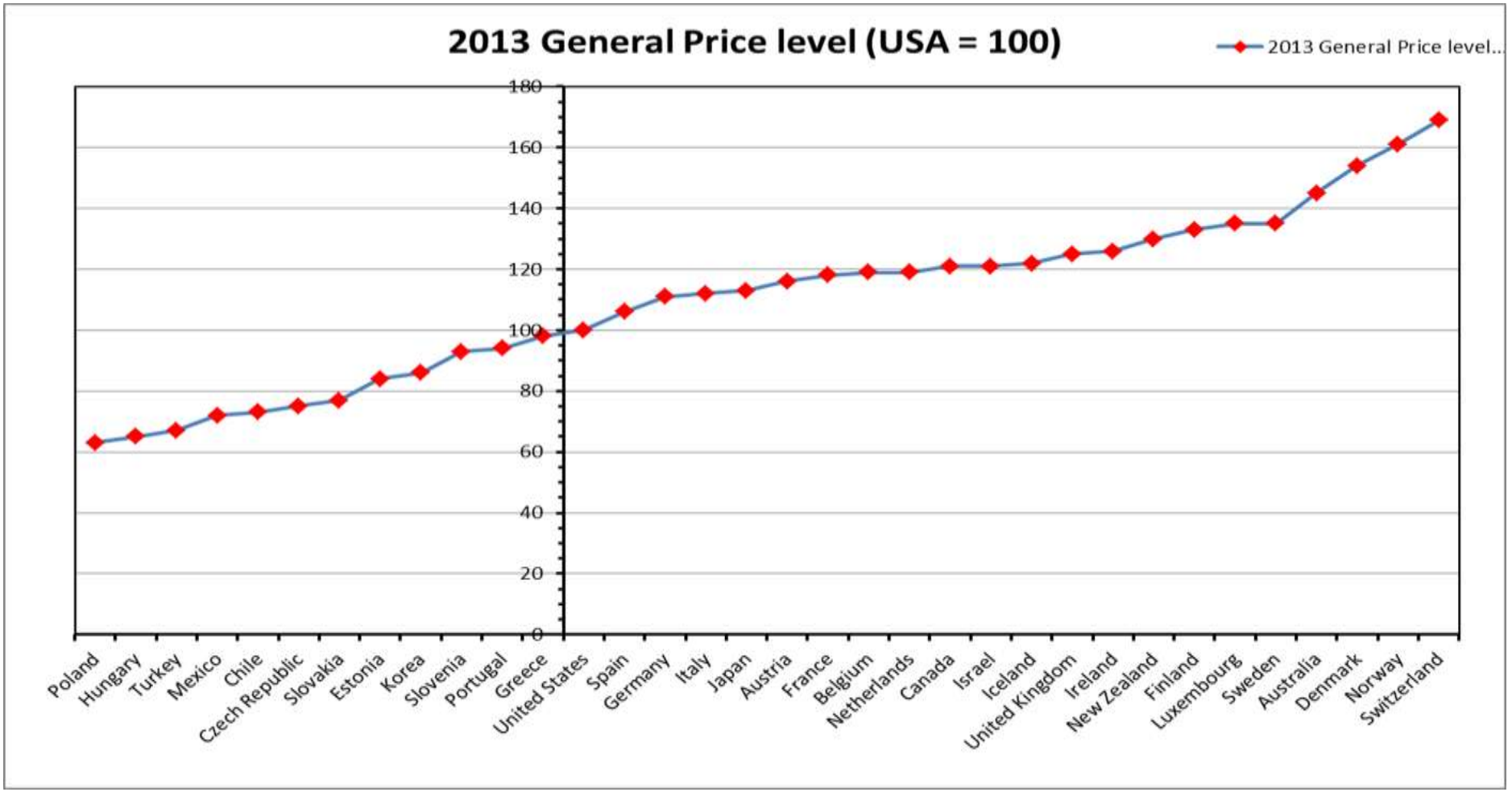
# Comparative Price levels

- The Organisation for Economic Co-operation and Development (OECD) measures monthly the difference in price levels between its member countries by calculating the ratios of PPPs for private final consumption expenditure to Exchange Rates
- The OECD graph at Slide 24 indicates the number of US dollars needed, as of January 2014, in each of the countries listed to buy the same representative basket of consumer goods and services that would cost 100 USD in the United States
- According to the graph, an American living or travelling with an income denominated in US dollars would:
  - find Switzerland (in January 2014) to be the most expensive of the group
  - and spend 69% more US dollars to maintain a standard of living comparable to the USA in terms of consumption

# General Price Comparisons PPP & Exchange Rate adjusted

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# Cost Modelling

- Simple cost models can be built to use:
  - Escalation Tables
  - Exchange Rates
  - PPP Factors
- Complex Excel models can be built covering many cost items in different currencies, placed on different timelines and having variable service lives but suffer from:
  - Increased levels of complexity to enable calculation of changes needed across currencies and time
  - Management & Use of conversion Tables and embedded data
  - Validation & Verification of the cost manipulations
- Why bother with this additional complexity and effort when other methods exist that require only the technical parameters to be determined and appropriate Economic and Country data to be simply selected?

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# The Messages to take away….

- Defence related programmes of work are influenced by macro–economic factors that Government departments cannot control
- Macro factors are often subject to external perturbations that are outside the control of a single Nation or even a group of co-operating nations such as the EEC
- In Cost Estimating these uncontrollables are inescapable because of the use of Escalation or PPP Factor Tables
- Failure to use these Tables correctly may introduce significant errors in cost prediction
- The Analyst's role must include choice of the right model to ensure consistent normalisation of data and/ or adjusting of data to report "Costs" whether in Option down selection or Decision Making processes

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# QUESTIONS?

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