U.S. INTERNATIONAL TRADE COMMISSION

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A PRESENTATION BY

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“ECONOMICS OF PRECIOUS METALS”

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What can economic theory tell us about the price behavior of precious metals?
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
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
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.
Gold hits record on US growth concerns

Dollar extends fall after Fed statement
Austalian currency surges ahead

By Michael Kitchen

The dollar sank to a three-year low against the yen on Thursday on the back of the Federal Reserve's decision to keep interest rates unchanged.

The Fed's decision to keep interest rates unchanged was seen as a sign that the US economy is still struggling to recover from the recent crisis.

The dollar was trading at 76.85 yen, down 0.3% from the previous day's close.

Source: Reuters

Financial Times, April 29, 2011, p. 22.
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. 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 $46.08 per 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 into force Saturday. To trade silver futures, investors typically pay only the margins, which cost a fraction of a contract's full value of about $230,500.

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 cost a silver 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 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 per 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.

Source: Compiled from statistics of the Silver Institute.

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

- Jewelry: 54.0%
- Cast & minted bars: 18.7%
- Investment funds: 8.9%
- Medallions: 2.0%
- Official coins: 5.4%
- Electronics: 7.5%
- Dentistry: 1.3%
- Other industrial: 2.2%

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

- Industrial: 46.1%
- Photography: 6.9%
- Jewelry: 15.8%
- Silverware: 4.8%
- Coins & medallions: 9.6%
- Implied net investment: 16.8%

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
- Jewelry: 32.0%
- Autocatalysts: 39.5%
- Investment items: 5.8%
- Chemicals: 4.8%
- Electrical: 3.0%
- Medical & biomedical: 3.4%
- Other: 3.3%
- Petroleum: 2.3%
- Dental: 6.9%

**Palladium:**
- Global demand = 8.9 million troy ounces
- Jewelry: 7.0%
- Investment items: 7.5%
- Electronics: 15.7%
- Dental: 6.9%
- Chemicals: 4.3%
- Autocatalysts: 57.6%
Rhodium and Iridium: global demand by end-use sectors, 2010

Source: Compiled from statistics of Johnson Matthey.

**Rhodium:**
- Autocatalysts: 83.0%
- Chemicals: 7.6%
- Electrical: 0.5%
- Glass: 6.5%
- Other: 2.4%

**Global demand:** 867,000 troy ounces

**Iridium:**
- Autocatalysts: 11%
- Electronics: 30%
- Electrochemical: 25%
- Other: 34%

**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

- Electronics 75.6%
- Electrochemical 11.7%
- Chemicals 8.6%
- Other 4.1%

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

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).
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

\[ S_c = \text{Supply curve} \]
\[ D_h = (\text{Dis})\text{hoarding demand curve} \]
\[ D_f = \text{Fabrication demand curve} \]
\[ D_T = \text{Total demand curve} \ (= D_f + D_h) \]
\[ P^* = \text{Equilibrium price} \]
\[ P' = \text{No net (dis)hoarding price} \]
\[ Q_h = \text{Hoarding demand quantity} \]
\[ Q_f = \text{Fabrication demand quantity} \]
\[ Q_T = \text{Total demand quantity} \ (= Q_f + Q_h) \]
\[ Q_c = \text{Supply capacity quantity} \]

Source: Tilton (1985)
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):

\[ P_F^* - P_0 = NMSC \]

- \( P_F^* = \) Anticipated future price
- \( P_0 = \) Current price

Net marginal cost of storage (with three components):

\[ NMSC = MOC + MIC - MCY \]

- \( MOC = \) Marginal outlay cost (warehousing and insurance)
- \( MIC = \) Marginal interest cost (time value of money)
- \( MCY = \) Marginal convenience yield

Source: Abken (1980) and others.
Precious-metal prices are interest-rate sensitive

- High unit values lead to predominance of the MlC (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 $r_{\text{nom}}$. 
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 \( r_{\text{nom}} \):

\[
r_{\text{nom}} = r_{\text{real}} + I
\]

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

AND HERE WE SEE TWENTY ENDMEMBERS BASED ON CLAY CONTENT AND LITHIC SIZE. I'LL NOW DESCRIBE EACH ACCORDING TO THE STATISTICAL PARAMETERS. AND FURTHERMORE, EXPLAIN THE AUGGH!

CLUNK!

CREAK

“ANOTHER LONG WINDED SPEAKER....”