

U.S. INTERNATIONAL TRADE COMMISSION



OFFICE OF INDUSTRIES SEMINAR SERIES

A PRESENTATION BY
KARL S. TSUJI

“ECONOMICS OF PRECIOUS METALS”

JUNE 15, 2011

What can economic theory
tell us about
the price behavior of
precious metals?

THIS PRESENTATION ADAPTED FROM A PREVIOUS ONE TO THE SME-DC SECTION



Karl Tsuji (L) receiving the 2011 Herbert C. Hoover Award from Lee Bray (R), the 2010-11 First Vice Chairman, at the SME-DC Section's May 10, 2011, meeting in Washington DC

Mineral Economics

An interdisciplinary approach to economics applied to what can be dug out or pumped out of the ground:

- Economics
- Finance
- Engineering
- Geosciences

U.S. International Trade Commission



- What the USITC is:
 - Established by Congress in 1916
 - An independent, quasi-judicial Federal agency
 - Impartial and non-partisan
 - Scope of trade-related mandates expanded over time
- What the USITC is not:
 - ...not a court of law
 - ...not a policy-making agency
 - ...not a trade-negotiating agency

The three-fold mission of the USITC

- Administers U.S. trade-remedy laws within its mandate, including:
 - Import injury investigations
 - Intellectual property-based investigations
- Provides impartial advice to Congress & Executive Branch agencies on:
 - Trade issues
 - Industry competitiveness issues
- Maintains the U.S. Harmonized Tariff Schedule

USITC OFFICE OF INDUSTRIES

Natural Resources and Metals (NRM) Division

- My various minerals and metals assignments:
 - Certain steel mill products
 - Precious metals
 - Copper, lead, zinc, and molybdenum
 - Various base-metal products
- My various issues assignments:
 - Steel industries of Africa, the Middle East, and Indian Subcontinent
 - Mining industries of Africa, the Middle East, and Indian Subcontinent

U.S. International Trade Commission

- Also interested in current issues of:
 - Strategic raw-materials access and
 - Conflict minerals issues.
- Also analyze products beyond my officially assigned minerals and metals:
 - Cover for colleagues' assigned minerals and metals.
 - Project assignments outside the NRM Division.

Hence, to a certain extent...

International Trade Analysts
have to be
“Renaissance Men and Women”

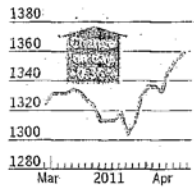
A couple disclaimers...



- The views expressed in this presentation are solely those of the author and are not those of the Commission or of any of its Commissioners.
- This presentation is not intended as financial planning advice.

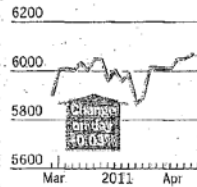
Friday April 29 2011

S&P 500 Index



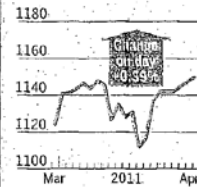
● US equities.
The market rose to its highest level since June 2008. Earnings were offset by weak data in early trade, but a late rally in financials boosted the broad market. Technology and energy stocks were the laggards.

FTSE 100 Index



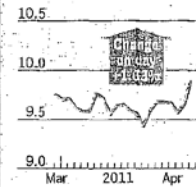
● UK equities.
The FTSE 100 closed a fraction firmer as investors digested a mix of earnings. AstraZeneca missed estimates. Barclays, BP and Vodafone also dragged on the market. GlaxoSmithKline was a bright spot.

FTSE Eurofirst 300 Index



● European equities.
Stocks posted their sixth straight session of gains, buoyed by a flurry of earnings and upbeat guidance. Results from Deutsche Bank, Suez and Safran offset misses by the likes of SAP.

Nikkei 225 Average



● Asian equities.
The MSCI Asia-Pacific index rose 1.4 per cent to its highest level since February. Stocks in Tokyo rallied 1.6 per cent as investors looked to a rebound in activity. Shares in China and India retreated.

Source: Thomson Reuters Datastream

Markets updated at www.ft.com/markets

Gold hits record on US growth concerns

Dollar extends fall after Fed statement

Australian currency surges ahead

By Michael Mackenzie in New York

The dollar sank to a three-year low and gold climbed to a record high as lacklustre US growth and no sign of tighter policy from the Federal Reserve weighed on the currency.

The Fed's policy meeting on Wednesday and chairman Ben Bernanke's subsequent press conference told investors that the US remained well behind other central banks in the tightening cycle, with the exception of Japan.

"The biggest force behind the dollar's decline stems from the fact that the Fed chairman's press conference gave no signal that the end of Quantitative Easing 2 in June will bring closer the turning point in the Fed's cycle," said Lena Komlieva, global head of G10 strategy at Brown Brothers Harriman.

"Indeed the impact of the Fed's policy has been strongly reflationary for global risk assets, including higher stocks, commodities, lower volatility and bond yields, and tighter credit spreads, as the flip side of extended dollar weakness," she added.

The bearish view on the dollar was also bolstered by news that the US economy grew by an annualised 1.8 per cent during the first quarter of 2011, down

sharply from the 3.1 per cent pace seen in the fourth quarter of 2010.

The slowdown was attributed to higher energy prices, adverse weather, and

a sizeable drop in public sector spending, according to economists. As such, many economists – and the Fed – expect a rebound from the "soft patch" of the

first quarter. "We prefer to judge the economy by job growth and profits – and these indicators are encouraging," said RDQ Economics. "We continue to expect

a pick-up in growth to above 3 per cent for the rest of the year."

The latest US growth numbers revealed rising inflation pressures, with the personal consumption expenditures price index at 3.8 per cent, the highest in almost three years.

In other data, weekly jobless claims rose 25,000 to 429,000, the third week in a row the series has been above 400,000 – seen as the threshold for an improving job market.

In the currency market, the latest downdraft in the dollar saw the Australian dollar power to a post-1982 high of \$1.0947, while the euro pulled back from a test of \$1.49. Traders are eyeing the \$1.50 hurdle that was last breached in November 2009 and other currencies such as the Swedish krona

and South African rand were also near key levels. Alan Ruskin, strategist at Deutsche Bank, said the approach of major currency levels may test some of the biggest US dollar bears. "It is all going to get much tougher, with risks of a choppy consolidation phase to follow after the recent clear US dollar downtrend," he said.

The weaker dollar helped propel gold to a record \$1,538.47 an ounce. Elsewhere in commodity trading, silver surged 7.4 per cent to \$49.38. US crude oil approached \$114 a barrel, only to falter and slip below \$113 late in New York.

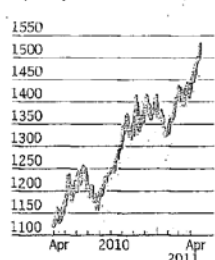
Lacklustre economic news and mixed earnings results limited US equities in early trade, but they staged a late recovery. In New York, the S&P 500 closed up 0.4 per

cent, its highest level since June 2008. The FTSE Eurofirst 300 index gained 0.4 per cent as good earnings from Deutsche Bank, Shell and Bayer were offset by disappointing results from Santander and SAP.

Earlier, Japan's Nikkei 225 rose 1.6 per cent as investors shrugged off a record 15.3 per cent drop in March industrial output. Shanghai fell 1.3 per cent, while stocks in India eased 0.8 per cent.

Yields across major government bond markets fell, with 10-year UK gilts down 9 basis points at 3.48 per cent and German 10-year Bunds down 7bps at 3.26 per cent. In the US, yields fell, and that lessened demand for the sale of \$29bn in seven-year paper.

Gold price

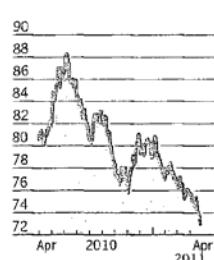


Source: Thomson Reuters Datastream

◀ Gold hit a record peak of \$1,538.47 an ounce, buoyed by weakness in the dollar and signs of rising US inflation. Gold is up more than 8 per cent this year, after a 30 per cent gain in 2010

▶ The dollar index was down for the eighth day in a row and at its lowest level since July 2008. The index is just over 2 per cent away from its all-time low set in April 2008

Dollar index



Lex, Page 12

Sudden Silver Plunge Erases Rally

Metal Drops 12% in an 11-Minute Span as Margin Requirements Are Tightened

By TATYANA SHUMSKY

Two weeks of gains in the silver market were erased in 11 minutes as investors sought to avoid higher trading costs and cash out of a historic rally.

Silver prices tumbled 12% shortly after electronic trading opened in Asia around 6 p.m.

COMMODITIES Eastern time on Sunday in a swift and violent cascade. Prices recouped some of the losses over the course of the trading session, but the most-active July silver futures contract closed down 5.2% at \$46.084 a troy ounce on the Comex division of the New York Mercantile Exchange. After prices had settled for the day, silver futures staged another sharp drop.

Margin Anxiety

Traders said the declines were triggered by exchange-mandated higher trading-deposit requirements, known as margins, which came in to force Saturday. To trade silver futures, investors typically pay only the margins, which cost a fraction of a con-

tract's full value of about \$230,000.

CME Group Inc., which operates the Nymex, had raised its margin requirement for speculative traders twice last week due to high volatility. These investors must now put up \$14,513 a contract for a day trade, and a further \$10,750 to keep that contract overnight. Both requirements are up 24% from a week ago. For investors holding hundreds of contracts, that's a difference of hundreds of thousands of dollars.

Silver costs a sliver of gold's more than \$1,500 an ounce price tag, but gold's margin requirements are less than half of silver's. The higher margins are a deterrent to new investors looking to enter the market.

"That's going to scare the weaker hands out of the market immediately," said Ralph Preston, market analyst at Heritage West Financial.

Following Gold's Lead

Silver prices have nearly doubled in six months, and both silver and gold have zoomed to record levels on concerns about

low U.S. interest rates, inflation and investor demand for an affordable store of value. Both metals are considered to be a safe haven when bearish sentiment pressures equities and the dollar, but the two markets don't always trade in concert.

Gold is very scarce and has few industrial uses. Silver is

Silver costs far less than gold, but its margin requirements are much higher, in a deterrent to investors looking to enter the market.

more abundant, and the metal's use in high-end electronics and in manufacturing makes it sensitive to economic downturns.

However, "for the same money you could trade almost twice as many gold contracts," said George Gero, vice president with RBC Capital Markets.

Silver's decline was accelerated by broker MF Global, which

raised its own margin requirements on top of CME's increase, several market participants said. A spokeswoman for MF Global declined to comment.

Swings Magnified

Low trading volumes likely amplified silver's decline. It took less than 6,000 contracts changing hands, or around 3% of the day's trading volume, to knock prices to a two-week low on a day when many markets in Asia and Europe were closed. Gold has been less prone to such wild price swings as there are many more market participants trading gold, which reduces the influence of each transaction.

"This was panic-type selling. As the market started falling in the midst of thin volumes it drew more sellers to the market, and this created a vacuum to the downside," said Dave Meger, director of metals trading at Vision Financial Markets.

Front-month May silver futures settled down 5.2% at \$46.078 a troy ounce.

Futures and cash-prices tables on C6

Precious Metals

- Gold
- Silver
- Platinum-group Metals (PGMs):
 - Platinum
 - Palladium
 - Rhodium
 - Iridium
 - Ruthenium
 - Osmium

Economic theory generally focuses on gold but is also applicable to silver and PGMs.

What makes precious metals “precious”?

- Ostensibly their high unit values:

– Gold:	\$1,200 per troy ounce	\$31,747 per kilogram
– Silver:	\$ 18 per troy ounce	\$ 470 per kilogram
– Platinum:	\$1,600 per troy ounce	\$42,329 per kilogram
– Palladium:	\$ 500 per troy ounce	\$13,228 per kilogram
– Rhodium:	\$2,500 per troy ounce	\$66,139 per kilogram
– Ruthenium:	\$ 198 per troy ounce	\$ 5,238 per kilogram
– Iridium:	\$ 635 per troy ounce	\$16,799 per kilogram

- But some non-precious metals can also have high unit values:

– Gallium:	\$ 670 per kilogram
– Germanium:	\$ 940 per kilogram
– Hafnium:	\$ 398 per kilogram
– Indium:	\$ 550 per kilogram
– Rhenium:	\$ 2,300 per kilogram
– Scandium (oxide, 99.9% purity):	\$ 1,400 per kilogram
– Tellurium:	\$ 210 per kilogram
– Thallium:	\$ 5,930 per kilogram

Source: Compiled by the U.S. Geological Survey from *Platts Metals Week*.

Gold: Monthly average London-fix prices, January 2001 to April 2011



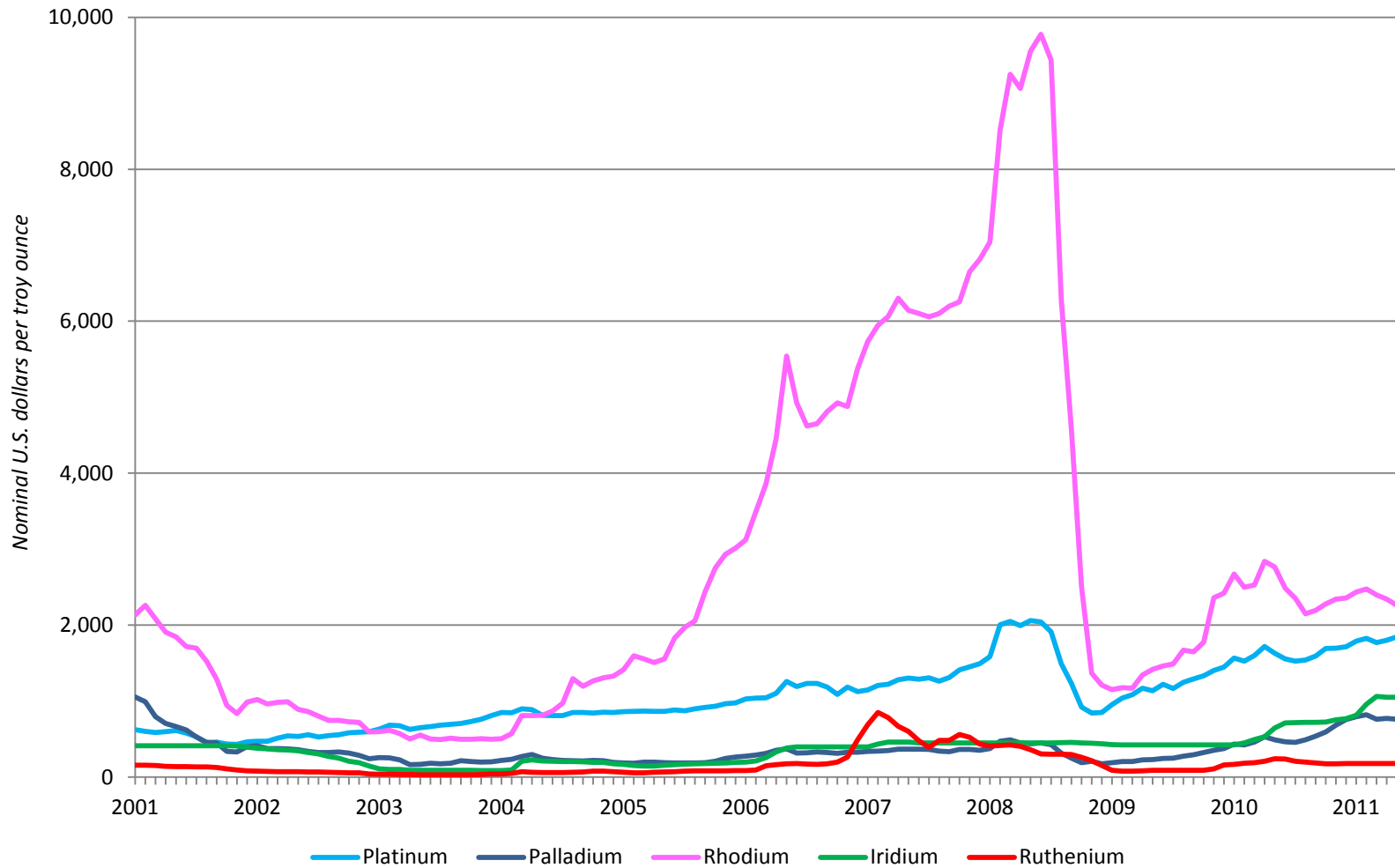
Source: Compiled from statistics of the World Gold Council.

Silver: Monthly average London-fix prices, January 2001 to March 2011



Source: Compiled from statistics of the Silver Institute.

Platinum-group metals: Monthly average Johnson Matthey producer prices, January 2001 to May 2011



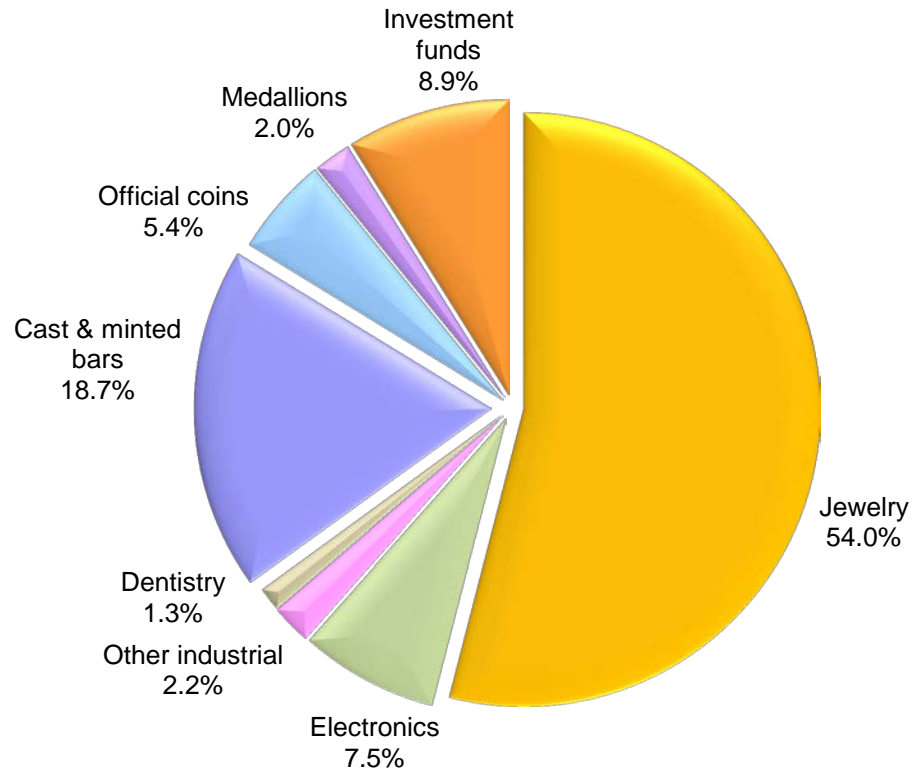
Source: Compiled from statistics of Johnson Matthey.

Precious-metal distinctions

- Distinguished by extent to which they're held for:
 - Financial security or
 - Anticipation of capital gains.
- A long history as a near-universally accepted:
 - Medium of exchange
 - Unit of account
 - Store of value:
 - Official financial reserves— held by central banks and multilateral institutions.
 - Investment items and financial instruments— traded by private and institutional investors.

Gold: global demand by end-use sectors, 2010

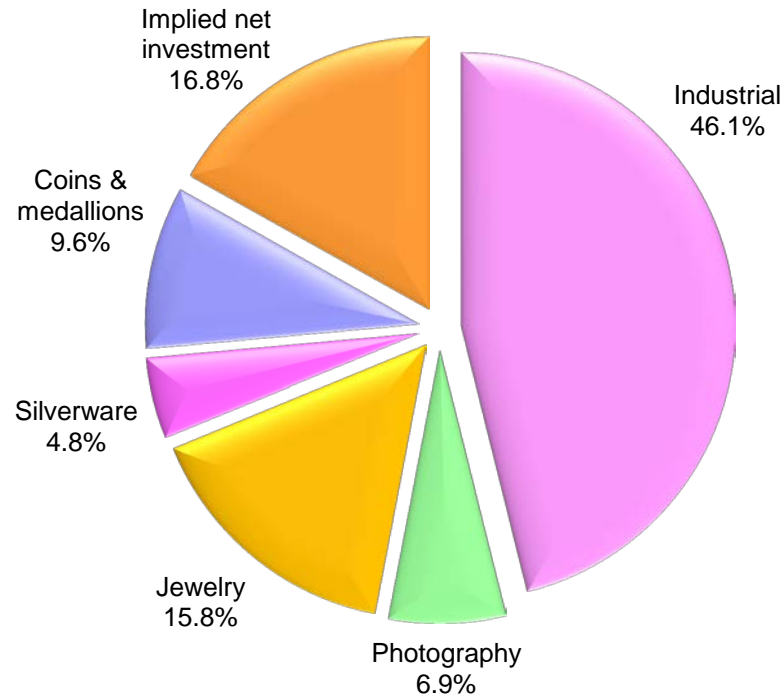
Gold:
global demand = 100.9 million troy ounces



Source: Compiled from statistics of the World Gold Council.

Silver: global demand by end-use sectors, 2010

Silver:
global demand = 1.1 billion troy ounces

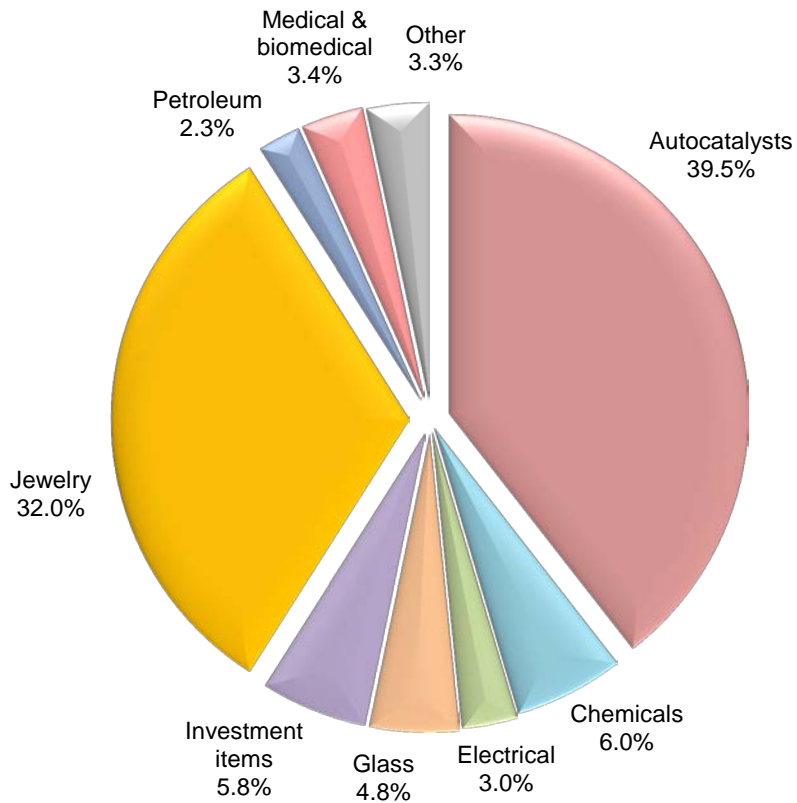


Source: Compiled from statistics of the Silver Institute.

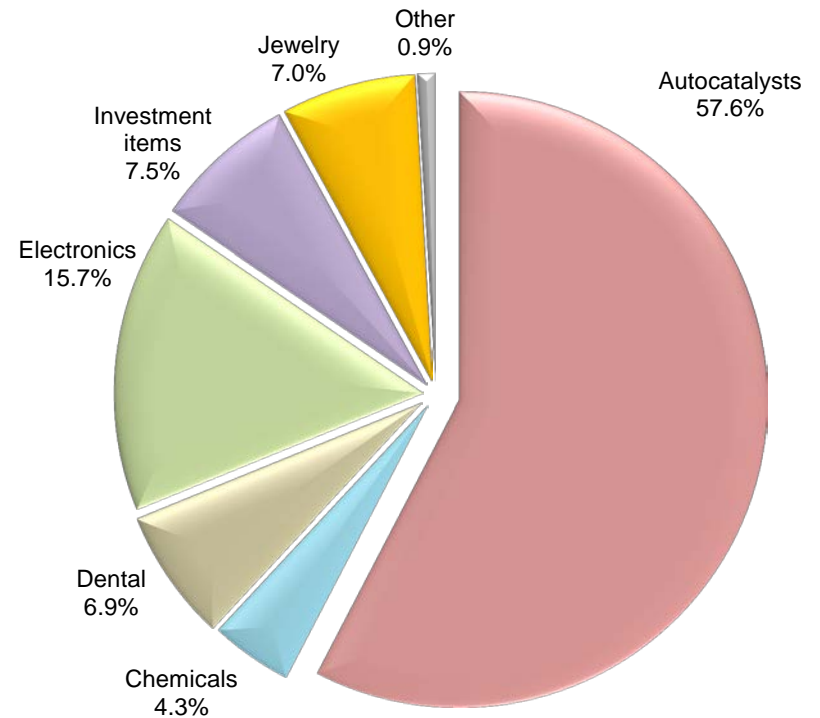
Platinum and palladium: global demand by end-use sectors, 2010

Source: Compiled from statistics of Johnson Matthey.

Platinum:
global demand = 7.6 million troy ounces



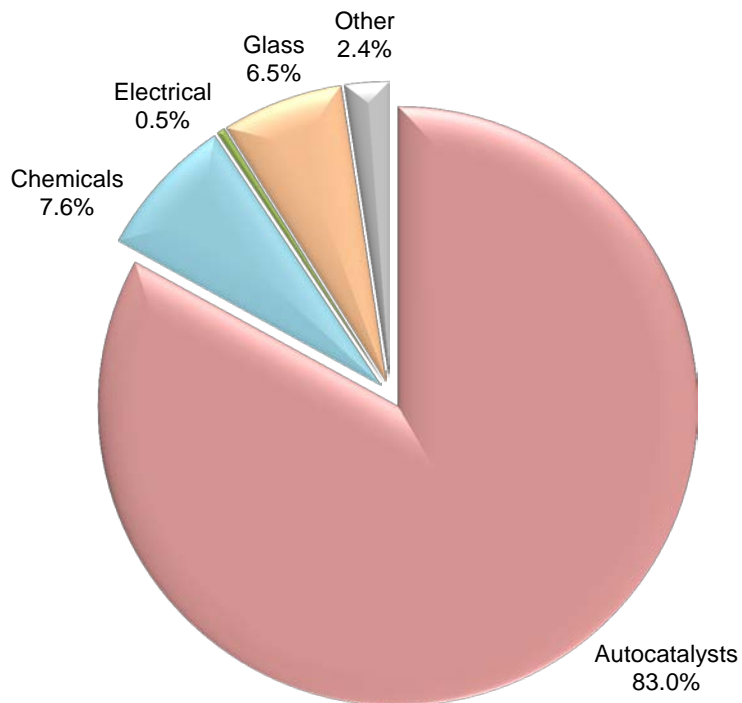
Palladium:
global demand = 8.9 million troy ounces



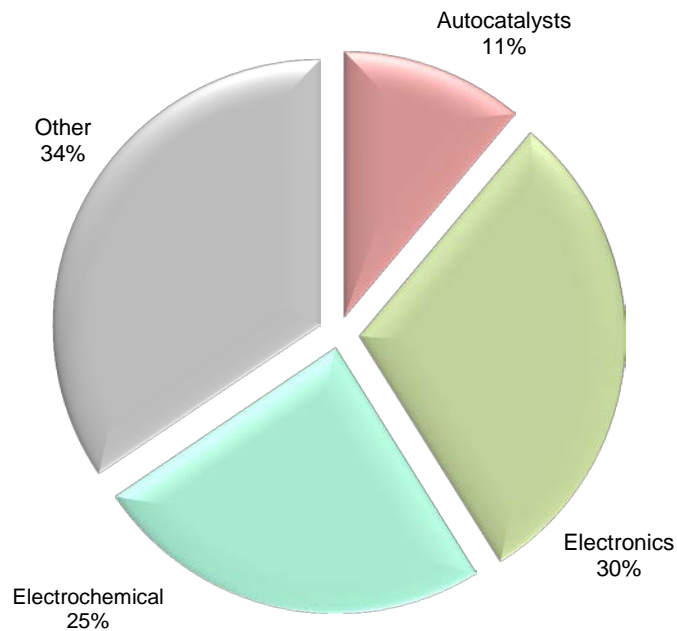
Rhodium and Iridium: global demand by end-use sectors, 2010

Source: Compiled from statistics of Johnson Matthey.

Rhodium:
global demand = 867,000 troy ounces



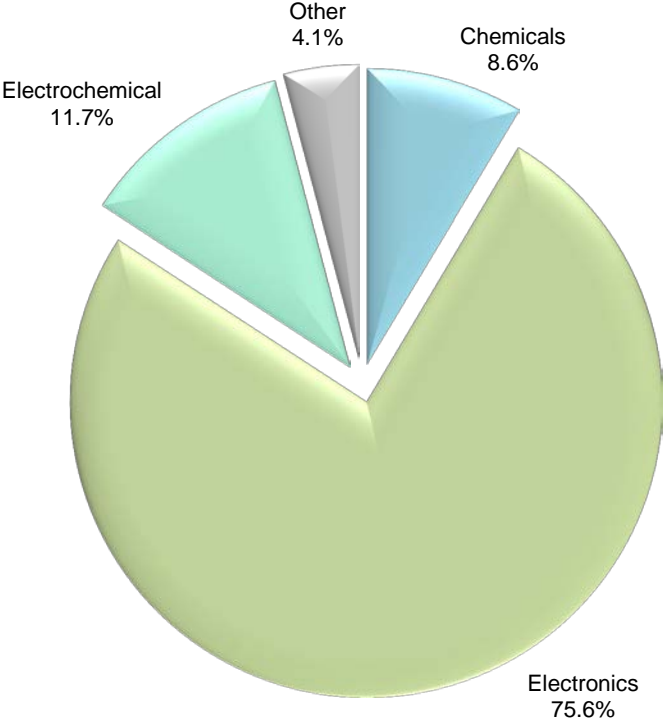
Iridium:
global demand = 204,000 troy ounces



Ruthenium and Osmium: global demand by end-use sectors, 2010

Source: Compiled from statistics of Johnson Matthey.

Ruthenium:
global demand = 1.1 million troy ounces



Osmium:
global demand (not available)



Reasons cited for holding gold and other precious metals:

- Asset diversification:
 - Official financial reserves
 - Private and institutional portfolios
- Inflation hedge
- Currency hedge
- Risk diversification

Source: World Gold Council.

Investment forms of precious metals:

- Investment items:
 - Non-numismatic coins (e.g., the U.S. Eagle)
 - Cast and minted bars
 - Medallions
 - Precious jewelry (a traditional form)
- Financial instruments:
 - Precious-metal mining company stocks
 - Commodity futures and options markets
 - Commodity mutual funds
 - Exchange-traded funds

Investment returns from precious metals:

- ✗ No dividend returns unlike equities (stocks)
- ✗ No interest returns unlike debentures (bonds)
- ✓ Only potential for capital appreciation

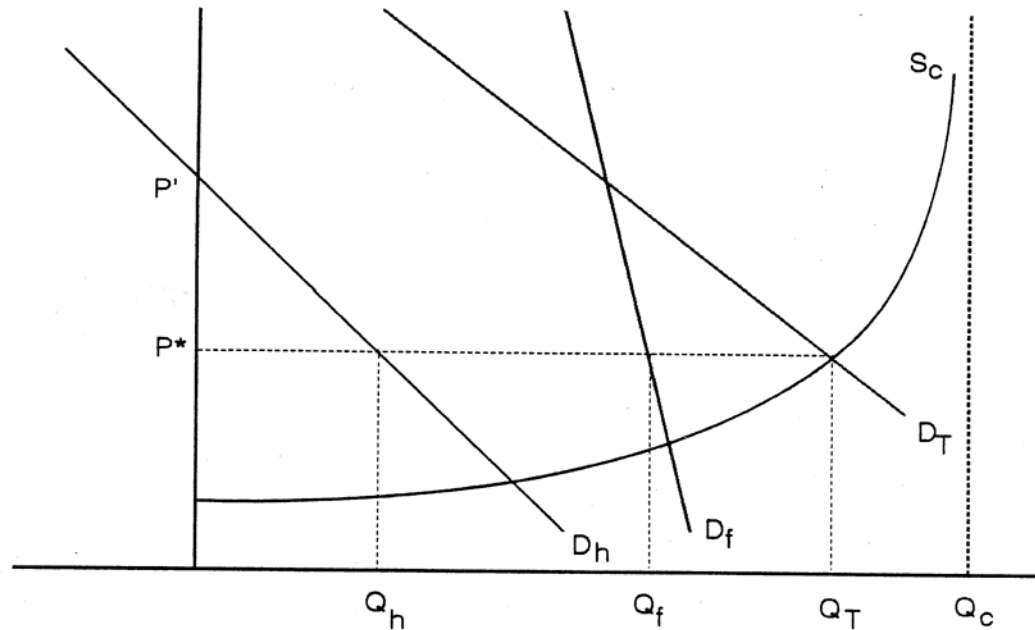
Precious-metals pricing

- Three views of precious-metals pricing (late 1970s to early 1990s):
 - **Resource exhaustion**—Assumes known and finite resource stock and no advancements in mining or processing technologies (VanTassel 1979, 1982).
 - **Abnormal deviations**— Speculative price swings are disruptions from the more “normal” mine-supply and fabrication-demand price trends (Languetin 1982, Quadrio-Curzio 1982, DuBoulay 1983).
 - **Economic theory**— Pricing of precious metals is in accord with economic rationale (Abklen 1980, Raftopoulos 1981, Sherman 1981, Koutsoyiannis 1983, Neal 1987, Murray 1991, etc.).

Precious-metals pricing

- Economic theory: precious metals distinguished by:
 - The extent to which they are held for financial security or anticipation of capital gains, and
 - (Dis)hoarding flows can exceed production and consumption flows.
- Hence, in accordance with economic theory: precious metals distinguished by:
 - The extent to which they are held for financial security or anticipation of capital gains, and
 - (Dis)hoarding flows can exceed production and consumption flows.

Short-run Supply and Demand Stock-flow Model



S_C = Supply curve

Q_C = Supply capacity quantity

D_h = (Dis)hoarding demand curve

D_f = Fabrication demand curve

D_T = Total demand curve ($= D_f + D_h$)

P^* = Equilibrium price

P' = No net (dis)hoarding price

Q_h = Hoarding demand quantity

Q_f = Fabrication demand quantity

Q_T = Total demand quantity ($= Q_f + Q_h$)

Accumulation can be modeled in accord with economic rationale

Rational accumulation of another unit of precious metal
when the net marginal benefit (anticipated price gain)
equals the net marginal cost (net marginal cost of storage):

$$P_F^* - P_0 = \text{NMSC}$$

P_F^* = Anticipated future price

P_0 = Current price

Net marginal cost of storage (with three components):

$$\text{NMSC} = \text{MOC} + \text{MIC} - \text{MCY}$$

MOC = Marginal outlay cost (warehousing and insurance)

MIC = Marginal interest cost (time value of money)

MCY = Marginal convenience yield

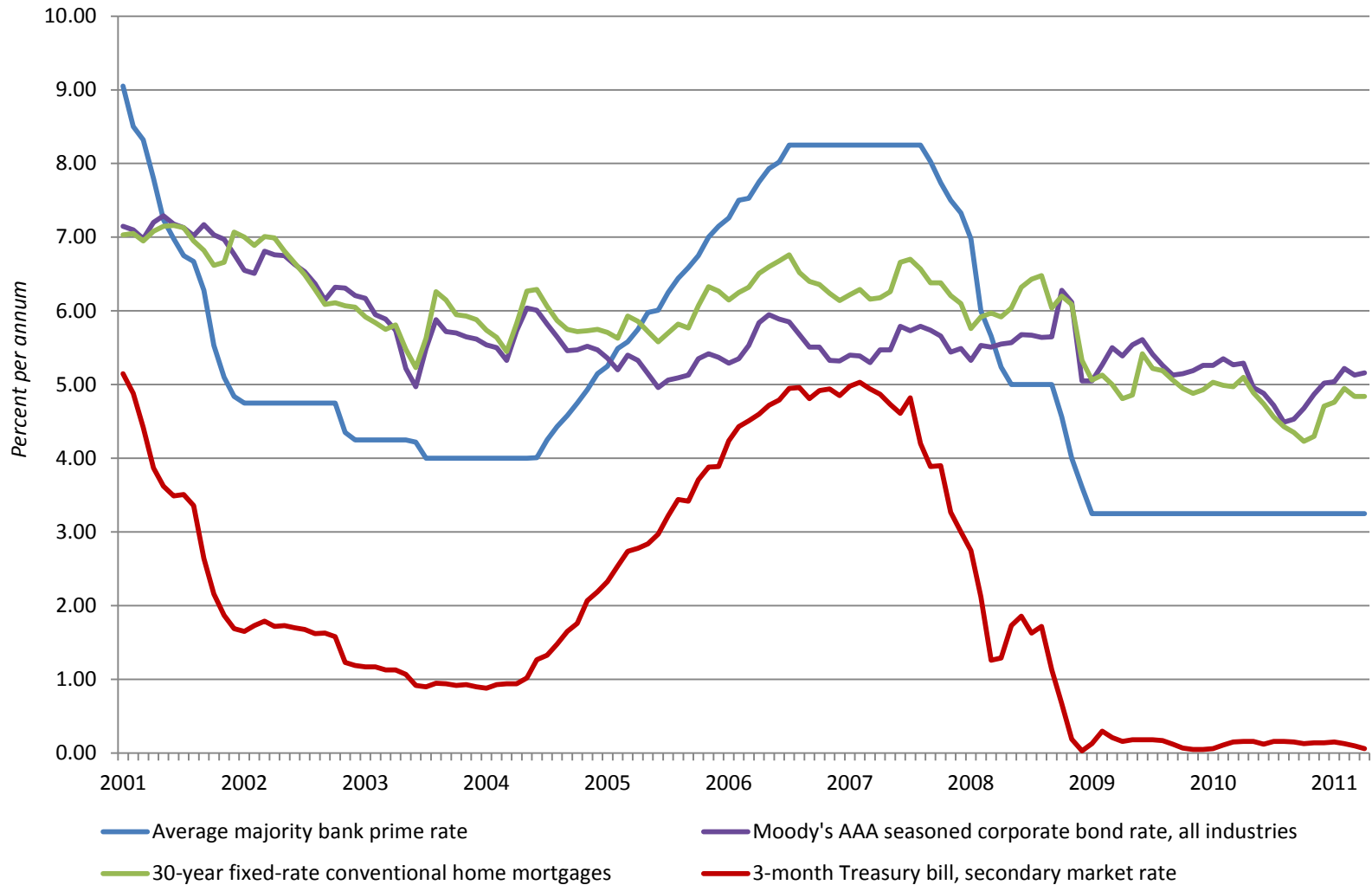
Precious-metal prices are interest-rate sensitive

- High unit values lead to predominance of the MIC (time value of money):

$$P_F^* = P_0 (1 + r_{\text{nom}})^t$$

- Hence, precious metal prices are sensitive to both anticipated **future prices** P_F^* and prevailing **nominal interest rates** r_{nom} .

Monthly average nominal interest rates, January 2001 to April 2011



Source: Compiled from official statistics of the U.S. Federal Reserve Bank.

Precious-metal prices are also sensitive to inflation

- Precious metal prices are also sensitive to **inflation** (I) which is a component of nominal interest rates r_{nom} :

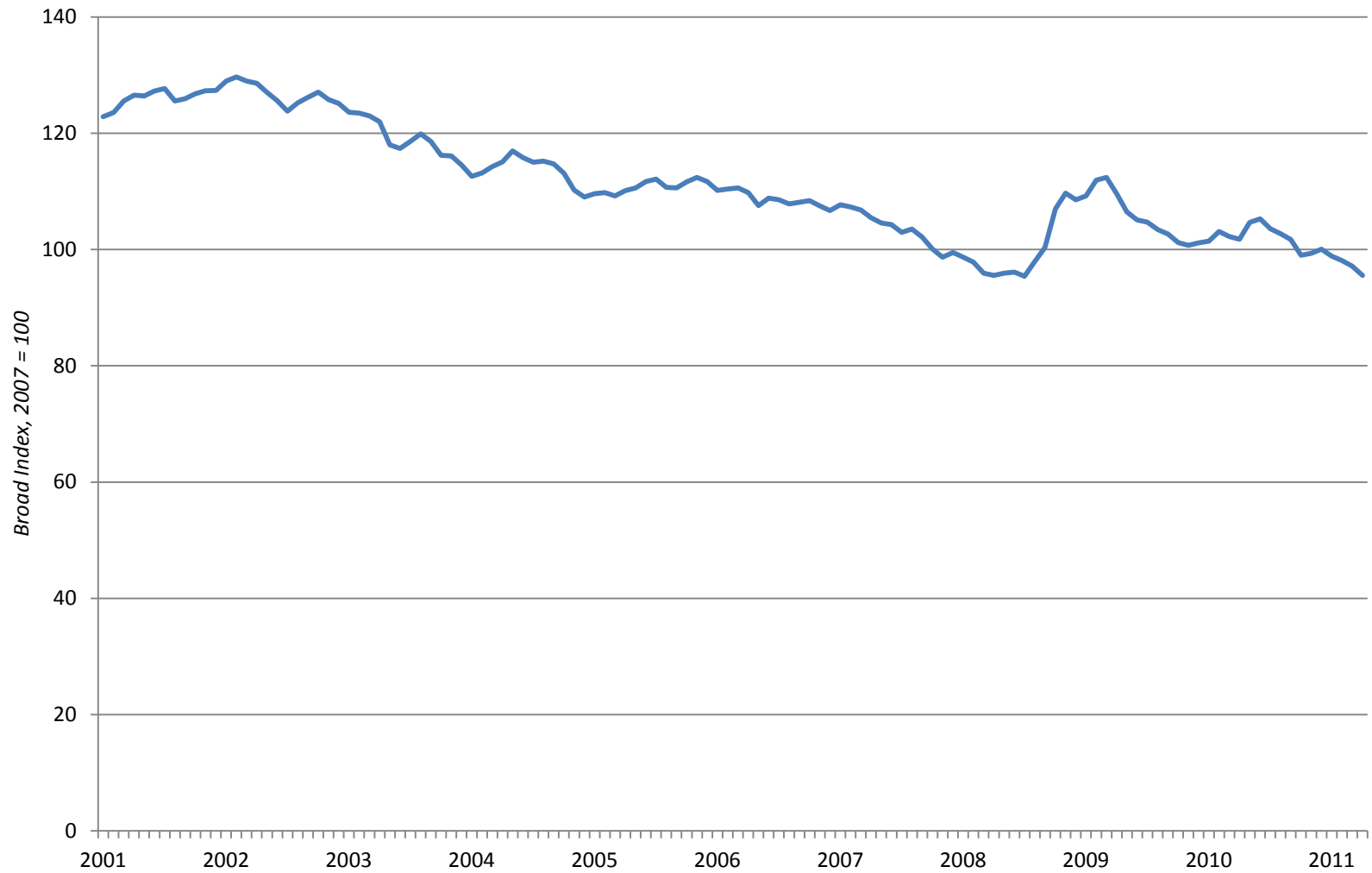
$$r_{\text{nom}} = r_{\text{real}} + I$$

$$P_F^* = P_0 (1 + (r_{\text{real}} + I))^t$$

Precious-metal prices are also exchange-rate sensitive

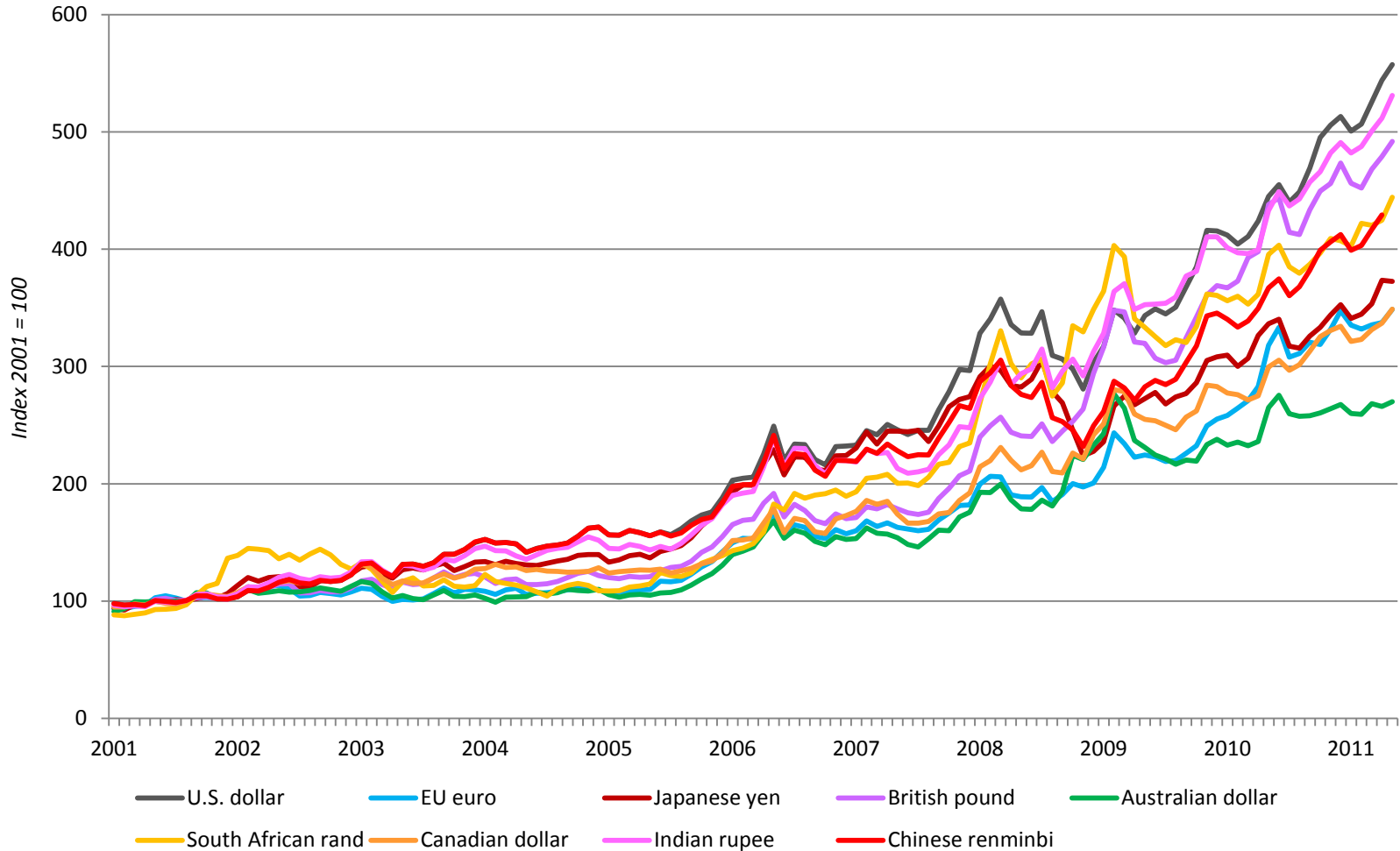
- Global trade in precious metals— generally denominated in U.S. dollars.
- Recent weakness of the U.S. dollar against many foreign currencies— cheaper precious-metal prices in foreign-currency terms for foreign purchasers.

U.S. dollar foreign exchange rate, broad index, January 2001 to April 2011



Source: Compiled from official statistics of the U.S. Federal Reserve Bank.

Indices of monthly average gold prices in selected currencies, per troy ounce, London fix, January 2001 to May 2011



Source: Compiled from official statistics of the World Gold Council.

Precious metals can be complements or substitutes

Depending on current relative price levels and anticipated future price levels, and other factors, precious metals can be:

- Complements—increased investment in gold can also prompt increased investment in silver and PGMs.
- Substitutes—increased gold prices may encourage consumer switching to cheaper silver-containing products.

Precious-metals pricing

- Hence, economic theory provides the basis for multivariate time-series **modeling** of precious-metals prices:
 - Selection of explanatory variables and
 - Model specification.
 - Results based on economic theory rather than “ad-hoc” explanatory variables selection and model specification.
- Likewise, economic theory provides the basis for attempts to **forecast** precious-metals prices:
 - Selection of explanatory variables and
 - Model specification.
 - Results based on economic theory rather than ad-hoc specification— but not guarantees of the accuracy of such “ex-ante” forecasts.

Thank You!

