Lecture 11

- Index Numbers
- Laspeyres, Paasche & Fischer Indices
- Useful Irish Applications of Indices

Not covered in textbook – will provide readings where necessary.

Index Numbers

- A price index is a single figure that shows how a whole set of prices have changed.
- For example, if we are asked what has happened to prices over the last twelve months, it is far simpler to reply that the overall price index has risen by 5%, rather than that the price of eggs is up 20%, the price of TV's is down 10% and so on.

Another example

- If we wish to compare the quantity or output of industrial goods in the UK and Ireland, it is convenient to state that the industrial output index of Ireland is 8% that of the UK, rather than state that Ireland produces, 9% of the UK output of machines, 2% of the UK output of aircraft parts, and so on.

Hypothetical Basket of Goods

Table One

	Given Prices		Ratio	Price Relative
	2005	2010	Pt	Pt x (100)
Item	Po	Pt	Po	Po
Steak (per pound)	2.20	3.00	1.36	136
Pepper (per ounce)	2.00	2.00	1.00	100
Bread (per pound)	0.50	0.60	1.20	120

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Price Relatives

- Develop a price index from above data, steak, pepper and bread - at prices initially denoted by Po and t years later by Pt. Steak has increased by the factor 3.00/2.20 = 1.36 (multiplied by 100 to get rid of the decimal point).
- Price relative P_t/P_o x 100
- Summarise with a single number, average….

  Simple average = $\frac{136 + 100 + 120}{3} = 119$
- Problem with a simple average is that is gives pepper as much weight as steak, thus must use an index that gives much heavier weight to more important items.

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Laspeyres and Paasche Indexes

- A price index is intended to measure the overall increase in prices, how much has our basket of goods increased in cost?
- In 2005 (see next slide for basket of goods), 50 pounds of steak @ 2.20 per pound, costs €110. Similarly for pepper and bread costs totalled €4 and €40. So total cost is €154.
- Initial cost = $\Sigma P_0 Q_0$
- Later cost = $\Sigma P_t Q_0$ (Same basket of goods)

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Table Two – Prices and Quantities

	Given Data				*Laspeyres Price Index*		*Paasche Price Index*	
	Prices		Quantities		Cost of 2005 basket		Cost of 2010 basket	
	2005	2010	2005	2010	In 2005	In 2010	In 2005	In 2010
Item	Po	Pt	Qo	Qt	PoQo	PtQo	PoQt	PtQt
Steak (per pound)	2.20	3.00	50	40	110	150	88	120
Pepper (per ounce)	2.00	2.00	2	3	4	4	6	6
Bread (per pound)	0.50	0.60	80	100	40	48	50	60
			↑		154	202	144	186
			2005 Basket of Goods		Index =	202 (100)	Index =	186 (100)
						154		144
					=	131	=	129

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Laspeyres Price Index

$$Laspeyres\ Price\ Index = \frac{\sum P_t Q_0}{\sum P_0 Q_0}(100)$$

$$= \frac{202}{154}(100) = 131$$

- Note that pepper has a very low influence on this basket € 4 in a budget of over €100.
- Why use initial basket as weights?

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Paasche Index

$$Paasche\ Price\ Index = \frac{\sum P_t Q_t}{\sum P_0 Q_t}(100)$$

$$= \frac{186}{144}(100) = 129$$

- Laspeyres vs Paasche – when index is done period after period, Laspeyres is more practical, as use same base weights.

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Laspeyres vs Paasche

- In applying the Laspeyres index, the selection of the base year is crucial. e.g. what if a wartime year when steak was rationed and very little is consumed, in peacetime it would not carry its proper weight.
- Generally Laspeyres works pretty well when there is no structural change in weights.

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Fischer's Ideal Index: The Geometric Mean

$$Geometric\,mean = \sqrt[n]{X_1 X_2 \ldots X_n}$$

	Population	Increase per decade
1980	1,000	
1990	2,000	2 times
2000	16,000	8 times
	Increase Overall	16 times

$$arithmetic\,mean = \frac{2+8}{2} = 5 \qquad geometric\,mean = \sqrt{(2)(8)} = 4$$

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Fischer's Ideal Index

$$\text{Fischer's Ideal Index} = \sqrt{(\text{Laspeyres index})(\text{Paasche index})}$$

$$= \sqrt{(131)(129)} = 130$$

- Laspeyres indexes are usually larger than Ideal indexes (& Paasche indexes smaller)
- Key to this is in the numerator $\sum P_t Q_0$, current prices are weighted by old quantities. Thus whatever goods currently have high prices P_t and hence are not bought so much, are none the less weighted with the higher quantities Q_0, making the product $P_t Q_0$ to high. Thus Laspeyres overstates.
- In a similar way Paasche understates, consequently the ideal index is preferred.

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Theory Summary

- A price index measures the change in price of a fixed basket of goods and services, and so is a measure of inflation.
- The Laspeyres index uses the initial basket, while the Paasche index uses the present basket.
- A subtle difference is produced, which the Fischer ideal index resolves by taking the geometric mean of the two.
- In constructing an index, there are many practical difficulties that limit the reliability: Sampling fluctuations and changes in product quality and availability make it very difficult to define a 'fixed' basket of goods.

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Applications:

- Consumer Price Index
- Wholesale Price Index
- Industrial Production & Turnover Index
- Retail Sales Index
- ESRI's Consumer Sentiment Index
- CSO Residential Property Price Index

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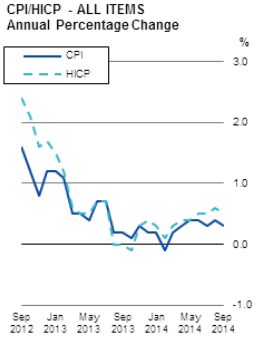
Consumer Price Index - The Official Measure of Inflation



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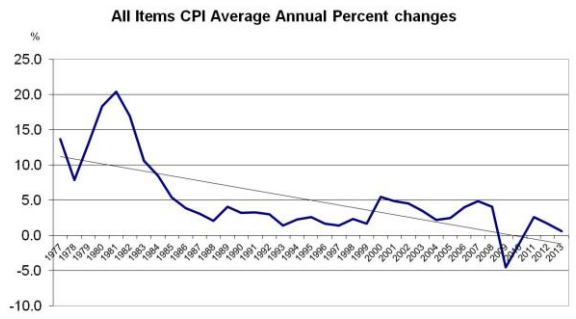
CPI 1977 - 2013



CPI

- The Consumer Price Index (current base December 2011=100) measures in **index** form **monthly** changes in the cost of purchasing a **fixed representative** basket of consumer goods and services by all private households in the country and by foreign tourists on holiday within Ireland
- The CPI has a multitude of users and is designed to measure inflation and reflects the change in the average price paid to purchase the full range of consumer goods and services available in the market

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The Role of the CPI

(1) to measure the change in the level of consumer prices

(2) changes in value of money

(3) to measure economic performance

(4) international comparisons - HICP

(5) as a mechanism to update contracts, wage agreements and welfare

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CPI

- The CPI covers a representative basket of consumer goods and services that consumers would typically purchase or consume - over 1,000 items covering a wide range of goods and services
- The Basket covers 12 main commodity headings
- Each Group is divided into subgroups and headings
- Under each heading a representative sample of items is selected as representative of all possible items

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The Basket covers 12 main commodity headings

(1) Food & Non Alcoholic Beverages
(2) Alcoholic Beverages & Tobacco
(3) Clothing & Footwear
(4) Housing, Water, Electricity, Gas & Other Fuels
(5) Furnishings, Household Equipment & Routine Household Maintenance
(6) Health
(7) Transport
(8) Communications
(9) Recreation & Culture
(10) Education
(11) Restaurants & Hotels
(12) Miscellaneous Goods & Services

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Compilation of the CPI

- 2nd Tuesday of each month
- 200 price collectors in 82 cities & towns
- Over 50,000 prices collected monthly
- 112 postal inquires
- National Weighted Average Price
- Each item in the Consumer Price Index is given an expenditure weight to reflect its share of total consumer expenditure

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Weights

	2001	2011
(1) Restaurants & Hotels	17.760%	14.172%
(2) Food & Non Alcohol Bev	14.092%	11.365%
(3) Transport	13.183%	15.088%
(4) Housing & Energy	12.331%	17.476%
(5) Recreation & Culture	10.810%	8.075%
(6) Misc Goods & Services	8.975%	9.915%
(7) Clothing & Footwear	5.052%	5.203%
(8) Alcohol and tobacco	4.399%	4.908%
(9) Other Categories	13.398%	13.771%

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Source of weights

- Household Budget Survey 2009/2010
- Survey of 5,900 households income and expenditure conducted every 5 years
- Example: CPI Weight for Alcoholic beverages and tobacco
  - 4.908% of total consumer expenditure comprised of
    - Spirits 0.3509
    - Wine 1.0529
    - Beer 0.8591
    - Cigarettes 2.5150
    - Other tobacco products 0.1304

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A look at alcohol & tobacco spending

Alcohol & Tobacco	4. 908%	Ratio
Meat	4.139%	1.19
Motor Fuel	3.487%	1.41
Communications	2.423%	2.03
Vegetables	2.338%	2.10
Electricity	1.387%	3.54

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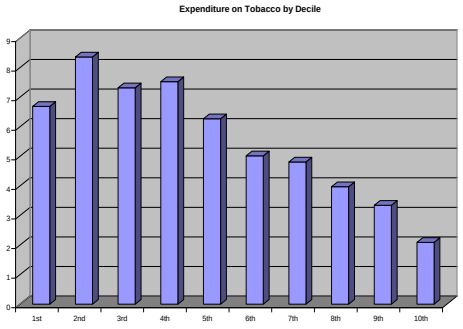

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Index point change vs % change

Index point change	
CPI	106.7
Less previous index	103.7
Equals index point change	3.0
Percentage change	
Index point difference	3.0
Divided by the previous index	103.7
Equals	0.0289
Results multiplied by 100	0.0289 x 100
Equals percentage change	2.9

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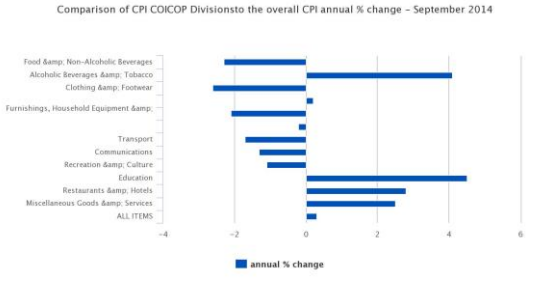

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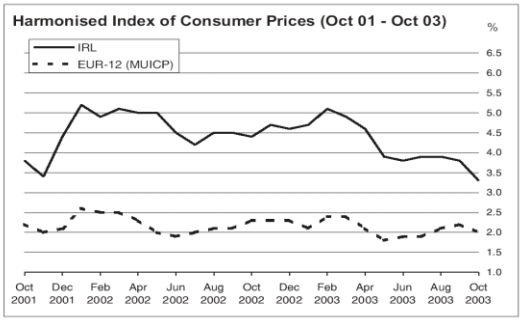

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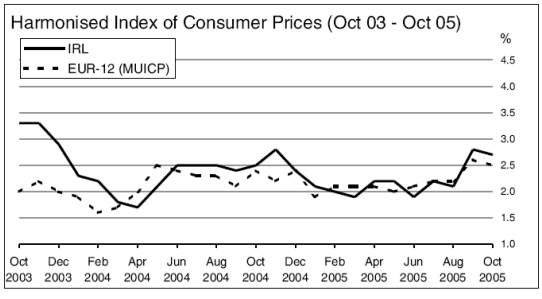

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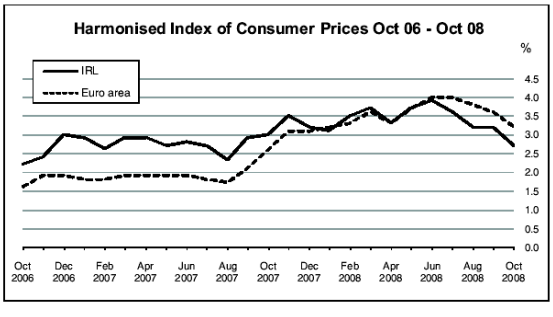

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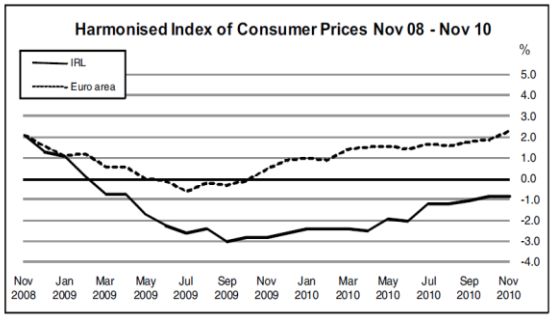

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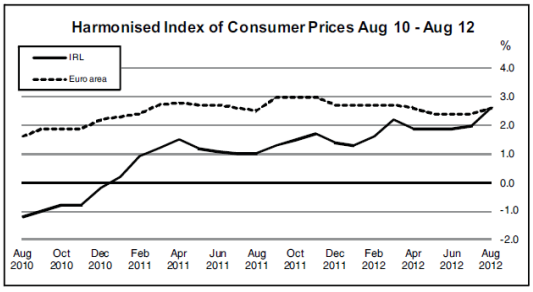

Doctors and Dentists

Table 6 06 Health - November 2003

Description	Dec. 2001 base expenditure weight %	Current Index	% change 1 mth	% change 12 mths
Medical products, appliances & equip.	1.0425	108.3	0.6	3.8
Pharmaceutical products	0.5626	108.9	0.2	3.3
Prescribed drugs	0.3205	109.9	0.4	2.9
Other medicines	0.2420	107.6	-0.1	4.0
Other medical products	0.1954	108.8	2.5	5.2
Therapeutic appliances & equip	0.2846	106.9	0.1	4.0
Outpatient services	0.8484	113.4	1.2	7.2
Medical services	0.5242	110.8	1.7	6.0
Doctors' fees	0.4310	111.3	1.8	6.4
Alternative & complementary medicine	0.0932	108.1	1.0	3.9
Dental services	0.2352	120.2	0.5	10.1
Paramedical services	0.0890	110.7	0.0	6.0
Hospital services	0.6273	129.0	0.0	11.5
Total	**2.5182**	**115.2**	**0.6**	**7.0**

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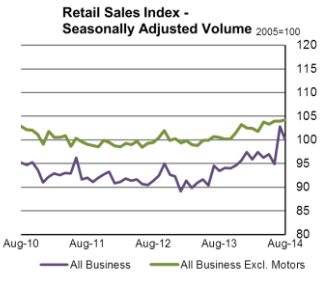
Retail Sales Index



Seasonally Adjusted Retail Sales Index-All Businesses

(Base Year 2005 = 100)

	Volume Index	Value Index
August 2013	93.5	88.2
July 2014	102.9	94.1
August 2014	99.9	92.9
Monthly % change	-2.9	-1.3
Annual % change	6.8	5.3

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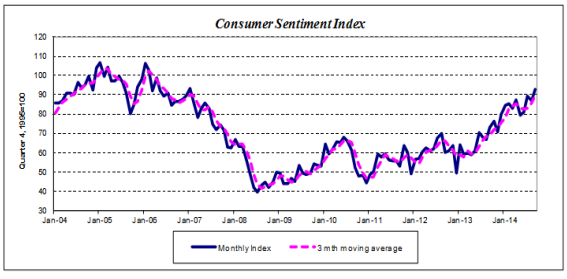
ESRI Consumer Sentiment Index



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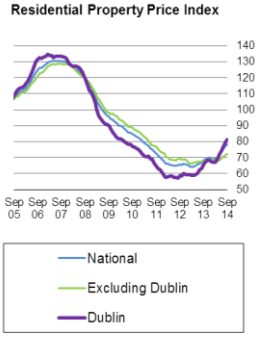
House Prices – Residential Property Price Index



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