Topic: Price Discovery of Gold in Indian Spot market

Name of presenter: Himanshu Sharma

Name of authors: Himanshu Sharma and Abhishek Haider

Name of institution affiliated to: Bank of America and IIM Ahmedabad

Introduction

- India is considered as a consumer and not a producer of gold. This implies that the country doesn't mine gold. India relies heavily on imports to meet existing gold demand.

- India's primary demand for gold is for use as jewelry. Investments are the next greatest demand driver. Unlike China, the next highest consumer of gold in the world, whose primary demand for gold is for industrial purposes, India's industrial usage of gold is minimal.

- Majorly imported from countries like Switzerland (49%), Ghana (12%), UAE (11%)

Price discovery is one of the central functions of financial markets. In the market microstructure literature, it has been variously interpreted as, "the search for an equilibrium price" (Schreiber and Schwartz (1986)), "gathering and interpreting news" (Baillie et. al. (2002)), "the incorporation of the information implicit in investor trading into market prices" (Lehmann (2002)).

Gold Fabrication Demand
Annual, Projected Through 2015
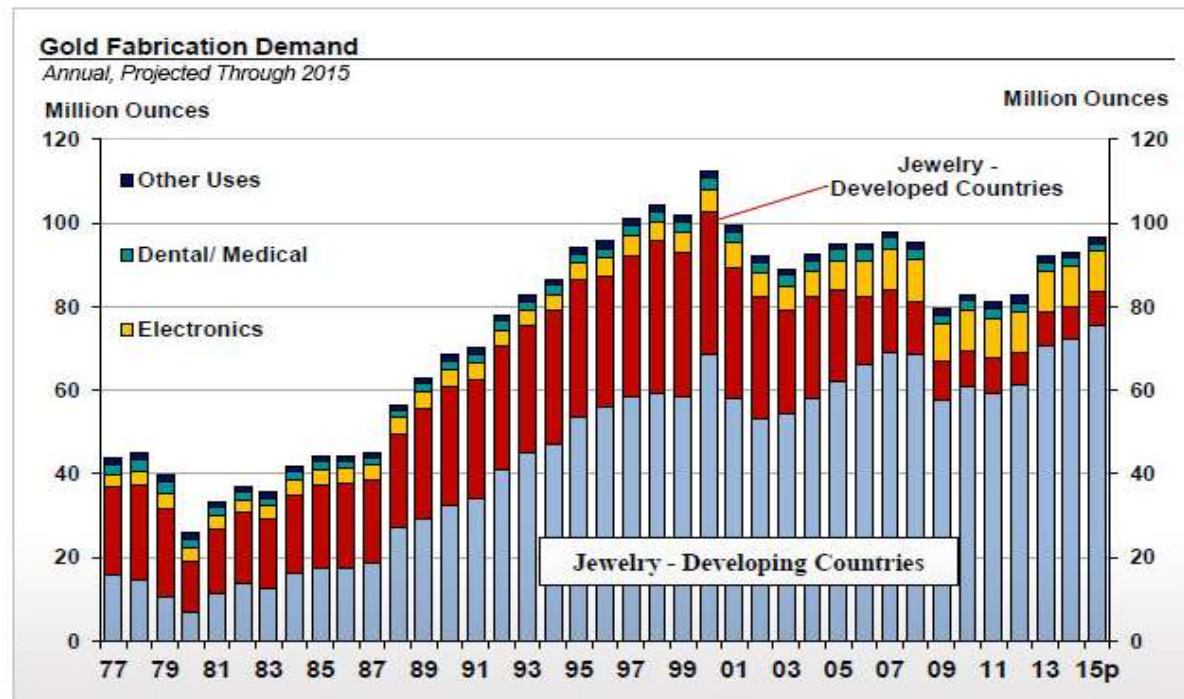
There are a number of factors which cause gold rates in India to fluctuate. Some of the factors have been discussed below:

- **Demand-Supply equation**
- **Global production cost**
- **Industrial uses**
- **Rupee-dollar equation**
- **Global crises:** Due to global crises, investors lose confidence in stock market investments and instead prefer to invest in stable and precious gold.
- **Inflation rate:** Due to the surge in the inflation rates, the value of our currency goes down. This is when most people tend to hold money in the form of gold due to its ability to hedge against financial and economic crises.
- **Interest Rates:** An exception on interest gain where Government of India's Sovereign Gold Bonds offer 2.50% fixed interest annually. When the RBI hikes interest rates, people start selling gold to invest in bank deposits and government bonds.

Large market volatility and shifted demand for safer assets have increased the importance of Gold as an investment asset. We aim to investigate the determinants of price discovery of gold in Indian spot markets which could be utilized for exploitation of any arbitrage opportunities and for policy makers for gold markets and gold products

Methodology

- Gold futures prices and volume taken from Intercontinental Exchange (ICE) and Mumbai bullion gold prices released from RBI is taken as a source for spot prices of gold in India.

- Period of study is from Jan 2009 to June 2019 for a period of about 10 years on a monthly frequency basis

- Data transformation: Log returns for stationarity of data

- Unit root (Stationarity) tested by ADF test: Dataset was found to be stationary

- Multivariate regression was done to understand how are the future prices affected by the prices in Indian spot market and volume traded.

$$F_t = -0.000737 + 0.91437\ S_p + 0.001698\ V_t\ (R^2 = 37\%)$$

- After establishing the series is stationary we had applied VAR model to predict interrelated time series and dynamic effects and allow the value of a variable to depend on its own lags and the lags of other variables.

- Granger causality test: To investigate effect of Lag 1 futures and Lag 2 futures cause together on spot prices. It is also to check whether L1 spot and L2 spot can together effect futures prices or not and how much effect spot lags and futures lags have on the volumes

Result and Discussion

- Multivariate Regression:
  - We observe a high F value which means that there is a high variation between the group means of the model and the error.
  - The probability value of less than 5% implies that the null hypothesis that the variances are equal is rejected.
  - R squared: 37% implies there is a large unexplained part of international gold futures that is not affected by these spot prices and volume traded.
  - Coefficient of spot prices is significant however coefficient of volume traded is insignificant in determination of futures prices
  - The negative constant coefficient tells that international gold prices will suffer a decline in the absence of Indian trading of gold stocks.

- The cumulative periodogram should ideally follow the 45-degree line because under the null hypothesis of white noise, it is an asymptotic set of exponential random variables.

- Since some of the datapoints go beyond the extreme lines of the periodogram, there exist unexplained disturbances which are beyond the white noise of residual term.

- The line plot between the futures and spot prices portray a very high correlation between the two. Also, the peaks and troughs show seasonality at regular intervals. In case of extreme variation, the troughs of futures does not necessarily result in trough of spot prices. It means that although international prices of gold may go down, there is sufficient buffer for the domestic spot prices to remain at normal levels.

Cumulative Periodogram White-Noise Test

Bartlett's (B) statistic = 2.48   Prob > B = 0.0000
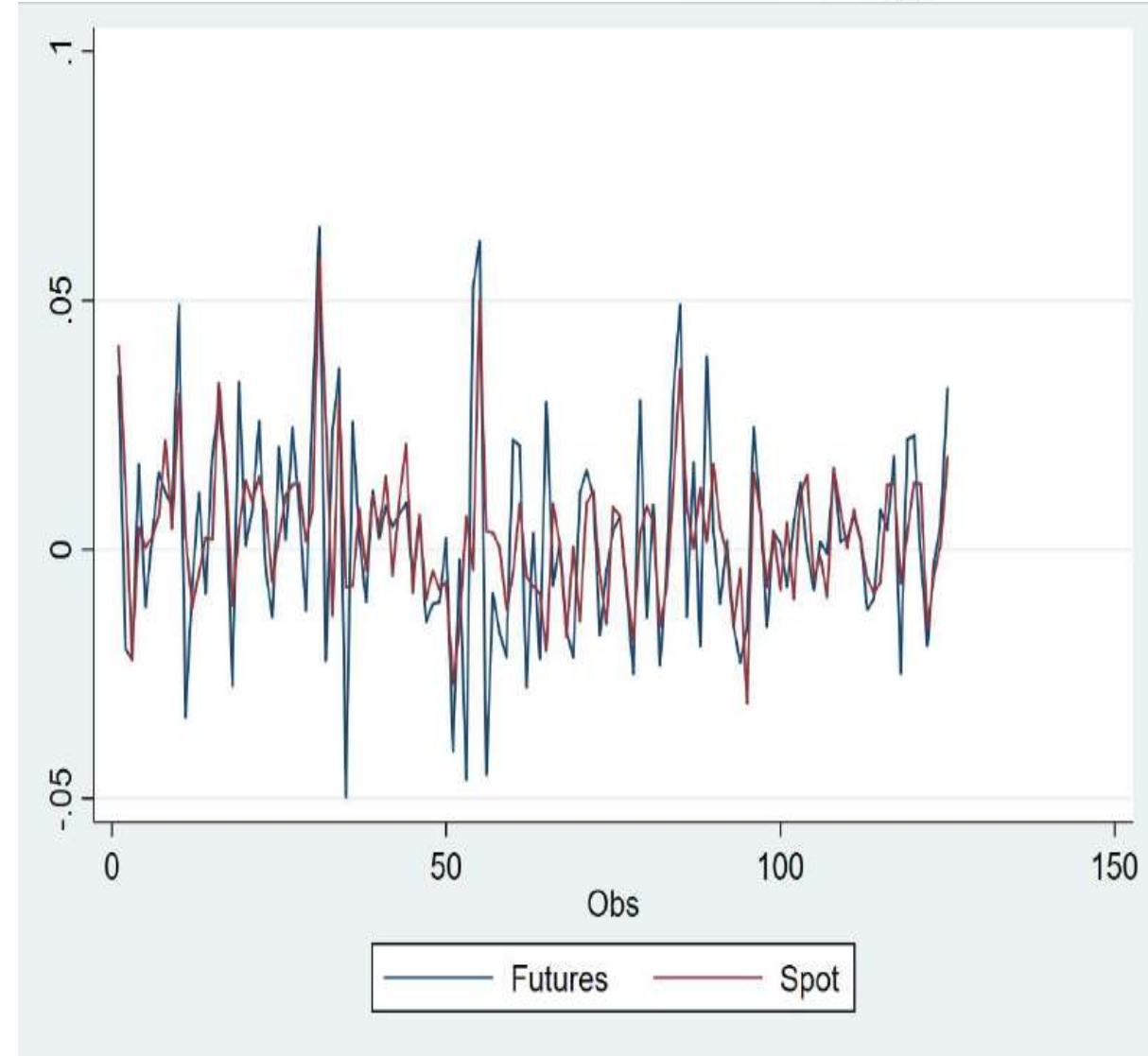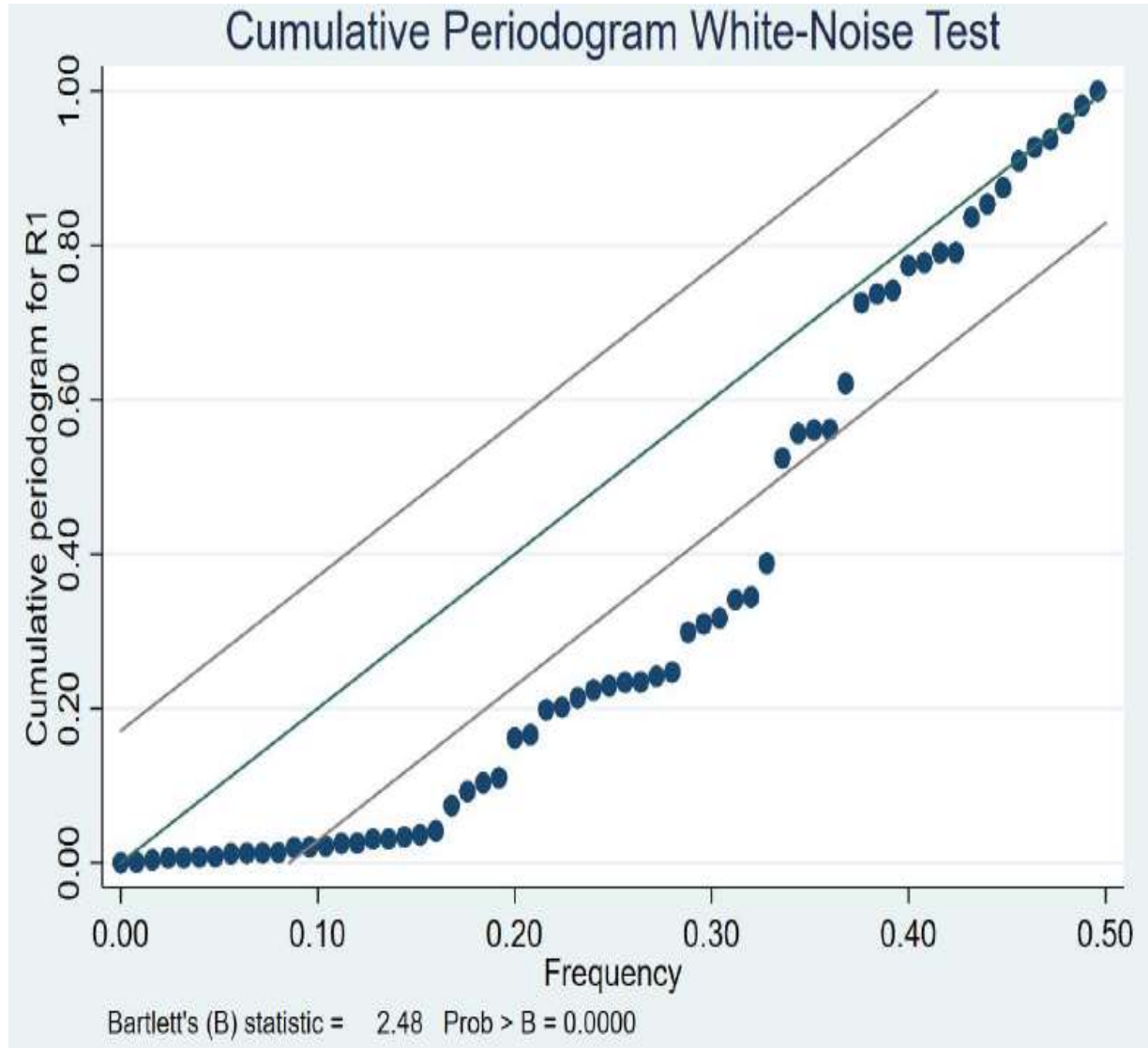
- Higher log-likelihood value signifies that the explanatory variables better fit into the response variable.
- Probability of less than 5% means variables are significant in hypothesis testing
- This shows that spot prices are dependent on lagged values of Futures prices and its own prices and not dependent on the volume traded in the market

		Coef.	Std. Err.	z	P>|z|
Futures					
Futures					
	L1.	-.1657212	.1356383	-1.22	0.222
	L2.	-.2600388	.1503312	-1.73	0.084
Spot					
	L1.	-.0060659	.2410741	-0.03	0.980
	L2.	.209377	.1625694	1.29	0.198
Volume					
	L1.	-.0029083	.0029227	-1.00	0.320
	L2.	-.0027744	.0029158	-0.95	0.341
	_cons	.0032295	.0019106	1.69	0.091
Spot					
Futures					
	L1.	.4672632	.0766635	6.09	0.000
	L2.	.0226326	.084968	0.27	0.790
Spot					
	L1.	-.3179637	.1362563	-2.33	0.020
	L2.	.0970103	.0918851	1.06	0.291
Volume					
	L1.	-.0005423	.0016519	-0.33	0.743
	L2.	-.0009703	.001648	-0.59	0.556

Application

- Decision to invest in gold is not just 'at what price' but also when, how and how much. Gold prices, gold price trends and movements, investment channels and returns on investing in gold are all important factors to consider.

- The troughs of international gold fluctuations does not necessarily converge with the domestic gold prices and in this case, the lagged effect is feeble or negligible. The consumer sentiment keeps the gold prices resilient to international headwinds. Therefore, this study can help the policy makers to tap this demand in an effective way by designing specialized seasonal gold products.

- Our results show that the lagged volumes of traded gold stocks do not affect the futures or spot prices of gold. Rather, the lagged futures prices cause change in spot prices of domestic gold prices. This implies that the investors can expect a lagged impact on gold prices in India if there are international gold price fluctuations. This entails the risk in investing in gold asset and provides a hedge option by other asset classes. The social implication of this study is demonstrated during the festival and wedding season when the demand for gold in India surges.

- The implications of this paper also become important from the point of view of policymaking for gold markets and trading. The fluctuation of domestic spot prices has been highly correlated with international gold futures prices on one hand while troughs also being affected by the domestic factors showing price stickiness. It can help arbitrageurs in designing algorithms to account for this stickiness as well as incorporating information from the global futures gold price data and increase depth of market.

Thank you..