Inflation, Exchange Rates, and Oil Prices

Crude oil is priced and traded in U.S. dollars. However, most producers and users of refined oil products around the world earn and spend other currencies. Furthermore, inflation occurs at different rates in different countries. The theory of purchasing-power parity (PPP) suggests that changes in exchange rates should offset inflation differentials, at least in the long run, keeping the “real” price of a common basket of goods and services roughly comparable across countries. Can we use PPP to explain movements in the inflation-adjusted, local-currency prices of crude oil?

The figure below compares inflation-adjusted, local-currency oil prices in the United States, Japan, and Germany during the last four decades. Expressed in terms of 1995 consumer prices, a barrel of oil cost $15.39, Y5862, or DM39.79 in the first quarter of 1960. A barrel of oil cost $27.87, Y3350, or DM63.80 in the third quarter of 2000, also expressed in 1995 prices. For convenience, the figure shows indexes of inflation-adjusted, local-currency oil prices that have been rebased to equal 100 for each country in the first quarter of 1960.

Inflation-adjusted, local-currency oil prices (excluding taxes) are much lower now in Japan than 40 years ago, even after the sharp recent increase. Of the three major subperiods evident in the chart—the “pre-oil shocks period” of 1960-1972, the "oil shocks period" of 1973-1985 and the "post-oil shocks period" of 1986-2000—only during 1986-2000 were average real oil prices lower in yen terms than they were in the third quarter of 2000. On the other hand, inflation-adjusted oil prices in dollars and marks (or euros) are relatively high now compared to previous periods. Only during 1973-1985 were real oil prices higher in the United States and Germany than they were in the third quarter of 2000.

Clearly, forecasts of oil prices based on PPP using consumer-price indexes and current exchange rates would not have been very accurate in recent decades. First, the dollar price of oil changed erratically during the last 40 years compared to the prices of broad consumer baskets of goods and services. This is indicated by abrupt upward and downward movements in the index levels in all three countries. Second, real exchange rates between the dollar, yen and mark (euro) have also varied substantially. This is demonstrated by the divergent time paths of real oil prices facing consumers in the three countries investigated here.

The chart demonstrates that the recent inflation-adjusted, local-currency oil-price shock has been greatest in percentage terms in Germany among the three countries considered here. The real mark (or euro) price of crude oil increased by 211 percent from the fourth quarter of 1998 through the third quarter of 2000, compared to 133 and 125 percent increases in real dollar and real yen terms, respectively. The much greater price impact evident in Germany reflects the fact that the mark (euro) has depreciated significantly against the dollar and yen during the last two years.

—William R. Emmons

Views expressed do not necessarily reflect official positions of the Federal Reserve System.
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Conventions used in this publication:

1. Charts and tables contain data that were current through October 2000. Unless otherwise indicated, data are quarterly.

2. The percent change refers to the percent change from the same period in the previous year. For example, the percent change in x between month t-12 and the current month t is: \((x_t / x_{t-12}) - 1\) \times 100.

3. All data with significant seasonal patterns are seasonally adjusted.

We welcome your comments addressed to:

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Research Division
Federal Reserve Bank of St. Louis
P.O. Box 442
St. Louis, MO 63166

or to:

webmaster@stls.frb.org
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<td>4.32</td>
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</tbody>
</table>
International Economic Trends -- Euro Area

M1 Growth

Percent change

0 3 6 9 12 15


Interest Rates

Percent

0 2 4 6 8


M3 Growth

Percent change

0 2 4 6 8


Exchange Rate and Inflation Differential

US$/Euro

0.8 1.0 1.2 1.4 1.6

Inflation Differential (right scale)

1.2 1.4 1.6

Exchange Rate (left scale)

0 1 2

-2 -1 0


Stock Exchange Index - Dow Jones EURO STOXX SM

1995 = 100

100 200 300 400


Real Effective Exchange Rate

Index 1995 = 100

65 75 85 95


Federal Reserve Bank of St. Louis
Hourly Earnings and Output per Worker

Hourly earnings and output per worker.

Labor Force Indicators

Unemployment rate and employment.

Saving and Investment

Saving and investment as a percent of GDP.

Government Debt and Budget Surplus or Deficit (-)

Government debt and budget surplus or deficit as a percent of GDP.
### International Trade - Goods and Services

**Percent of GDP**

![Graph of International Trade - Goods and Services](image)

- Exports
- Imports

### Current Account Balance

**Percent of GDP**

![Graph of Current Account Balance](image)

### Foreign Exchange Reserves

**Billions of US$**

![Graph of Foreign Exchange Reserves](image)

### Stock Exchange Index - SBF 250

**1995 = 100**

![Graph of Stock Exchange Index](image)

---

Federal Reserve Bank of St. Louis
International Economic Trends--Germany

11/08/00

Real GDP Growth
Percent change

Employment Growth
Percent change

Consumer Price Index
Percent change

Unemployment Rate
Percent

Hourly Earnings
Percent change

Current Account Balance
Percent of GDP

Federal Reserve Bank of St. Louis
Real GDP Growth

Percent change

Employment Growth

Percent change

Consumer Price Index

Percent change

Unemployment Rate

Percent

Hourly Earnings

Percent change

Current Account Balance

Percent of GDP

International Economic Trends--Italy

Federal Reserve Bank of St. Louis
International Economic Trends—Japan

11/08/00

Federal Reserve Bank of St. Louis

Real GDP Growth
Percent change

Employment Growth
Percent change

Consumer Price Index
Percent change

Unemployment Rate
Percent

Monthly Earnings
Percent change

Current Account Balance
Percent of GDP

International Economic Trends—Japan

Federal Reserve Bank of St. Louis
Monthly Earnings and Output per Worker

Monthly earnings

Output per worker

Labor Force Indicators

Employment (left scale)

Unemployment rate (right scale)

Saving and Investment

Saving

Investment

Government Debt and Budget Surplus or Deficit (-)

Surplus or deficit (-) (left scale)

Debt (right scale)
Hourly Earnings and Output per Worker
Percent change

Labor Force Indicators
Percent change

Saving and Investment
Percent of GDP

Government Debt and Budget Surplus or Deficit (-)
Percent of GDP, annual data
Notes

Euro-area Data – The unit of account for most series is the euro.

Prior to December 1998, euro-area interest rates are calculated on the basis of national government yields weighted by GDP. Starting in 1999 short-term rates are euro interbank offered rates. Long-term rates are calculated on the basis of national government bond yields weighted by the nominal outstanding amounts of government bonds in each maturity band.

Inflation data for the euro area is based on the harmonized index of consumer prices. Data for individual countries in this publication continues to be based on national consumer price indexes.

The dollar/euro exchange rate used in the chart on page 12 is a synthetic rate prior to January 1999. This is constructed by calculating a weighted average of the exchange rates of the 10 euro-area countries against the dollar. The weights are based on 1997 GDP shares.

German Data – As a result of reunification, data for all of Germany are now incorporated in most of the statistical series. The starting periods for unified German data are listed below. Care should be exercised when interpreting the data around these break periods. Data for capacity utilization and hourly earnings remain for western Germany only.

First quarter 1992: employment and output per worker.
First quarter 1993: stock exchange index and unemployment rate.
First quarter 1994: retail sales.

Capacity Utilization covers the manufacturing sector for Canada, France, Japan, the United Kingdom, the United States, and the euro area; manufacturing excluding food, beverage and tobacco for Germany; and mining and manufacturing for Italy.

Consumer Price Index is for all items. The current index is based on goods and services consumed by all individuals for Canada and Italy; all households for France; households with a monthly income of less than 25,000 DM for Germany; all multi-person households excluding those mainly engaged in agriculture, forestry and fisheries for Japan; all households except pensioners dependent on state pension and high income households for the United Kingdom; and all urban households for the United States.

Current Account Balance is the sum of merchandise and service exports and income receipts on domestic assets abroad minus the sum of merchandise and service imports and income payments from foreign assets in the domestic economy plus net unilateral transfers.

Earnings are based on hourly earnings in manufacturing for Canada, France, Germany, the United States, and the euro area; hourly earnings in industry excluding construction for Italy; monthly earnings in manufacturing for Japan; and weekly earnings in manufacturing for the United Kingdom.

The Real Effective Exchange Rate uses normalized unit labor costs in manufacturing. The weighting scheme used to construct the rates, for all except the euro area, is based on disaggregated data for trade among 21 industrial countries in manufactured goods for 1989-91. For the euro area the weights relate to the trade of the euro area with the other countries. The weights reflect the relative importance of a country’s trading partners in its direct bilateral trade relations and competition in third markets. Normalized unit labor costs in manufacturing are calculated by dividing an index of actual hourly compensation per worker by a five-year moving average index of output per man-hour.

Employment data refer to civilian employment for Canada, Germany, the United States, and the euro area; industrial employment for France; employed persons excluding conscripts for Italy; and total employment for Japan and the United Kingdom.

Industrial Production measures the change in the volume of output in the mining, manufacturing, oil, electricity, gas and water industries.

The Short-Term Interest Rate table on page 4 uses the relevant 3-month interest rate shown in the country pages.

The Long-Term Interest Rate table on page 4 uses the government bond rate. The government bond rate is a composite of yields on Federal government bonds with maturities of more than 10 years for Canada and the United States; long-term public and semi-public sector bonds for France; 7-15 year public sector bonds for Germany; 15-20 year government bonds through 1990, and 10-year government bonds starting in 1991 for Italy; 10-year government bonds for Japan, the United Kingdom, and the euro area.

Investment is gross fixed capital formation and changes in stocks (inventories) of the government and business sectors.

The Reserve Money table on page 4 refers to the adjusted monetary base for Japan and the United States; reserve money for Canada; and M0 for the United Kingdom. Reserve Money is currency in circulation, deposits of the deposit money banks, and demand deposits of other residents (with the exception of the central government) with the monetary authority.

Adjusted Monetary Base
Japan – currency in circulation and current deposits at the Bank of Japan. United States – the sum of currency in circulation outside Federal Reserve Banks and the U.S. Treasury, deposits of depository financial institutions at Federal Reserve Banks, and an adjustment for the effects of changes in statutory reserve requirements on the quantity of base money held by depositories.

M0

M1

MZM
United States – currency in circulation, travelers’ checks and total publicly-held checkable deposits minus cash items in the process of collection and Federal Reserve float, savings deposits, shares in retail money market mutual funds (funds with initial investments of less than $50,000), net of retirement accounts and institutional money market mutual funds.

M2
Canada – M1 plus all checkable notice deposits and personal term deposits. United Kingdom – currency in circulation and sterling retail deposits with the UK banks and building societies. United States – MZM less institutional money market mutual funds plus small denomination (less than $100,000) time deposits.
M2 + CDs
Japan – M1 plus private deposits, public deposits less demand deposits, and certificates of deposit.

M3
Euro area – M1 plus deposits with a maturity up to 2 years, deposits redeemable at notice up to 3 months, repurchase agreements, money market funds and debt securities up to two years.

M4
United Kingdom – M2 plus wholesale deposits with the UK banks and building societies.

Output Per Worker is the ratio of real GDP to employment.

Retail Sales are based on a volume index.

Saving is gross national saving which includes net national saving (receipts less disbursements of households, business and the government) and consumption of fixed capital.

The Stock Market Index refers to all share prices except for the United Kingdom, which excludes financial firms.

The trade-weighted exchange rate, TWEX, is the Board of Governors of the Federal Reserve System’s major currency trade-weighted dollar exchange rate. This is a weighted average of the exchange value of the U.S. dollar relative to the major international currencies of 17 industrial countries.

The Unemployment Rate is the standardized unemployment rate. It is the percentage of the civilian labor force that is unemployed. The unemployed are all persons of working age who are without work, readily available for work and actively seeking work. The standardized rate may differ from the national unemployment rate calculations.

Sources

Except as noted below, all data are from the Organization for Economic Cooperation and Development (OECD). For more details on these data see: OECD, Main Economic Indicators, Sources and Definitions 1997, July 1997. This publication is available on the Internet at: http://www.oecd.org/std/meta.htm.

Bank of Canada
M1 and M2 (Canada)

Bank of England
M2 (U.K.)

Banca D’Italia
Long-term interest rate (Italy)

Bank of Japan
Adjusted monetary base (Japan), long-term interest rate (Japan), employment (Japan)

Board of Governors of the Federal Reserve System
Exchange rates, short and long-term interest rates (U.S.), M2 (U.S.), industrial production index (U.S.), capacity utilization (U.S.)

Bundesanstalt Fur Arbeit
Employment (Germany)

Bureau of Economic Analysis (BEA), U.S. Department of Commerce
Gross domestic product (U.S.), current account balance (U.S.), merchandise and service trade (U.S.)

Bureau of Labor Statistics (BLS), U.S. Department of Labor
Employment (U.S.), consumer price index (U.S.)

Eurostat
Current account balance (euro area), gross domestic product (euro area), retail sales (euro area)

Federal Reserve Bank of St. Louis
Inflation differential (U.S. and euro area), adjusted monetary base (U.S.), MZM (U.S.)

Financial and Economic Research International
Employment (euro area), merchandise trade (euro area)

Haver Analytics
Synthetic euro exchange rate

Instituto Centrale di Statistica
Employment (Italy)

International Monetary Fund (IMF)
Foreign exchange reserves, reserve money (Canada), merchandise and service trade (except U.S. and euro area), and real effective exchange rate. For more details on these data see: IMF, International Financial Statistics.

Ministere du Travail et des Affaires Sociales
Employment (France)

Statistics Canada
Employment (Canada)

U.K. Office for National Statistics
Employment (U.K.) and M0 (U.K.)