

# Inflation, Relative Price Variability and the Markup: Evidence from the United States and the United Kingdom

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## Sources and Broad Definitions of the Data

United States	<i>Inflation and the Markup</i>	<i>RPV</i>	<i>Sample</i>
Annual	BEA: Private gross domestic product implicit price deflator at factor cost, exports implicit price deflator and unit labour costs.	BEA: National accounts industry data.	1948 to 1997
Quarterly	BEA: Gross domestic product implicit price deflator at factor cost, exports implicit price deflator and unit labour costs.	BLS: CPI-U data.	March 1967 to June 2001
<b>United Kingdom</b>			
Annual	ONS: Gross domestic product implicit price deflator at factor cost, exports implicit price deflator and unit labour costs.	ONS: National accounts industry data.	1948 to 1999
Quarterly	ONS: Private final consumption implicit price deflator at 'factor cost', imports of goods and services implicit price deflator and unit labour costs.	ONS: Private final household consumption data.	March 1963 to March 2001

- (a) Acronyms: BEA: United States Bureau of Economic Analysis. BLS: United States Bureau of Labor Statistics. ONS: United Kingdom Office of National Statistics.
- (b) Annual United States data is the same as that used in Banerjee and Russell (2001b) where further details concerning the data can be found.
- (c) Unit labour costs derived from aggregate national accounts data as total labour compensation divided by constant price gross domestic product.
- (d) Exports and imports prices are measured for goods and services.
- (e) The 'factor cost' adjustment of the quarterly United Kingdom consumption price index is  $P_{FC} = P_{MP} / \text{tax}$  where  $P_{FC}$  and  $P_{MP}$  are prices at factor cost and market prices respectively, tax is  $GDP_{MP} / GDP_{FC}$ , where  $GDP_{MP}$  and  $GDP_{FC}$  are gross domestic product at market prices and factor cost respectively. While the 'factor cost' adjustment is theoretically appealing, in practice it has little effect on the results.
- (f) The quarterly measures of *RPV* were seasonally adjusted using four quarter centred seasonal dummies simultaneously with the 'de-spiking' process. The data appendix of Banerjee, Mizen and Russell (2002) provides further details concerning the calculation of *RPV* and the data involved in the estimation.

## THE DATA IN MORE DETAIL

### US ANNUAL DATA

- (a) The annual gross product originating by industry data is from 1947 to 1997 and taken from the November 1998 *Survey of Current Business* published by the United States Department of Commerce. The data is the same as that used in Banerjee and Russell (2001a) where further details concerning the series can be found. Prior to 1987, the data uses the 1972 SIC codes.
- (b) The price and markup data is calculated for ‘private industries’ defined as total GDP less government (1987 SIC Code: 01-42, 44-89).

Name of Series	Source of Series	Notes
1. ‘Private industries’ markup of price on unit labour costs  mu in Excel file	Gross product originating by industry at current dollars GPC; Indirect tax and non-tax liabilities by industry IBT; Subsidies SUBSIDIES; Compensation of employees by industry COMP	Private sector is calculated as total less government.  Markup is calculated as (GPC less IBT less SUBSIDIES) / COMP  Note that SUBSIDIES are published as negative values.
2. ‘Private industries’ gross product originating by industry implicit price deflator at factor cost  p in Excel file	Gross product originating by industry at current dollars GPC Indirect tax and non-tax liabilities by industry IBT Subsidies SUBSIDIES Gross product originating by industry at constant chained 1992 prices GPR	Private sector is calculated as total less government.  Implicit price deflator is calculated as (GPC less IBT less SUBSIDIES) / GPC
3. Relative Price Variability  rivxsm in Excel file	RPV is calculated using gross product originating by industry data.	See following for details concerning the calculation of RPV  RPV was ‘de-spiked’ using ‘spike’ dummies for observations greater than 2.5 standard deviations from the mean.  Spike dummies are 1973 and 1974.
4. Exports of Goods and Services implicit price deflator  px in Excel file	Current price expenditure on exports of goods and services NIPA Table 1.1; Constant price expenditure on exports of goods and services NIPA Table 1.2.	Exports price deflator = current price exports / constant price exports.
5. Unemployment rate  ue in Excel file	Unemployment rate civilian labour force (seasonally adjusted quarterly) Bureau of Labor Statistics: LFS21000000	Annual rate is the average of quarterly seasonally adjusted unemployment rates.

## CALCULATION OF ANNUAL RELATIVE PRICE VARIABILITY

The gross product originating by industry data is from the November 1998 *Survey of Current Business* published by the United States Department of Commerce.

The weighted average relative price variability, RPV, is calculated as  $RPV = \left( \sum_i s_i (Dp_i - Dp_T)^2 \right)^{\frac{1}{2}}$

where  $s_i$  is the share of each component's share of total current gross product originating by sector at factor cost (i.e. GPC less IBT less SUBSIDIES),  $Dp_i$  and  $Dp_T$  are the annual rates of inflation of the  $i$ th component series and 'Private Industries' respectively.

- a) The data is annual from 1947 to 1997.
- b) The data is back-spliced prior to 1987 using 1972 SIC code data.

The gross product originating by industry SIC codes are set out in the table below. RPV is calculated using industries, 3, 4, 5, 7, 8, 10, 11, 12, 13, 14, 15, and 16 from the table below.

### Classification of Industries in Gross Product Originating by Industry Data

	<i>Industry</i>	<i>1987 SIC Code</i>		<i>Industry</i>	<i>1987 SIC Code</i>
1	Total GDP	01-97	9	Transportation and public utilities	40, 42, 44-49
2	Private Industries	01-42, 44-89	10	Transportation	40-42, 44-47
3	Agriculture	01-09	11	Communications	48
4	Mining	10-14	12	Electricity, gas & sanitary services	49
5	Construction	15-17	13	Wholesale trade	50-51
6	Manufacturing	20-39	14	Retail trade	52-59
7	Durable goods	24, 25, 32-39	15	Finance, insurance and real estate	60-67
8	Non-durable goods	20-23, 26-31	16	Services	70-89
			17	Government	43, 91-97

## US QUARTERLY DATA

- (a) The data is quarterly from the June 2001 NIPA tables (published 29 August) downloaded from the Bureau of Economic Analysis web site on 2 September 2001 unless otherwise stated.
- (b) Data is seasonally adjusted unless otherwise indicated.
- (c) The data is quarterly from March 1967 to June 2001 unless otherwise indicated.

Name of Series	Source of Series	Notes
1. Unit Labour Costs ulc in Excel file	Compensation of Employees Table 1.14; Constant Gross Domestic Product Table 1.2	Unit Labour Costs is compensation of employees / constant price GDP
2. Private Consumption implicit price deflator at 'factor cost'. gdpp in Excel file	Current Private Consumption Table 1.1; Constant Private Consumption Table 1.2; Current GDP at market prices Table 1.1; Indirect business tax and nontax liability Table 1.9; Subsidies less current surplus of government enterprises Table 1.9	Deflator at market prices: $P_{MP}$ = current consumption / constant consumption  $GDP_{FC}$ = $GDP_{MP}$ less indirect business and nontax liability plus subsidies  Consumption deflator at factor cost: $P_{FC}$ = $P_{MP}/\text{tax}$ where tax is $GDP_{MP}/GDP_{FC}$
3. Relative Price Variability rivxsm in Excel file	RPV calculated from monthly <u>not seasonally adjusted</u> CPI-U data.	Data from June 1967 – June 2001. See following for details concerning the calculation of RPV  RPV was seasonally adjusted using centered seasonal dummies and 'de-spiked' using 'spike' dummies for observations greater than 2.5 standard deviations from the mean.  Spike dummies are March and September 1973, June 1986 and December 1990.
4. Exports of Goods and Services implicit price deflator px in Excel file	Current price exports of Goods & Services Table 1.1 Constant price exports of Goods and Services Table 1.2	Deflator is current price exports / constant price exports.
5. Unemployment rate Civilian Labour Force ue in Excel file	Bureau of Labor Statistics, Labor Force Statistics, Monthly unemployment rate Series ID : LFS21000000	Quarterly average of monthly data.

## CALCULATION OF QUARTERLY RELATIVE PRICE VARIABILITY

The underlying data is monthly, All Urban Consumers (i.e. CPI-U data) and not seasonally adjusted. The monthly data is converted to quarterly data by averaging the monthly levels of the respective indexes.

Relative price variability, RPV, calculated as  $RPV = \left( \sum_i s_i (Dp_i - Dp_{AI})^2 \right)^{\frac{1}{2}}$  where  $s_i$  are the expenditure weights of the components in the All Items index,  $Dp_i$  and  $Dp_{AI}$  are the annualised quarterly rates of inflation of the  $i$ th component indexes and All Items indexes respectively.

Difficulties exist in terms of the change in definitions of the indexes. The BLS publishes back data of the series used to calculate the latest published estimates (in this case the component series of the July 2001 estimates). Therefore, if a series has a major change in its content, the back series is not provided. This problem arises for, Recreation, that only goes back to January 1993. The series used in the calculation of RPV prior to this series is CPI-U 'Entertainment' which is back-spliced onto 'Recreation' at January 1993.

The data is from 3 sources.

- I. Downloaded from the CPI home page from the Bureau of Labour Statistics web site. The component series and All Items series are the CPI-U (Consumer Price Index – All Urban Consumers) series. The data was downloaded on 9 September 2001. The data is available from January 1967 to July 2001 unless stated otherwise.

<i>Name of Index</i>	<i>BLS Series Code</i>	<i>Notes</i>
1. All Items	CUUR0000SA0	January 1913 – July 2001
2. Food and Beverages	CUUR0000SAF	
3. Housing	CUUR0000SAH	
4. Apparel	CUUR0000SAA	January 1941 – July 2001, some sporadic data prior to 1941 back to 1913
5. Transportation	CUUR0000SAT	January 1937 – July 2001, some sporadic data prior 1937 back to 1935.
6. Medical Care	CUUR0000SAM	January 1947 – July 2001, some sporadic data prior to 1947 back to 1935.
7. Recreation	CUUR0000SAR	January 1993 – July 2001
8. Education and communication	CUUR0000SAE	January 1993 – July 2001
9. Other goods and services	CUUR0000SAG	

- II. The weights  $W_i$  are provided in Tables 7.9 and 7.10 from: Jacobs, Eva E. (ed.) *Handbook of U.S. Labor Statistics: Employment, Earnings, Prices, Productivity, and Other Labor Data*, Editor and Associate Editor Sohair M. Abu-Aish, Bureau of Labor Statistics, Bernan Press, 2001.

The weights used in the calculation.

		Food & Beverages	Housing	Apparel	Transportation	Medical care	Recreation	Education & Communication	Other goods and services	Total All Items
Old	1935-1939	0.354	0.337	0.11	0.081	0.041	0.028		0.049	1
CPI-W	Dec-52	0.322	0.335	0.094	0.113	0.048	0.04		0.048	1
	Dec-63	0.252	0.349	0.106	0.14	0.057	0.039		0.057	1
	Dec-77	0.205	0.407	0.058	0.202	0.045	0.039		0.044	1
Old										
CPI-U	Dec-77	0.188	0.439	0.058	0.18	0.05	0.041		0.044	1
	Dec-82	0.201	0.377	0.052	0.218	0.06	0.042		0.05	1
	Dec-95	0.173	0.413	0.053	0.17	0.074	0.044		0.071	0.998
	Dec-97	0.175	0.415	0.053	0.166	0.074	0.043		0.074	1
New	Dec-97	0.163	0.396	0.049	0.176	0.056	0.061	0.055	0.043	0.999
CPI-U	Dec-98	0.164	0.398	0.048	0.17	0.057	0.061	0.055	0.046	0.999
	Dec-99	0.163	0.396	0.047	0.175	0.058	0.06	0.054	0.047	1

- III. Prior to January 1993 the All Urban Consumers 'Entertainment' index is used in place of the 'Recreation' index. This index is taken from page 222 of:

Darnay, Arsen J. (ed.) *Economic Indicators Handbook: Time Series, Conversions, Documentation*, Gale Research Inc. Detroit, 1994.

## UK ANNUAL DATA

(a) The data is from the ONS Blue Book (2000) and from the ONS web site.

(b) Data is annual and from 1948 - 1999

Name of Series	Source of Series	Notes
1. Unit Labour Costs ucl in Excel file	Total compensation of employees HAEA; Gross Value Added at constant basic prices ABMM	Unit labour costs = HAEA / ABMM.
2. Gross Value Added implicit price deflator at factor cost. pa in Excel file	Gross Value Added at current basic prices ABML; Production taxes other than on products NMYD; Gross Value Added at constant basic prices ABMM	Gross Value Added at factor cost (GVAfc) is calculated as ABML less NMYD ipd calculated as GVAfc / ABMM
3. Relative Price Variability rivxsm in Excel file	RPV is calculated using national accounts industry data.  RPV uses published total inflation not the implicit total inflation (from the weighted sum of industry sectors).	See following for details concerning the calculation of RPV  RPV was 'de-spiked' using 'spike' dummies for observations greater than 2.5 standard deviations from the mean.  Spike dummies are 1976 and 1986.
4. Exports of Goods and Services implicit price deflator px in Excel file	Current price expenditure on exports of goods and services KTMW; Constant price expenditure on exports of goods and services KTMZ.	Exports price deflator: KTMW / KTMZ.
5. Unemployment rate ue in Excel file	UK Unemployment rate (ILO) MGSX; UK Unemployment rate 'un' (see Hendry (2001) for further details of the data).	Prior to 1983 MGSX is backspliced using 'un' plus 0.1861 (the average difference between MGSX and 'un' from 1983 to 1991).

## CALCULATION OF ANNUAL RELATIVE PRICE VARIABILITY

The ‘basic price’ data is annual from 1948 to 1999 and taken from the ONS Blue Book 2000, Gross value added at current basic prices: by industry (Table 2.3) and Gross value added at 1995 basic prices: by industry (Table 2.4). The ‘factor cost’ data was supplied directly by the Pete Lee at the ONS and is taken from various older publications of the Blue Book.

The weighted average relative price variability, RPV, is calculated as  $RPV = \left( \sum_i s_i (Dp_i - Dp_T)^2 \right)^{\frac{1}{2}}$

where  $s_i$  is the share of each component’s share of total current value added,  $Dp_i$  and  $Dp_T$  are the annual rates of inflation of the *i*th component and Total Value Added respectively.

- a) The basic price data is back-spliced using factor cost data at 1984 for Total services and at 1969 for the other series. Whole economy value added is available using basic prices (constant and current) all the way back to 1948.
- b) Total value added inflation is the published rate and not the implicit weighted average of the current series. In practice the difference is very small.

<i>Name of Index</i>	<i>Current Price ONS Code</i>	<i>Constant Price ONS Code</i>
1. Agriculture, hunting, forestry and fishing	QTOP	GDQA
2. Mining and quarrying	QTOT	CKYZ
3. Total Manufacture	QTPI	CKYY
4. Electricity, gas and water supply	QTPJ	CKYZ
5. Total production	QTPK	CKYW
6. Construction	QTPL	GDQB
7. Total service industries	QTPZ	GDQS
8. All industries	ABML	CGCE



## UK QUARTERLY DATA

- (a) Data is quarterly from Economic Trends Annual Supplement (2000), ONS Blue Book (2000) and from the ONS web site.
- (b) Seasonally adjusted unless otherwise indicated.
- (c) The data is quarterly from June 1963 to June 2001.

Name of Series	Source of Series	Notes
1. Unit Labour Costs ulc in Excel file	Total Compensation of Employees DTWM; GDP at constant prices ABMI	Unit Labour Costs = DTWM/ABMI
2. Private Final Consumption implicit price deflator at 'factor cost'. pqfc in Excel file	Current Household consumption ABJQ; Constant Household consumption ABJR; Current GDP at market prices YBHA; Current Taxes less subsidies CMVL	Deflator at market prices: $P_{MP} = ABJQ/ABJR$ . Consumption deflator at factor cost: $P_{FC} = P_{MP}/\text{tax}$ where tax is $GDP_{MP}/GDP_{FC}$
3. Relative Price Variability rivxsa in Excel file	RPV calculated using Household final consumption expenditure data less financial services. <u>Not seasonally adjusted.</u>  RPV is calculated using the published total implicit household final consumption implicit price deflator.	See following for details concerning the calculation of RPV  RPV was seasonally adjusted using centered seasonal dummies and 'de-spiked' using 'spike' dummies for observations greater than 2 standard deviations from the mean.  Spike dummies are June 1974, June 1975, December 1976, March 1978, September 1979, June 1981, and December 2000.
4. Imports of Goods and Services deflator pm in Excel file	Current price expenditure on imports of goods and series IKBI; Constant price expenditure on imports of goods and services IKBL	Imports price deflator: $IKBI / IKBL$
5. Unemployment rate ue in Excel file	UK Unemployment Rate (ILO) MGSX; UK Unemployment Rate 264284A2 (June 1997 OECD Statistical Compendium).	Prior to June 1992 MGSX is 264284A2 plus 0.4048 (the average difference between MGSX and 264284A2 from June 1992 to June 1997).

## CALCULATION OF QUARTERLY RELATIVE PRICE VARIABILITY

The RPV calculation uses national accounts household final consumption expenditure data. The data was downloaded from the ONS web site on 11 September 2001 and is the same data as in Table 1.7 in the Economic Trends Annual Supplement 2000.

The weighted average relative price variability, RPV, is calculated as  $RPV = \left( \sum_i s_i (Dp_i - Dp_T)^2 \right)^{\frac{1}{2}}$

where  $s_i$  is the share of each component's current value added in total current value added,  $Dp_i$  and  $Dp_T$  are the annualised quarterly rates of inflation of the  $i$ th component series and Total Value Added respectively.

- a) The data is quarterly from March 1963 to March 2001 and RPV starts from June 1963.
- b) RPV is calculated for household consumption less financial services (as it is not measured at market prices). Prior to March 1974 there is no constant price data for 'Other Services'.
- c) The inflation data is at market prices and not at factor cost.

<i>Name of Index</i>	<i>Current Price ONS Code</i>	<i>Constant Price ONS Code</i>
1. Durable Goods	AEIT	AEIV
2. Food (Household expenditure)	CCDW	CCBM
3. Alcoholic drink and tobacco	CDFH	FCCA
4. Clothing and footwear	CDDE	FCCB
5. Energy products	CCEC	CCBS
6. Other goods	ABZN	ABZP
7. Rent, water and sewerage charges	ABRG	ABRI
8. Catering	CDEY	CCHS
9. Transport and communications	ABOZ	ABPD
10. Other services	ABOY	ABPC
11. Total value added	ABPB	ABPF

10 April 2003.