Eighth Annual International Campbell Collaboration Colloquium
May 12-14 2008, Vancouver, British Columbia, Canada

"*Speaking Truth to Power:*
Evidence for decisions in education, social welfare and criminal justice"

A level playing field: how to adjust cost estimates to a common currency and price year

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Campbell & Cochrane Economics Methods Group
www.c-cemg.org

Overview

Objective: To introduce participants to the use of PPPs and GDP deflators to adjust estimates of costs to a common currency and price year

- Introduction: context, theory, methods
- Small group exercises
- Solutions
- Questions

Introduction

- Economics is the study of optimal allocation of limited resources for the production of benefit to society.
- Optimal decisions require the best available evidence on both effects and efficiency.
- Including economic perspectives and evidence can increase the relevance and usefulness of the reviews

Introduction

- Campbell Methods Policy Brief on Economics Methods: www.campbellcollaboration.org/MG/briefs.asp
- Extract / present measures of cost from two or more studies
- Cost = number of units of resource multiplied by unit cost
- Currency and price year reported - $100.00 (2005 US Dollars)
- Studies conducted at different times and in different countries
- Compare measures of costs on ‘a level playing field’

GDP Purchasing Power Parities (PPPs)

- Cost-conversion to create a common cost base
- Requires data on currency and price year to have been reported in original studies.
- Alternative methods available:
  - Pure exchange-rate conversion
  - Gross Domestic Product (GDP) per capita
  - Purchasing Power Parities (PPPs)
- PPPs reflect price differences between countries thus allowing comparisons of cost-estimates based on a common set of average international prices

GDP Purchasing Power Parities (PPPs)

- OECD - PPPs for GDP historical series: http://www.oecd.org/document/47/0,3343,en_2649_34357_36202863_1_1_1_1,00.html#historicalppp
- Further information on OECD PPPs: www.oecd.org/std/ppp
- IMF World Economic Outlook database - Implied PPP conversion rates dataset (historical series): http://www.imf.org/external/pubs/ft/weo/2008/01/weodata/index.aspx
- Which currency? 1 US Dollar = 1 International Dollar

http://www.oecd.org/document/47/0,3343,en_2649_34357_36202863_1_1_1_1,00.html#historicalppp

Indicators (updated monthly)

Euro Denominated Series (*)

- Purchasing Power Parities (PPPs) for OECD Countries since 1980 (xls)
  PPPs for the Euro area member countries are shown in euros.

1999, 2002, 2005: PPPs for all OECD countries are triennial benchmark results calculated jointly by the OECD and Eurostat.

Years prior to 1995: The 1995 PPPs for all countries have been backdated using the relative rates of inflation between countries as measured by their implicit price deflators for GDP.

1995-1998, 2000-2001, 2003-2004,2006: PPPs for all European countries are annual benchmark results provided by Eurostat. PPPs for all non-European countries are OECD estimates.

2007: PPPs for all countries are OECD estimates

Euro Denominated Series(*)

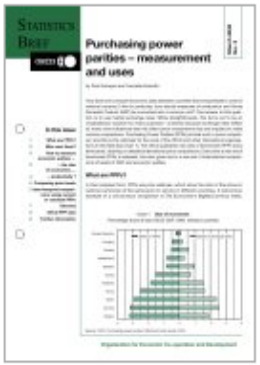
(*) Euro Denominated Series
From the February 2002 edition of MEI, national data for Euro area member countries have been published in euro.

The option chosen by OECD has been to convert data for periods prior to entry into European Monetary Union (EMU), i.e. prior to 1999 for all members apart from Greece which acceded in 2001, from the former national currency using the appropriate irrevocable conversion rate. Such a presentation facilitates comparisons within a country over time and ensures that historical evolution (i.e. growth rates) is preserved.

However, pre-EMU euro are national units and are not always suitable to form area aggregates. For further details on this issue see the article by Schreyer and Suyker in Statistics Brief Number 2, February 2002.

» Purchasing Power Parities - Publications

Statistics Brief



The March 2002 issue of the Statistics Brief gives an overview of the measurement and the uses of PPPs.

» Purchasing Power Parities – Measurement and Uses

GDP Purchasing Power Parities (PPPs)

- OECD – 'PPPs for GDP historical series': http://www.oecd.org/document/47/0,3343,en_2649_34357_36202863_1_1_1_1,00.html#historicalppp
- Further information on OECD PPPs: www.oecd.org/std/ppp
- IMF World Economic Outlook database – 'Implied PPP conversion rates' dataset (historical series): http://www.imf.org/external/pubs/ft/weo/2008/01/weodata/index.aspx
- Which currency? 1 US Dollar = 1 International Dollar

GDP Deflators

- Adjust measures of cost to a common price year
- GDP Deflator or 'Implicit price deflator for GDP'
- Measure of change in prices over time
- Current price GDP / Constant price GDP
- International Monetary Fund (IMF) - historical series
- The World Economic Outlook Database (April 2008 Edition) http://www.imf.org/external/pubs/ft/weo/2008/01/weodata/index.aspx
- Which price year? Most recent year for which all data are available

http://www.imf.org/external/pubs/ft/weo/2008/01/weodata/index.aspx

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World Economic Outlook **Text**, April 2008

Other issues of the World Economic Outlook databases

Changes to the Database

Assumptions and Data Conventions

Country Information

Groups and Aggregates

Frequently Asked Questions: WEO

Note

Tell us what you think of the April 2008 WEO Database. Please note that this is a user feedback tool only.

If you have questions about the WEO database that are not found in the Frequently Asked

World Economic and Financial Surveys

World Economic Outlook Database

April 2008 Edition

Disclaimer

Download WEO Data:

By Countries (country-level data) or By Country Groups (aggregated data) and commodity prices or Entire Dataset

The World Economic Outlook (WEO) database contains selected macroeconomic data series from the statistical appendix of the World Economic Outlook report, which presents the IMF staff's analysis and projections of economic developments at the global level, in major country groups and in many individual countries. The WEO is released in April and September each year.

Use this database to find data on national accounts, inflation, unemployment rates, balance of payments, fiscal indicators, trade for countries and country groups (aggregates), and commodity prices whose data are reported by the IMF.

Data are available from 1980 to the present, and projections are given for the next two years. Additionally, medium-term projections are available for selected indicators. For some countries, data are incomplete or unavailable for certain years.

Changes to the April 2008 Database

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Help

1. Select Country Group

Country Group	Notes
All countries	
Advanced economies	
Euro area	
Major advanced economies (G7)	
Newly industrialized Asian economies	
Emerging and developing economies	
Africa	
Central and eastern Europe	
Commonwealth of Independent States and Mongolia	
Developing Asia	
Middle East	
Western Hemisphere	

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Help

2. Select Countries

Select All | Clear All | Continue >

All countries (181 countries)

Countries	Notes	Countries	Notes
☐ Afghanistan, Rep. of.		☐ Lebanon	
☐ Albania		☐ Lesotho	
☐ Algeria		☐ Liberia	
☐ Angola		☐ Libya	
☐ Antigua and Barbuda		☐ Lithuania	
☐ Argentina		☑ Luxembourg	
☐ Armenia		☐ Macedonia, Former Yugoslav Republic of	
☑ Australia		☐ Madagascar	

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Your selections Help

3. Select Subjects

Select All Clear All Continue >

Subjects	Notes	Availability
National Accounts		
☐ Gross domestic product, constant prices National currency		[30/30]
☐ Gross domestic product, constant prices Annual percent change		[30/30]
☐ Gross domestic product, current prices National currency		[30/30]
☐ Gross domestic product, current prices U.S. dollars		[30/30]
☑ Gross domestic product, deflator Index		[30/30]
☐ Gross domestic product per capita, constant prices National currency		[30/30]
Gross domestic product per capita, current prices		

☐	Gross domestic product, constant prices National currency	[30/30]
☐	Gross domestic product, constant prices Annual percent change	[30/30]
☐	Gross domestic product, current prices National currency	[30/30]
☐	Gross domestic product, current prices U.S. dollars	[30/30]
☑	Gross domestic product, deflator Index	[30/30]
☐	Gross domestic product per capita, constant prices National currency	[30/30]
☐	Gross domestic product per capita, current prices National currency	[30/30]
☐	Gross domestic product per capita, current prices U.S. dollars	[30/30]
☐	Output gap in percent of potential GDP Percent of potential GDP	[18/30]
☐	Gross domestic product based on purchasing-power-parity (PPP) valuation of country GDP Current international dollar	[30/30]
☐	Gross domestic product based on purchasing-power-parity (PPP) per capita GDP Current international dollar	[30/30]
☐	Gross domestic product based on purchasing-power-parity (PPP) share of world total Percent	[30/30]
☑	Implied PPP conversion rate National currency per current international dollar	[30/30]
☐	Investment Percent of GDP	[7/30]
☐	Gross national savings Percent of GDP	[7/30]

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Your selections Help

4. Select Date Range

Prepare Report >

Date Range

Start Year 1980 End Year 2007

Advanced Settings (Optional)

Notes

- [ ] Append Subject Notes
- [x] Append Country/Series-specific Notes

Fields to show on report

...for Country

- [ ] WEO Country Code
- [ ] ISO Alpha-3 Code

...for Subject

- [x] Subject Descriptor
- [ ] WEO Subject Code

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World Economic Outlook Database, April 2008

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5. Report for Selected Countries and Subjects

You will find notes on the data and options to download the table below your results.

Country	Subject Descriptor	Units	Scale	Country/Series-specific Notes	1980	1981	1982	1983	1984	1985	1986	1987
Australia	Gross domestic product, deflator	Index			33.292	36.660	41.069	44.603	47.298	49.761	52.831	57.046
Austria	Gross domestic product, deflator	Index			56.770	60.494	63.721	66.051	69.111	71.242	73.169	74.714
Belgium	Gross domestic product, deflator	Index			48.682	51.183	55.063	58.149	61.335	64.146	65.938	67.060
Canada	Gross domestic product, deflator	Index			50.269	55.686	60.409	63.691	65.780	67.825	69.879	73.097
Czech Republic	Gross domestic product, deflator	Index			24.604	24.212	25.130	25.105	25.760	25.810	25.940	26.413
Denmark	Gross domestic product, deflator	Index			48.181	53.214	58.588	62.925	66.690	69.560	71.414	74.839
Finland	Gross domestic product, deflator	Index			41.235	46.026	50.253	54.399	59.063	62.248	65.259	68.059
France	Gross domestic product, deflator	Index			47.576	53.063	59.411	65.069	69.841	73.764	77.614	79.756
Germany	Gross domestic product, deflator	Index			63.124	65.819	68.961	71.204	72.645	74.217	76.630	77.995

See notes for:
Gross domestic product, constant prices (National currency)
Gross domestic product, current prices (National currency).

Turkey: Gross domestic product, deflator (Index)
See notes for:
Gross domestic product, constant prices (National currency)
Gross domestic product, current prices (National currency).

United Kingdom: Gross domestic product, deflator (Index)
See notes for:
Gross domestic product, constant prices (National currency)
Gross domestic product, current prices (National currency).

United States: Gross domestic product, deflator (Index)
See notes for:
Gross domestic product, constant prices (National currency)
Gross domestic product, current prices (National currency).

Download

The downloads are presented in Tab Delimited Values format which is compatible with most statistical packages and Excel.

Your WEO Report

New Query

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World Economic Outlook Database, April 2008

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5. Report for Selected Countries and Subjects

You will find notes on the data and options to download the table below your results.

Country	Subject Descriptor	Units	Scale	Country/Series-specific Notes	1980	1981	1982	
Australia	Gross domestic product, deflator	Index			33.292	36.660	41.069	44
Australia	Implied PPP conversion rate	National currency per current international dollar			0.976	0.982	1.037	1
Austria	Gross domestic product, deflator	Index			56.770	60.494	63.721	68
Austria	Implied PPP conversion rate	National currency per current international dollar			0.951	0.926	0.919	0
Belgium	Gross domestic product, deflator	Index			48.682	51.183	55.063	58
Belgium	Implied PPP conversion rate	National currency per current international dollar			0.915	0.879	0.891	0
Canada	Gross domestic product, deflator	Index			50.269	55.686	60.409	63
Canada	Implied PPP conversion rate	National currency per current international dollar			1.155	1.170	1.196	1
Czech Republic	Gross domestic product, deflator	Index			24.604	24.212	25.130	25

United Kingdom: Gross domestic product, deflator (Index)
See notes for:
Gross domestic product, constant prices (National currency)
Gross domestic product, current prices (National currency).

United Kingdom: Implied PPP conversion rate (National currency per current international dollar)
See notes for:
Gross domestic product, current prices (National currency).

United States: Gross domestic product, deflator (Index)
See notes for:
Gross domestic product, constant prices (National currency)
Gross domestic product, current prices (National currency).

United States: Implied PPP conversion rate (National currency per current international dollar)
See notes for:
Gross domestic product, current prices (National currency).

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Your WEO Report

New Query

GDP Deflators

- Standardise measures of cost to a common price year
- GDP Deflator or 'Implicit price deflator for GDP'
- Measure of change in prices over time
- Current price GDP / Constant price GDP
- International Monetary Fund (IMF) - historical series
- The World Economic Outlook Database (April 2008 Edition) http://www.imf.org/external/pubs/ft/weo/2008/01/weodata/index.aspx
- Which price year? Most recent year for which all data are available

Step 1

Inflate cost estimate to a common price year using GDP Deflator:

$$a = (b / c) * d$$

where: a = cost-estimate expressed in reported currency and target price year
b = GDP deflator value for reported currency in target price year
c = GDP deflator value for reported currency in reported price year
d = reported cost-estimate

Step 1: Example

Express £25 (1995 UK Sterling Pounds) in 2007 UK prices (2007 UK Sterling Pounds):

$$a = (b / c) * d$$

1995 GDP Deflator = 81.333 [c]
2007 GDP Deflator = 110.999 [b]
£25 [d]

(110.999 / 81.333) = 1.364747397

1.364747397 x 25 = 34.11868491
= £34.12 (2007 UK Sterling Pounds)

Step 2

Convert inflated cost estimate to a target currency using PPPs:

$$x = (y / z) * a$$

where: x = cost-estimate expressed in target currency and price year
y = target year PPP value for target currency
z = target year PPP value for reported currency

Step 2: Example

Express £34.12 [a] (2007 UK Sterling Pounds) in 2007 US Dollars:

$$x = (y / z) * a$$

1.00 (2007 US Dollar) [y] = 0.656 (2007 UK Sterling Pounds) [z]

1.00 (2007 UK Sterling Pound) = (y / z) = (1.00 / 0.656)
= 1.524390344 (2007 US Dollars)

1.524390344 * 34.11868491 = 52.01019383
= $52.01 (2007 US Dollars)

Exercise 1

Study	Direct cost of program per participant	Price year	Currency	Direct cost of program per participant expressed in 2007 US Dollars	Rounded
A	4,743.00	2001	US Dollars		
B	2,845.00	1997	UK Sterling Pounds		
C	2,399.00	1991	UK Sterling Pounds		
D	5,460.00	1999	Canadian Dollars		
E	38,620.00	2003	Norwegian Kroner		
F	4,820.00	2005	France (Euros)		
G	731,400.00	2000	Japanese Yen		

Exercise 2

Study	Total duration of individual face-to-face sessions per participant	Salary of therapist per hour (inc. on-costs)	Total cost of therapist time per participant	Price year	Currency	Salary of therapist per hour (inc. oncosts) expressed in 2007 US Dollars	Total cost of therapist time per participant expressed in 2007 US Dollars
A	10.0 hrs (95% CI: 9.5 to 10.25)	30.00	300.00 (285 to 307.5)	2006	UK Sterling Pounds		
B	10.0 hrs (95% CI: 8.75 to 10.5)	50.00	500.00 (437.5 to 525)	2000	Canadian Dollars		
C	10.0 hrs (95% CI: 9.25 to 10.25)	50.00	500.00 (462.5 to 512.5)	1996	Australian Dollars		

Exercise 1 - Study A

Step 1

Express $4,743.00 (2001 US Dollars) in 2007 US prices (2007 US Dollars):

2001 GDP Deflator = 102.399
2007 GDP Deflator = 119.682

(119.682 / 102.399) = 1.168780945

1.168780945 * 4743 = 5543.528023
= **$5,543.53** (2007 US Dollars)
= **$5,544** (2007 US Dollars)

Step 2 - No step 2 (already in target currency)

Exercise 1 - Study B

Step 1

Express £2,845.00 (1997 UK Sterling Pounds) in 2007 UK prices (2007 UK Sterling Pounds):

1997 GDP Deflator = 86.597
2007 GDP Deflator = 110.999

(110.999 / 86.597) = 1.281788053

1.281788053 * 2845 = 3646.68701 (2007 UK Sterling Pounds)

Exercise 1 - Study B

Step 2

Express £3646.68701 (2007 UK Sterling Pounds) in 2007 US Dollars

1.00 (2007 US Dollar) = 0.656 (2007 UK Sterling Pounds)

1.00 (2007 UK Sterling Pound) = (1.00 / 0.656)
= 1.524390344 (2007 US Dollars)

1.524390344 * 3646.68701 = 5558.974466
= **$5558.97** (2007 US Dollars)
= **$5559** (2007 US Dollars)

Exercise 1 - Solutions

Study	Direct cost of program per participant	Price year	Currency	Direct cost of program per participant expressed in 2007 US Dollars	Rounded
A	4,743.00	2001	US Dollars	5,543.53	5,544
B	2,845.00	1997	UK Sterling Pounds	5,558.97	5,559
C	2,399.00	1991	UK Sterling Pounds	5,560.31	5,560
D	5,460.00	1999	Canadian Dollars	5,542.92	5,543
E	38,620.00	2003	Norwegian Kroner	5,564.45	5,564
F	4,820.00	2005	France (Euros)	5,546.54	5,547
G	731,400.00	2000	Japanese Yen	5,554.83	5,555

Exercise 2 - Study A

Step 1

i) Express £30.00 (2006 UK Sterling Pounds) in 2007 UK prices (UK Sterling Pounds):

ii) Express 300.00 (285 to 307.5) in 2007 UK prices

2006 GDP Deflator = 107.722
2007 GDP Deflator = 110.999

i)	(110.999 / 107.722) = 1.030420898 * 30.00	= 30.91262695
ii)	(110.999 / 107.722) = 1.030420898 * 300	= 309.1262695
	(110.999 / 107.722) = 1.030420898 * 285	= 293.669956
	(110.999 / 107.722) = 1.030420898 * 307.5	= 316.8544262

Exercise 2 - Study A

Step 2

i) Express £30.89828527 (2007 UK Sterling Pounds) in 2007 US Dollars

ii) Express £ 308.9828526 (293.53371 to 316.7074239) in 2007 US Dollars

1.00 (2007 US Dollar) = 0.656 (2007 UK Sterling Pounds)
1.00 (2007 UK Sterling Pound) = (1.00 / 0.656)
= 1.524390344 (2007 US Dollars)

i)	1.524390344 * 30.91262695	= 47.12291003	= **$47.12**
ii)	1.524390344 * 309.1262695	= 471.2291003	= $471.23
	1.524390344 * 293.669956	= 447.6676452	= $447.67
	1.524390344 * 316.8544262	= 483.0098278	= $483.01

= **$471.23 (447.67 to 483.01)**

Exercise 2 - Solutions

Study	Total duration of individual face-to-face sessions per participant	Salary of therapist per hour (inc. on-costs)	Total cost of therapist time per participant	Price year	Currency	Salary of therapist per hour (inc. oncosts) expressed in 2007 US Dollars	Total cost of therapist time per participant expressed in 2007 US Dollars
A	10.0 hrs (95% CI: 9.5 to 10.25)	30.00	300.00 (285 to 307.5)	2006	UK Sterling Pounds	47.12	471.23 (447.67 to 483.01)
B	10.0 hrs (95% CI: 8.75 to 10.5)	50.00	500.00 (437.5 to 525)	2000	Canadian Dollars	48.75	487.45 (426.52 to 511.82)
C	10.0 hrs (95% CI: 9.25 to 10.25)	50.00	500.00 (462.5 to 512.5)	1996	Australian Dollars	48.26	482.57 (446.37 to 494.63)

Limitations and further considerations

- Quality of reporting in original study
- 'Basket' of goods and services underlying PPPs and GDP deflators not specific to education, criminal justice, or social welfare
- Conversion of cost-estimates to a common currency and price year is an <u>essential</u> preliminary stage to a meta-analysis of cost data - see Campbell Methods Policy Brief on Economics Methods

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