A STUDY OF HISTORICAL PRICE VOLATILITY IN INDIAN COMMODITY MARKET WITH SPECIAL REFERENCE TO GOLD AND SILVER

by

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A PROJECT REPORT

submitted

In partial fulfillment of the requirements
for the award of the degree

of

MASTER OF BUSINESS ADMINISTRATION

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BONAFIDE CERTIFICATE

Certified that this project report titled, "**A Study Of Historical Price Volatility in Indian Commodity Market with Special Reference to Gold and Silver**" is the bonafide work of **Mr.V.GOWTHAM (1120400033)** who carried out the project under my supervision. Certified further, that to the best of my knowledge the work reported herein does not form part of any other project report or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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DECLARATION

I affirm that the project work titled "**A STUDY OF HISTORICAL PRICE VOLATILITY IN INDIAN COMMODITY MARKET WITH SPECIAL REFERENCE TO GOLD AND SILVER**" being submitted in partial fulfillment for the award of Master of Business Administration is the original work carried out by me. It is not a part of any other project work submitted for the award of any degree or diploma, either in this or any other university.

Signature of the Candidate

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I certify that the declaration made above by the candidate is true.

Signature of the Guide

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SYNOPSIS

The objective is to analyze the Historical Price Volatility of the Gold and Silver in Indian commodity market and to find out the relationship between gold and silver price volatility. The data has been collected from the Multi Commodity Exchange of India. The period of the study is 8 years from 2004 to 2011. The standard deviation and correlation tools have used to find out the objectives. As per the empirical result, there is a positive relationship between the gold and silver price volatility.

CHAPTER 1
1. INTRODUCTION

1.1 About the study

Commodity markets are markets where raw or primary products are exchanged. These raw commodities are traded on regulated commodities exchanges, in which they are bought and sold in standardized contracts. Commodity market is an important constituent of the financial markets of any country. It is the market where a wide range of products, viz., precious metals, base metals, crude oil, energy and soft commodities like palm oil, coffee etc.

Evolution of commodity market

Commodities future trading was evolved from need of assured continuous supply of seasonal agricultural crops. The concept of organized trading in commodities evolved in Chicago, in 1848. But one can trace its roots in Japan. In Japan, merchants used to store Rice in warehouses for future use. To raise cash warehouse holders sold receipts against the stored rice. These were known as “rice tickets”.

Eventually, these rice tickets become accepted as a kind of commercial currency. Latter on rules came in to being, to standardize the trading in rice tickets. In 19th century Chicago in United States had emerged as a major commercial hub. So that wheat producers from Mid-west attracted here to sell their produce to dealers & distributors. Due to lack of organized storage facilities, absence of uniform weighing & grading mechanisms producers often confined to the mercy of dealers discretion. These situations lead to need of establishing a common meeting place for farmers and dealers to transact in spot grain to deliver wheat and receive cash in return. Gradually sellers & buyers started making commitments to exchange the produce for cash in future and thus contract for “futures trading” evolved.

This is why Chicago Board of Trade (CBOT) was established in 1848. In 1870 and 1880s the New York Coffee, Cotton and Produce Exchanges were born. Agricultural commodities were mostly traded but as long as there are buyers and sellers, any commodity can be traded. In 1872, a group of Manhattan dairy merchants got together to bring chaotic condition in New York market to a system in terms of storage, pricing, and transfer of agricultural products. In 1933, during the Great Depression, the Commodity Exchange, Inc. was established in New York through the merger of four small exchanges – the National Metal Exchange, the Rubber Exchange of New York, the National Raw Silk Exchange, and the New York Hide Exchange.

The largest commodity exchange in USA is Chicago Board of Trade, The Chicago Mercantile Exchange, the New York Mercantile Exchange, the New York Commodity Exchange and New York Coffee, sugar and cocoa Exchange. Worldwide there are major futures trading exchanges in over twenty countries including Canada, England, India, France, Singapore, Japan, Australia and New Zealand.

History of Commodity Market in India

The history of organized commodity derivatives in India goes back to the nineteenth century when Cotton Trade Association started futures trading in 1875, about a decade after they started in Chicago. Over the time datives market developed in several commodities in India. Following Cotton, derivatives trading started in oilseed in Bombay (1900), raw jute and jute goods in Calcutta (1912), Wheat in Hapur (1913) and Bullion in Bombay (1920).

The parliament passed the Forward Contracts (Regulation) Act, 1952, which regulated contracts in Commodities all over the India. The act prohibited options trading in Goods along with cash settlement of forward trades, rendering a crushing blow to the commodity derivatives market. Under the act only those associations/exchanges, which are granted reorganization from the Government, are allowed to organize forward trading in regulated commodities. The act envisages three tire regulations: (i) Exchange which organizes forward trading in commodities can regulate trading on day-to-day

basis; (ii) Forward Markets Commission provides regulatory oversight under the powers delegated to it by the central Government. (iii) The Central Government- Department of Consumer Affairs, Ministry of Consumer Affairs, Food and Public Distribution is the ultimate regulatory authority. However many feared that derivatives fuelled unnecessary speculation and were detrimental to the healthy functioning of the market for the underlying commodities, resulting in to banning of commodity options trading and cash settlement of commodities futures after independence in 1952.

The commodities future market remained dismantled and remained dormant for about four decades until the new millennium when the Government, in a complete change in a policy, started actively encouraging commodity market. After Liberalization and Globalization in 1990, the Government set up a committee (1993) to examine the role of futures trading. The Committee (headed by Prof. K.N. Kabra) recommended allowing futures trading in 17 commodity groups. It also recommended strengthening Forward Markets Commission, and certain amendments to Forward Contracts (Regulation) Act 1952, particularly allowing option trading in goods and registration of brokers with Forward Markets Commission.

Multi Commodity Exchange of India Limited (MCX)

Multi Commodity Exchange of India Limited (MCX) is an independent and de-mutualised exchange with permanent reorganization from Government of India, having Head Quarter in Mumbai. Key share holders of MCX are Financial Technologies (India)Limited, State Bank of India, Union Bank of India, Corporation Bank of India, Bank of India and Canara Bank. MCX facilitates online trading, clearing and settlement operations for commodity futures market across the country.

MCX started of trade in Nov 2003 and has built strategic alliance with Bombay Bullion Association, Bombay Metal Exchange, Solvent Extractors Association of India, pulses Importers Association and Shetkari Sanghatana. MCX deals with about 100commodities

Gold

Definition:

Gold is the oldest precious metal known to man and for thousands of years it has been valued as a global currency, a commodity, an investment and simply an object of beauty.

Major Characteristics

- Gold (Chemical Symbol-Au) is primarily a monetary asset and partly a commodity.
- Gold is the world's oldest international currency.
- Gold is an important element of global monetary reserves.
- With regards to investment value, more than two-thirds of gold's total accumulated holdings is with central banks' reserves, private players, and held in the form of high-karat jewellery.
- Less than one-third of gold's total accumulated holdings are used as “commodity” for jewellery in the western markets and industry.

Global Scenario

- London is the world’s biggest clearing house.
- Mumbai is under India's liberalised gold regime.
- New York is the home of gold futures trading.
- Zurich is a physical turntable.
- Istanbul, Dubai, Singapore, and Hong Kong are doorways to important consuming regions.
- Tokyo, where TOCOM sets the mood of Japan.

Indian Scenario

- India is the largest market for gold jewellery in the world. 2010 was a record year for Indian jewellery demand; at 745.7 tonnes, annual demand was 13% above the previous peak in 1998. In local currency terms, Indian jewellery demand more than doubled in 2010.
- A 20% rise in the rupee price of gold combined with a 69% rise in the volume of demand, pushed up the value of gold demand by 101% to ₹1,342 billion. This compares with 2009 demand of ₹669 billon.
- The rising price of gold, particularly in the latter half of 2010, created a 'virtuous circle' of higher price expectations among Indian consumers, which fuelled purchases, thereby further driving up local prices.

Factors Influencing the Market

- Above ground supply of gold from central bank's sale, reclaimed scrap, and official gold loans.
- Hedging interest of producers/miners.
- World macroeconomic factors such as the US Dollar and interest rate, and economic events.
- In India, gold demand is also determined to a large extent by its price level and volatility.

Silver

Definition:

A soft white metallic element, sonorous, ductile, very malleable, and capable of a high degree of polish. It is found native, and also combined with sulphur, arsenic, antimony, chlorine, etc., in the minerals argentite, proustite, pyrargyrite, ceragyrite, etc. Silver is one of the "noble" metals, so-called, not being easily oxidized, and is used for coin, jewellery, plate, and a great variety of articles. Symbol Ag (Argentums). Atomic weight Specific gravity.

Major Characteristics

- Silver (Chemical Symbol-Ag) is a brilliant grey-white metal that is soft and malleable.
- Silver has unique properties such as its strength, malleability, ductility, electrical and thermal conductivity, sensitivity, high reflectance of light, and reactivity.
- The main source of silver is in lead ore, although it can also be found associated with copper, zinc and gold and produced as a by-product of base metal mining activities.
- Secondary silver sources include coin melt, scrap recovery, and dis-hoarding from countries where export is restricted. Secondary sources are price sensitive.
- Silver is unique amongst metals due to the fact that it can be classified as both a precious metal and an industrial metal.
- Today, silver is sought as a valuable and practical industrial commodity and as an investment.
- Silver is an important element of global monetary reserves.
- It is an effective portfolio diversifier.

Global Scenario

- Silver is predominantly traded on the London Bullion Market Association (LBMA) and COMEX in New York.
- LBMA, as the global hub of over-the-counter (OTC) trading in silver, is its main physical market. Comex is a futures and options exchange, where most fund activity is focused.
- Silver is invariably quoted in the US dollars per troy ounce.

Indian Scenario

- India's silver demand averages 2500 tonnes per year, whereas the country's production was around 206.95 tonnes in 2010.
- Nearly 60% of India's silver demand comes from farmers and rural India, who store their savings in silver bangles and coins

Factors Influencing the Market

- Economic events such as national industrial growth, global financial crisis, recession, and inflation affect metal prices.
- Commodity-specific events such as the construction of new production facilities or processes, unexpected mine or plant closures, or industry restructuring, all affect metal prices.
- Governments set trade policy (implementation or suspension of taxes, penalties, and quotas) that affect supply by regulating (restricting or encouraging) material flow.
- A faster growth in demand against supply often leads to a drop in stocks with the government and investors.
- In India, the real industrial demand occupies a small share in the total industrial demand of silver. This is in sharp contrast to most developed economies.
- In India, silver demand is also determined to a large extent by its price level and volatility.

1.2 About the Company

Religare Securities Limited

Religare Securities Ltd. (RSL), a wholly owned subsidiary of Religare Enterprises Limited (REL), an emerging markets financial services group is one of the market leading securities firm in India. The company offers equity & currency broking services to more than 7, 50,000 clients using both, offline and online platforms and also offers depository participant services. RSL is a member of the NSE, BSE, MCXSX, USE and a depository participant with NSDL and CDSL. RSL employs more than 4800 employees and has a wide distribution reach that spans across more than 1500 locations in India.

Religare is an emerging markets financial services group with a presence across Asia, Africa, Middle East, Europe, and the Americas. In India, Religare's largest market, the group offers a wide array of products and services including broking, insurance, asset management, lending solutions, investment banking and wealth management. With 10,000-plus employees across multiple geographies, Religare serves over a million clients, including corporate and institutions, high net worth families and individuals, and retail investors.

We ensure you have a superlative trading experience through -

• A highly process driven, diligent approach

• Powerful Research & Analytics and

• One of the "best-in-class" dealing rooms

Further, Religare also has one of the largest retail networks. Now, you can walk into any of our branches and connect to our highly skilled and dedicated relationship managers to get the best services.

LIFE INSURANCE

Religare in partnership with Aegon, one of the world's largest life insurance and pension groups, operates its Life Insurance business in India under a Joint venture, Aegon Religare Life Insurance Company Limited.

ASSET MANAGEMENT

Religare Asset Management Company Limited is a wholly owned subsidiary of Religare Securities Limited (RSL), which in turn is a 100% subsidiary of Religare Enterprises Limited. It operates out of 60* locations across 57 cities in India, the AMC, as on 28th Feb 2010 had an AUM of over INR 148 bn with over 230,000 investor folios.

EQUITY TRADING

Trading in Equities with Religare truly empowers you for your investment needs. We ensure you have a superlative trading experience through -

- A highly process driven, diligent approach
- Powerful Research & Analytics and
- One of the "best-in-class" dealing rooms

ONLINE INVESTMENT PORTAL

Religare Online is your single gateway for all your financial needs. Now you not just trade online in Equities, Commodities, invest in Mutual Funds, buy Insurance, but also get Trade Rewards each time you invest online with our 360 degree portal.

INSURANCE SOLUTIONS

Religare with one of the largest retail networks in the country offers a complete range of insurance solutions though its 100% subsidiary company, Religare Insurance

Broking Limited (RIBL). The company holds a composite broker's license operating in the Life, General and Reinsurance domains.

LOANS

Structurally all business are operated through various subsidiaries held through the holding company Religare Enterprises Limited. One such wholly owned subsidiary of REL is Religare Finvest Limited registered with the Reserve Bank of India as a Non-Banking Finance Company (NBFC) and is a Member of CDSL.

COMMODITIES TRADING

Religare Commodities Limited (RCL), a wholly owned subsidiary of Religare Enterprises Limited was initiated to spearhead Exchange based Commodity Trading. As a member of NCDEX, MCX and NMCE, RCL, present in 529 locations provides options in both agri and non-agri commodities for Exchange based commodity trading backed by incisive dedicated research.

1.3 STATEMENT OF THE PROBLEM

In recent years the price movements and fluctuations of the precious metals vary from time to time. Investors do not have enough awareness about the volatility in gold and silver. The relationship between the Gold and Silver price volatility is not known.

1.4 SCOPE OF THE STUDY

This study measures the historical price volatility in gold and silver. This deals with Multi Commodity Exchange of India. This helps to find out the relationship between the gold and silver price volatility.

CHAPTER 2

2. REVIEW OF LITERATURE

This chapter deals with research studies of volatility in commodity market.

Pipattadanukul and Chintrakarn[1]: This study shows that if there are short-run and long-run relationships between gold and silver futures prices, it implied that gold can be used as a predictor to forecast silver as well. This result revealed that there is a robust positive relationship between gold and silver future prices in long run. For the short run relationship, change in the silver futures price significantly affects the gold price and vice versa.

C. Ciner[2]: This study examines the long run trend between the prices of gold and silver futures contracts traded on the Tokyo Commodity Exchange and concludes that the stable relationship between gold and silver prices has disappeared in the 1990s. It is indicated that these two markets should be approached as separate markets and changes in the gold to silver ratio should not be used to predict prices in the future. Also implied is that these two markets should not be regarded as substitutes to hedge against similar types of risks.

Jonathan A Batten and Brian Lucey[3]: This study investigates the volatility structure of gold, trading as a futures contract on the Chicago Board of Trade (CBOT) using intraday (high frequency) data from January 1999 to December 2005. Apart from investigating the now familiar GARCH properties they also utilize a rarely used measure of volatility–the Garman Klass estimator – to provide new insights in intraday and interday volatility. The results suggest significant variation across the trading day and week consistent with microstructure theories, although volatility is only slightly positively correlated with volume when measured by tick-count.

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[1] Pipattadanukul and Chintrakarn(2012) “Analyzing Long and Short-run Relationships Between Comex Gold and Silver Futures” Journal of Applied Sciences

[2] C. Ciner (2001) “On the long run relationship between Gold and Silver prices A note” Global Finance Journal 12 (2001) 299–303

[3] Jonathan A Batten and Brian Lucey (2007) “ Volatility in the Gold Futures Market”

S. Asha Prasuna, Krishnan Chari, S.N.V. Siva Kumar[4]: Value at Risk (V-a-R) models have been popularly used to quantify the exposure of a given entity in various financial instruments. In view of the recent spurt and volatility in gold prices due to various reasons, this paper analyzes the Indian gold price dynamics. Indian banks have been more active in the Bullion market in the recent years. In this context, a comparative study of different types of V-a-R models is used to suggest a logical linkage to arrive at policy formulation by the banks.

Dipak Ghosh,Eric J. Levin,Peter Macmillan,Robert E. Wright[5]:This paper attempts to reconcile an apparent contradiction between short-run and long-run movements in the price of gold. The theoretical model suggests a set of conditions under which the price of gold rises over time at the general rate of inflation and hence be an effective hedge against inflation. The model also demonstrates that short-run changes in the gold lease rate, the real interest rate, convenience yield, default risk, the covariance of gold returns with other assets and the dollar/world exchange rate can disturb this equilibrium relationship and generate short-run price volatility.

Erin Mastrangelo[6]: This paper is to address whether natural gas prices have been more volatile in recent years and identify potential market factors that may contribute to price volatility. In addition to a first-order autoregressive error model, several graphical and statistical tools are used to examine trends and determine influencing factors. Although there is no demonstrated long-term trend in volatility, there are seasonal patterns and volatility is correlated strongly with storage dynamics.

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[4] S. Asha Prasuna, Krishnan Chari, S.N.V. Siva Kumar, “V-a-R Model of Bullion Price Volatility for Indian Banks

[5] Dipak Ghosh,Eric J. Levin,Peter Macmillan,Robert E. Wright (2002) “Gold as an Inflation Hedge?”

[6] Erin Mastrangelo (2007) “An Analysis of Price Volatility in Natural Gas Markets” Energy Information Administration, Office of Oil and Gas

P K Mishra, J R Das , S K Mishra[7]: This paper is an attempt to analyze the causality relation that may run between domestic gold prices and stock market returns in India. The analysis provides the evidence of feedback causality between the variables. It infers that the Gold prices Granger-causes stock market returns and stock market returns also Granger-causes the gold prices in India during the period. Thus, both the variables contain some significant information for the prediction of one in terms of another.

SnehalBandivadekar and SaurabhGhosh[8]: This paper observed that the impact of introduction of index futures on spot market volatility on both S&P CNX Nifty and BSE Sensex using ARCH/GARCH technique. The empirical analysis points towards a decline in Spot market volatility after the introduction of index future due to increased impact of recent news and reduced effect of uncertainty originating from the old news. However, further investigation also reveals that the market wide volatility has fallen during the period under consideration.

Jae H. Kim and Hristos Doucouliagos[9]: This paper uses realized volatility methods to calculate daily volatility and correlation estimates for three grain futures prices (corn, soybean and wheat). According to daily realized correlations and regression coefficients, the spot returns from the three grain futures are positively related. The realized estimates are then used to evaluate the degree of volatility transmissions across grain future prices. The impulse response analysis is conducted by fitting the vector autoregressive model to realized volatility and correlation estimates, using the bootstrap method for statistical inference. The results indicate that there exist rich dynamic interactions among the volatilities and correlations across the grain futures markets.

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[7] P K Mishra, J R Das , S K Mishra (2010), "Gold Price Volatility and Stock Market Returns in India" American Journal of Scientific Research

[8] SnehalBandivadekar and SaurabhGhosh (2003), "Derivatives and Volatility on Indian Stock Market", Reserve Bank of India Occasional Papers Vol. 24, No. 3

[9] Jae H. Kim and Hristos Doucouliagos, "Realized Volatility and Correlation in Grain Futures Markets: Testing for Spill-Over Effects"

CHAPTER 3

3. RESEARCH METHODOLOGY

3.1 TYPE OF RESEARCH

It is a descriptive type of study. The study identifies the price volatility in gold and silver. This research study deals with trading in MCX.

3.2 OBJECTIVE OF THE STUDY

- To analyze the Historic Price Volatility in gold and silver.
- To analyze the correlation between Gold and Silver price volatility

3.3 SOURCES OF DATA

The study is based on Secondary Data. The data required for the study is collected from the Multi Commodity Exchange.

3.4 PERIOD OF STUDY

- To analyze the Objectives, 8 years monthly data are collected (2004 to 2011)
- The Commodity selected for the study is Gold and Silver.

3.5 TOOLS USED

- Correlation
- Standard Deviation

3.6 LIMITATION OF THE STUDY

- This study is not considering the factors influencing the commodities (Gold, Silver) price fluctuations.
- This study is restricted to Multi Commodity Exchange of India.
- The study is limited to selected commodity.

PROCESS OF ANALYSIS OF DATA

To analyze the first objective, the following process is carried out “To analyze the Historic price Volatility in Indian commodity market”

1. Return :

$$Rt = In\ (St\ /St\text{-}1)$$

Rt = Return

In = Natural log

St = Current Month Price

St-1 = Previous Month Price

2. Average Return :

$$Rm = \frac{\sum Rt}{n}$$

Rm = Average Return

n = No of months

3. Historical Volatility

$$HV = \frac{\sqrt{(Rt\text{-}Rm)^2}\ x\ \sqrt{12}}{n\text{-}1}$$

To analyze the correlation between gold and silver price volatility, the following process is carried out:

$$r = \frac{\sum (X - \overline{X}) - (Y - \overline{Y})}{\sqrt{\sum X^2 - \overline{X}^2}\sqrt{\sum Y^2 - \overline{Y}^2}}$$

CHAPTER 4

ANALYSIS AND INTERPRETATION

4.1 HISTORICAL PRICE VOLATILITY OF GOLD

Table 4.1.1 Historical price volatility of Gold during 2004

2004	St	Rt = Ln (St/St-1)	(Rt-Rm)	(Rt-Rm)2
Dec 03	6240			
JAN	5995	-0.04005	-0.04094	0.001676
FEB	5977	-0.00301	-0.0039	1.52E-05
MAR	6015	0.006338	0.005448	2.97E-05
APR	5758	-0.04367	-0.04456	0.001985
MAY	5852	0.016193	0.015303	0.000234
JUN	5931	0.013409	0.012519	0.000157
JUL	5954	0.00387	0.00298	8.88E-06
AUG	6163	0.0345	0.03361	0.00113
SEP	6311	0.02373	0.02284	0.000522
OCT	6329	0.002848	0.001958	3.83E-06
NOV	6528	0.030958	0.030068	0.000904
DEC	6307	-0.03444	-0.03533	0.001186
Total		0.01068		0.007852
N		12		
Rm		0.00089		
HV		0.092551		
HV(%)		9.255053		

Table 4.1.2 Historical price volatility of Gold during 2005

2005	St	Rt = Ln (St/St-1)	(Rt-Rm)	(Rt-Rm)2
Dec 04	6307			
JAN	6000	-0.0499	-0.06586	0.004337
FEB	6245	0.040022	0.024065	0.000579
MAR	6103	-0.023	-0.03896	0.001518
APR	6229	0.020435	0.004479	2.01E-05
MAY	5966	-0.04314	-0.0591	0.003492
JUN	6214	0.040728	0.024772	0.000614
JUL	6084	-0.02114	-0.0371	0.001376
AUG	6263	0.028997	0.013041	0.00017
SEP	6731	0.072064	0.056108	0.003148
OCT	6822	0.013429	-0.00253	6.39E-06
NOV	7416	0.083487	0.067531	0.00456
DEC	7638	0.029496	0.01354	0.000183
Total		0.191476		0.020005
N		12		
Rm		0.015956		
HV		0.147726		
HV(%)		14.77265		

Table 4.1.3 Historical price volatility of Gold during 2006

2006	St	Rt = Ln (St/St-1)	(Rt-Rm)	(Rt-Rm)2
Dec 05	7638			
JAN	8166	0.066843	0.050751	0.002576
FEB	8112	-0.00663	-0.02273	0.000517
MAR	8382	0.032742	0.01665	0.000277
APR	9609	0.136614	0.120521	0.014525
MAY	9526	-0.00868	-0.02477	0.000613
JUN	9220	-0.03265	-0.04874	0.002376
JUL	9560	0.036213	0.02012	0.000405
AUG	9554	-0.00063	-0.01672	0.00028
SEP	8859	-0.07553	-0.09162	0.008394
OCT	8894	0.003943	-0.01215	0.000148
NOV	9269	0.041299	0.025206	0.000635
DEC	9265	-0.00043	-0.01652	0.000273
Total		0.193108		0.031018
N		12		
Rm		0.016092		
HV		0.183952		
HV(%)		18.39516		

Table 4.1.4 Historical price volatility of Gold during 2007

2007	St	Rt = Ln (St/St-1)	(Rt-Rm)	(Rt-Rm)2
Dec 06	9265			
JAN	9242	-0.00249	-0.01369	0.000187
FEB	9628	0.040917	0.029715	0.000883
MAR	9339	-0.03048	-0.04168	0.001737
APR	9203	-0.01467	-0.02587	0.000669
MAY	8694	-0.0569	-0.0681	0.004637
JUN	8662	-0.00369	-0.01489	0.000222
JUL	8708	0.005297	-0.00591	3.49E-05
AUG	8935	0.025734	0.014532	0.000211
SEP	9530	0.064469	0.053267	0.002837
OCT	10083	0.056406	0.045204	0.002043
NOV	10033	-0.00497	-0.01617	0.000262
DEC	10598	0.054786	0.043584	0.0019
Total		0.134421		0.015624
N		12		
Rm		0.011202		
HV		0.130553		
HV(%)		13.0553		

Table 4.1.5 Historical price volatility of Gold during 2008

2008	St	Rt = Ln (St/St-1)	(Rt-Rm)	(Rt-Rm)2
Dec 07	10598			
JAN	11707	0.099522	0.078554	0.006171
FEB	12396	0.057187	0.03622	0.001312
MAR	11920	-0.03916	-0.06012	0.003615
APR	11370	-0.04724	-0.06821	0.004652
MAY	12199	0.070376	0.049408	0.002441
JUN	12879	0.054244	0.033277	0.001107
JUL	12618	-0.02047	-0.04144	0.001717
AUG	11895	-0.05901	-0.07997	0.006396
SEP	13192	0.103492	0.082525	0.00681
OCT	11630	-0.12602	-0.14699	0.021606
NOV	13125	0.120931	0.099964	0.009993
DEC	13630	0.037754	0.016787	0.000282
Total		0.251608		0.066102
N		12		
Rm		0.020967		
HV		0.268536		
HV(%)		26.85359		

Table 4.1.6 Historical price volatility of Gold during 2009

2009	St	Rt = Ln (St/St-1)	(Rt-Rm)	(Rt-Rm)2
Dec 08	13630			
JAN	14452	0.05856	0.041702	0.001739
FEB	15504	0.070265	0.053407	0.002852
MAR	15132	-0.02429	-0.04114	0.001693
APR	14503	-0.04246	-0.05931	0.003518
MAY	14923	0.028548	0.01169	0.000137
JUN	14451	-0.03214	-0.049	0.002401
JUL	14802	0.023999	0.007141	5.1E-05
AUG	15125	0.021587	0.004729	2.24E-05
SEP	15703	0.037503	0.020645	0.000426
OCT	15957	0.016046	-0.00081	6.6E-07
NOV	17614	0.098796	0.081938	0.006714
DEC	16686	-0.05412	-0.07098	0.005038
Total		0.202297		0.024592
N		12		
Rm		0.016858		
HV		0.163793		
HV(%)		16.37928		

Table 4.1.7 Historical price volatility of Gold during 2010

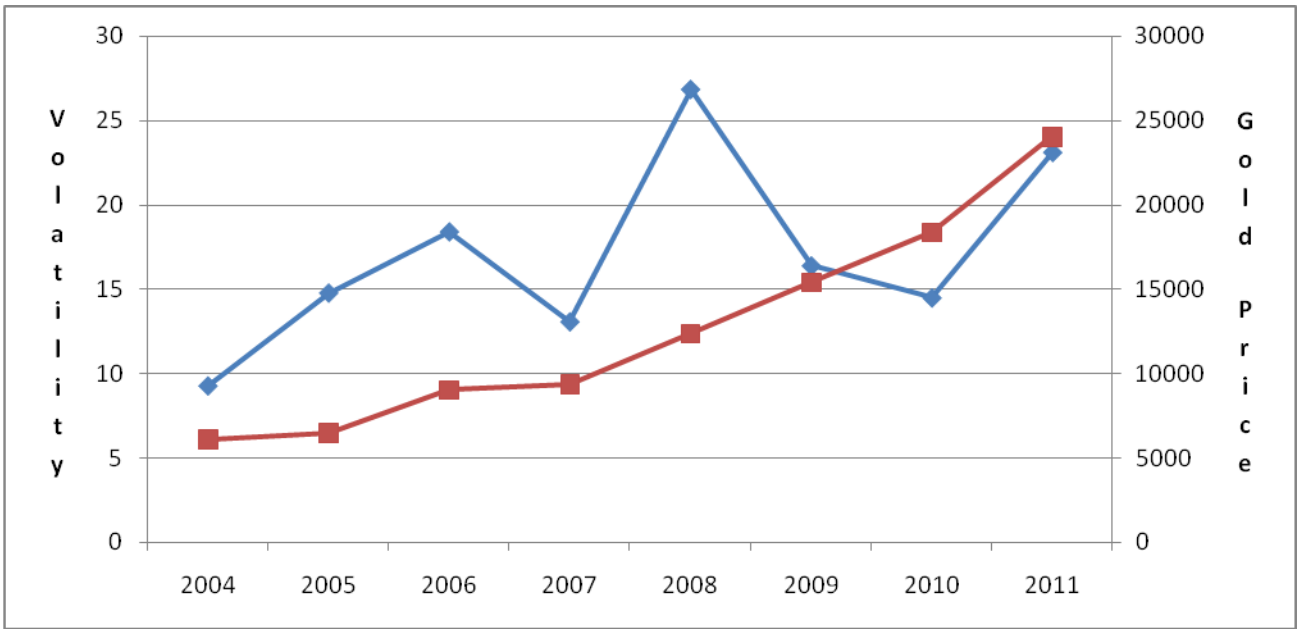
2010	St	Rt = Ln (St/St-1)	(Rt-Rm)	(Rt-Rm)2
Dec 09	16686			
JAN	16200	-0.02956	-0.04764	0.002269101
FEB	16789	0.035713	0.017636	0.000311042
MAR	16295	-0.02987	-0.04794	0.002298424
APR	17125	0.049681	0.031605	0.000998863
MAY	18385	0.070996	0.052919	0.002800468
JUN	18852	0.025084	0.007008	4.91066E-05
JUL	17770	-0.05911	-0.07718	0.005957316
AUG	19134	0.073955	0.055879	0.003122455
SEP	19035	-0.00519	-0.02326	0.000541202
OCT	19807	0.039756	0.02168	0.000470011
NOV	20538	0.036241	0.018165	0.000329972
DEC	20728	0.009209	-0.00887	7.86355E-05
Total		0.216915		0.019226596
N		12		
Rm		0.018076		
HV		0.144825649		
HV(%)		14.4825649		

Table 4.1.8 Historical price volatility of Gold during 2011

2011	St	Rt = Ln (St/St-1)	(Rt-Rm)	(Rt-Rm)2
Dec 10	20728			
JAN	19922	-0.03966	-0.0627	0.003931
FEB	20923	0.049024	0.025986	0.000675
MAR	20693	-0.01105	-0.03409	0.001162
APR	22820	0.097842	0.074803	0.005596
MAY	22426	-0.01742	-0.04045	0.001637
JUN	21904	-0.02355	-0.04659	0.002171
JUL	23166	0.056016	0.032978	0.001088
AUG	27184	0.159943	0.136904	0.018743
SEP	25989	-0.04496	-0.06799	0.004623
OCT	27343	0.050787	0.027749	0.00077
NOV	29061	0.060937	0.037898	0.001436
DEC	27329	-0.06145	-0.08449	0.007138
Total		0.276463		0.048969
N		12		
Rm		0.023039		
HV		0.23113		
HV(%)		23.11301		

CHART 4.1.1 HISTORICAL VOLATILITY OF GOLD (2004-2011)

This diagram shows the historical price volatility of gold for the period 2004 to 2011



INTERPRETATION

The Chart above shows the Historical volatility of Gold from 2004 to 2011. The highest Historical volatility occurred during the year of 2008 at a rate of 26.85% and least occurred during the year of 2004 at a rate of 9.26%. The overall average Annual volatility for 8 years is 17.03%. The highest volatility when compared with the average accounted 1.5 times more than the average.

4.2 HISTORICAL PRICE VOLATILITY OF SILVER

Table 4.2.1 Historical price volatility of Silver during 2004

2004	St	Rt = Ln (St/St-1)	(Rt-Rm)	(Rt-Rm)2
Dec 03	9280			
JAN	9615	0.035463	0.025775	0.000664
FEB	10257	0.064636	0.054949	0.003019
MAR	11452	0.110204	0.100517	0.010104
APR	9153	-0.22408	-0.23377	0.054648
MAY	9549	0.042355	0.032667	0.001067
JUN	9335	-0.02267	-0.03235	0.001047
JUL	10263	0.094774	0.085087	0.00724
AUG	10618	0.034005	0.024318	0.000591
SEP	10775	0.014678	0.004991	2.49E-05
OCT	11185	0.037345	0.027658	0.000765
NOV	11610	0.037293	0.027606	0.000762
DEC	10424	-0.10776	-0.11744	0.013793
Total		0.116249		0.093726
N		12		
Rm		0.009687		
HV		0.31976		
HV(%)		31.97596		

Table 4.2.2 Historical price volatility of Silver during 2005

2005	St	Rt = Ln (St/St-1)	(Rt-Rm)	(Rt-Rm)2
Dec 04	10424			
JAN	10209	-0.02084	-0.04097	0.001679
FEB	10794	0.055721	0.035592	0.001267
MAR	10779	-0.00139	-0.02152	0.000463
APR	10240	-0.0513	-0.07143	0.005102
MAY	10844	0.05731	0.037182	0.001382
JUN	10481	-0.03405	-0.05418	0.002935
JUL	10686	0.01937	-0.00076	5.75E-07
AUG	10295	-0.03728	-0.0574	0.003295
SEP	11126	0.077626	0.057498	0.003306
OCT	11462	0.029753	0.009624	9.26E-05
NOV	12285	0.069342	0.049213	0.002422
DEC	13272	0.077278	0.057149	0.003266
Total		0.241546		0.02521
N		12		
Rm		0.020129		
HV		0.165837		
HV(%)		16.58373		

Table 4.2.3 Historical price volatility of Silver during 2006

2006	St	Rt = Ln (St/St-1)	(Rt-Rm)	(Rt-Rm)2
Dec 05	13272			
JAN	13793	0.038505	0.006767	4.58E-05
FEB	14049	0.01839	-0.01335	0.000178
MAR	16770	0.17704	0.145303	0.021113
APR	19786	0.165383	0.133645	0.017861
MAY	19203	-0.02991	-0.06165	0.0038
JUN	16651	-0.1426	-0.17433	0.030392
JUL	17748	0.063803	0.032065	0.001028
AUG	19344	0.086109	0.054372	0.002956
SEP	18115	-0.06564	-0.09738	0.009483
OCT	18484	0.020165	-0.01157	0.000134
NOV	20395	0.098384	0.066647	0.004442
DEC	19424	-0.04878	-0.08052	0.006483
Total		0.380853		0.097917
N		12		
Rm		0.031738		
HV		0.32683		
HV(%)		32.68303		

Table 4.2.4 Historical price volatility of Silver during 2007

2007	St	Rt = Ln (St/St-1)	(Rt-Rm)	(Rt-Rm)2
Dec 06	19424			
JAN	19933	0.025867	0.0257	0.00066
FEB	20486	0.027365	0.027198	0.00074
MAR	19622	-0.04309	-0.04326	0.001871
APR	18508	-0.05845	-0.05862	0.003436
MAY	18300	-0.0113	-0.01147	0.000132
JUN	16786	-0.08636	-0.08652	0.007486
JUL	17583	0.046387	0.04622	0.002136
AUG	16523	-0.06218	-0.06235	0.003887
SEP	18479	0.111882	0.111714	0.01248
OCT	18981	0.026804	0.026636	0.000709
NOV	18159	-0.04427	-0.04444	0.001975
DEC	19463	0.069349	0.069182	0.004786
Total		0.002006		0.040299
N		12		
Rm		0.000167		
HV		0.209672		
HV(%)		20.96723		

Table 4.2.5 Historical price volatility of Silver during 2008

2008	St	Rt = Ln (St/St-1)	(Rt-Rm)	(Rt-Rm)2
Dec 07	19463			
JAN	21676	0.10769	0.112575	0.012673
FEB	24707	0.130881	0.135765	0.018432
MAR	22274	-0.10367	-0.09878	0.009758
APR	22121	-0.00689	-0.00201	4.03E-06
MAY	23376	0.055182	0.060067	0.003608
JUN	24260	0.037119	0.042003	0.001764
JUL	24720	0.018784	0.023668	0.00056
AUG	20232	-0.20035	-0.19546	0.038206
SEP	20109	-0.0061	-0.00121	1.47E-06
OCT	16858	-0.17634	-0.17146	0.029398
NOV	16779	-0.0047	0.000187	3.51E-08
DEC	18355	0.089774	0.094658	0.00896
Total		-0.05861		0.123365
N		12		
Rm		-0.00488		
HV		0.366851		
HV(%)		36.68513		

Table 4.2.6 Historical price volatility of Silver during 2009

2009	St	Rt = Ln (St/St-1)	(Rt-Rm)	(Rt-Rm)2
Dec 08	18355			
JAN	19893	0.080466	0.049014	0.002402
FEB	21820	0.092459	0.061008	0.003722
MAR	21855	0.001603	-0.02985	0.000891
APR	21319	-0.02483	-0.05628	0.003168
MAY	24195	0.126547	0.095096	0.009043
JUN	21768	-0.1057	-0.13716	0.018812
JUL	22468	0.031651	0.0002	3.99E-08
AUG	23822	0.058517	0.027066	0.000733
SEP	26486	0.106007	0.074555	0.005558
OCT	25933	-0.0211	-0.05255	0.002762
NOV	28300	0.087346	0.055894	0.003124
DEC	26771	-0.05554	-0.08699	0.007568
Total		0.377417		0.057783
N		12		
Rm		0.031451		
HV		0.25107		
HV(%)		25.10697		

Table 4.2.7 Historical price volatility of Silver during 2010

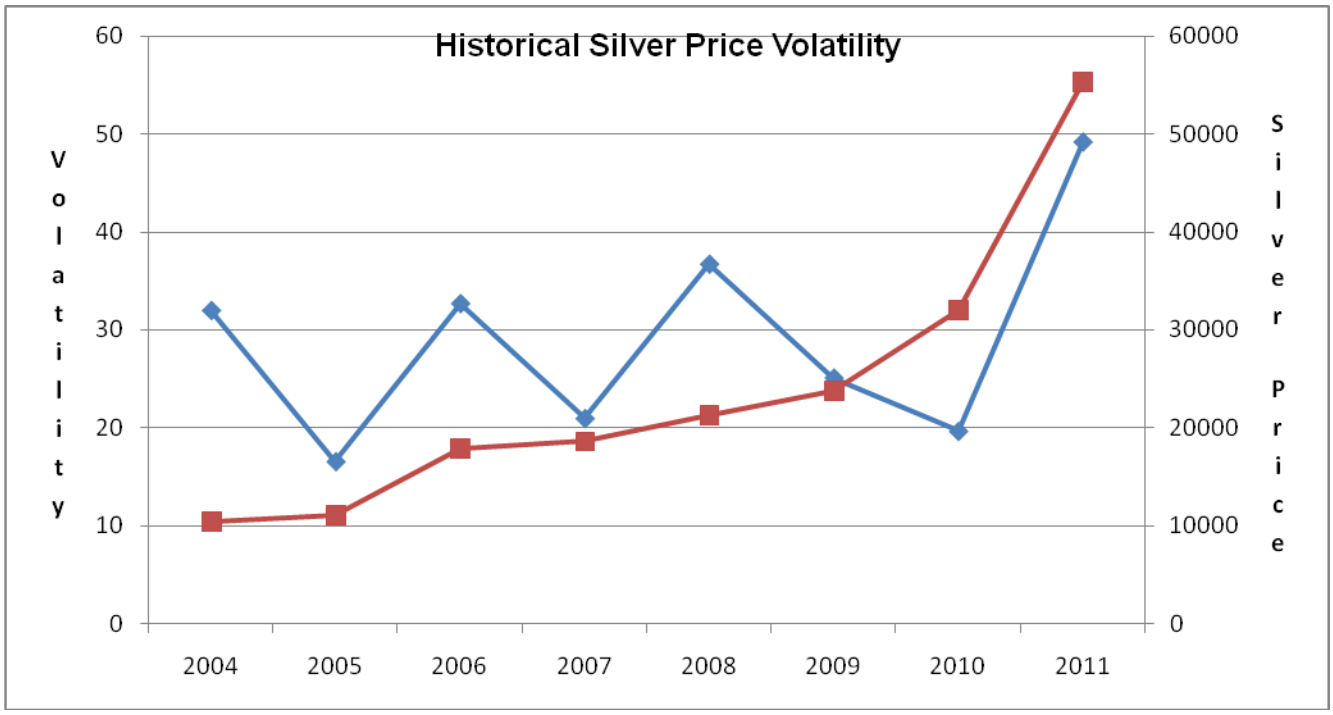
2010	St	Rt = Ln (St/St-1)	(Rt-Rm)	(Rt-Rm)2
Dec 09	26771			
JAN	25500	-0.04864	-0.09414	0.008863
FEB	25767	0.010416	-0.03509	0.001231
MAR	26935	0.044332	-0.00117	1.37E-06
APR	28304	0.049577	0.004074	1.66E-05
MAY	29292	0.034311	-0.01119	0.000125
JUN	29604	0.010595	-0.03491	0.001219
JUL	28636	-0.03324	-0.07875	0.006201
AUG	30915	0.076577	0.031074	0.000966
SEP	32962	0.064114	0.018612	0.000346
OCT	37105	0.118396	0.072894	0.005314
NOV	43009	0.147658	0.102155	0.010436
DEC	46217	0.071938	0.026436	0.000699
Total		0.546028		0.035417
N		12		
Rm		0.045502		
HV		0.196562		
HV(%)		19.65621		

Table 4.2.8 Historical price volatility of Silver during 2011

2011	St	Rt = Ln (St/St-1)	(Rt-Rm)	(Rt-Rm)2
Dec 10	46217			
JAN	43640	-0.05737	-0.06563	0.004307
FEB	49850	0.133044	0.12479	0.015573
MAR	55970	0.115797	0.107543	0.011566
APR	70507	0.230896	0.222642	0.04957
MAY	57919	-0.19667	-0.20492	0.041992
JUN	50963	-0.12795	-0.1362	0.01855
JUL	58898	0.144707	0.136453	0.01862
AUG	62162	0.053937	0.045683	0.002087
SEP	51111	-0.19574	-0.204	0.041615
OCT	56427	0.098948	0.090694	0.008225
NOV	55520	-0.0162	-0.02446	0.000598
DEC	51029	-0.08435	-0.0926	0.008575
Total		0.099046		0.221278
N		12		
Rm		0.008254		
HV		0.491319		
HV(%)		49.13189		

CHART 4.2.1 HISTORICAL VOLATILITY OF SILVER (2004-2011)

This diagram shows the historical price volatility of silver for the period 2004 to 2011



INTERPRETATION

The Chart above shows the Historical volatility of Silver from 2004 to 2011. The highest Historical volatility occurred during the year of 2011 at a rate of 49.13% and least occurred during the year of 2005 at a rate of 16.38%. The overall average Annual volatility for 8 years is 29.1%. The highest volatility when compared with the average accounted 1.68 times more than the average.

4.3 CORRELATION BETWEEN THE GOLD AND SILVER PRICE VOLATILITY (2004-2011)

This outputs shows the correlation between the Gold and Silver historical price volatility

TABLE 4.3.1 CORRELATION BETWEEN THE GOLD AND SILVER PRICE VOLATILITY (2004-2011)

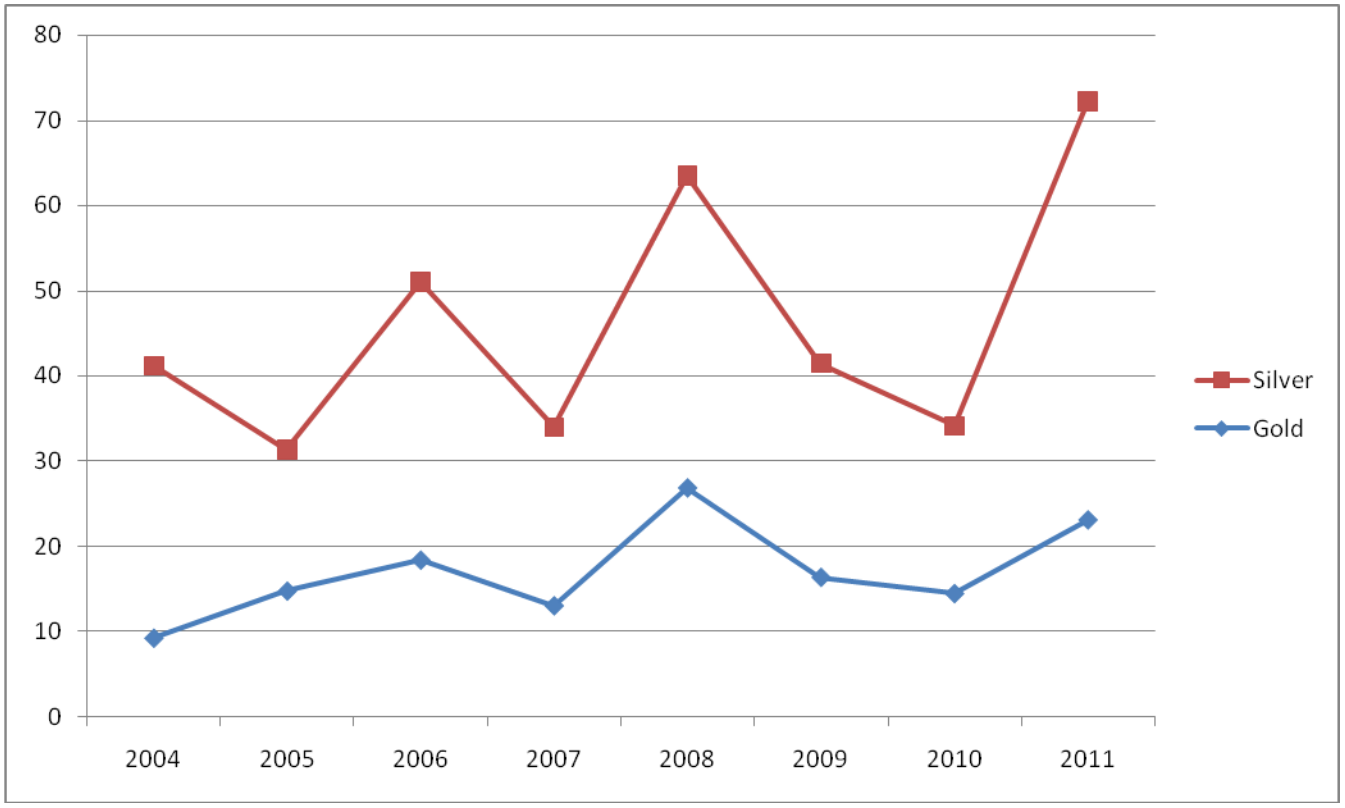
		SILVER	GOLD
SILVER	Pearson Correlation	1	.626*
	Sig. (1-tailed)		.048
	N	8	8
GOLD	Pearson Correlation	.626*	1
	Sig. (1-tailed)	.048	
	N	8	8

*. Correlation is significant at the 0.05 level (1-tailed).

r = .626

CHART 4.3.1 CORRELATION BETWEEN THE PRICE VOLATILITY OF GOLD VS SILVER (2004 – 2011)

This diagram shows the correlation of gold and silver price volatility for the period 2004 to 2011



INTERPRETATION

The above chart indicates the relationship between the Historical volatility of Gold and Silver. The correlation between the Historical Volatility of Gold and Silver is 62.6%.This shows the positive relationship between Gold and Silver Annual volatility.

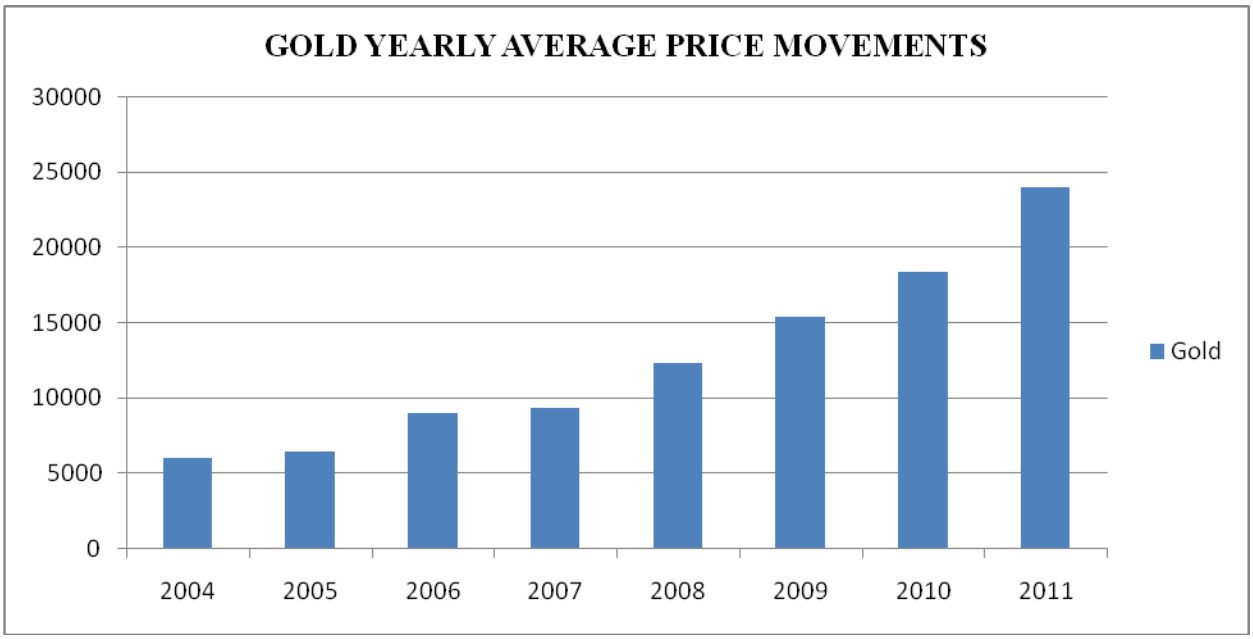
4.4 AVERAGE PRICE MOVEMENTS

The average price movements of gold and silver are shown below.

4.4.1 AVERAGE PRICE MOVEMENTS – GOLD

CHART 4.4.1 AVERAGE PRICE MOVEMENTS – GOLD

This bar chart shows the average price movements of Gold from the year 2004 to 2011



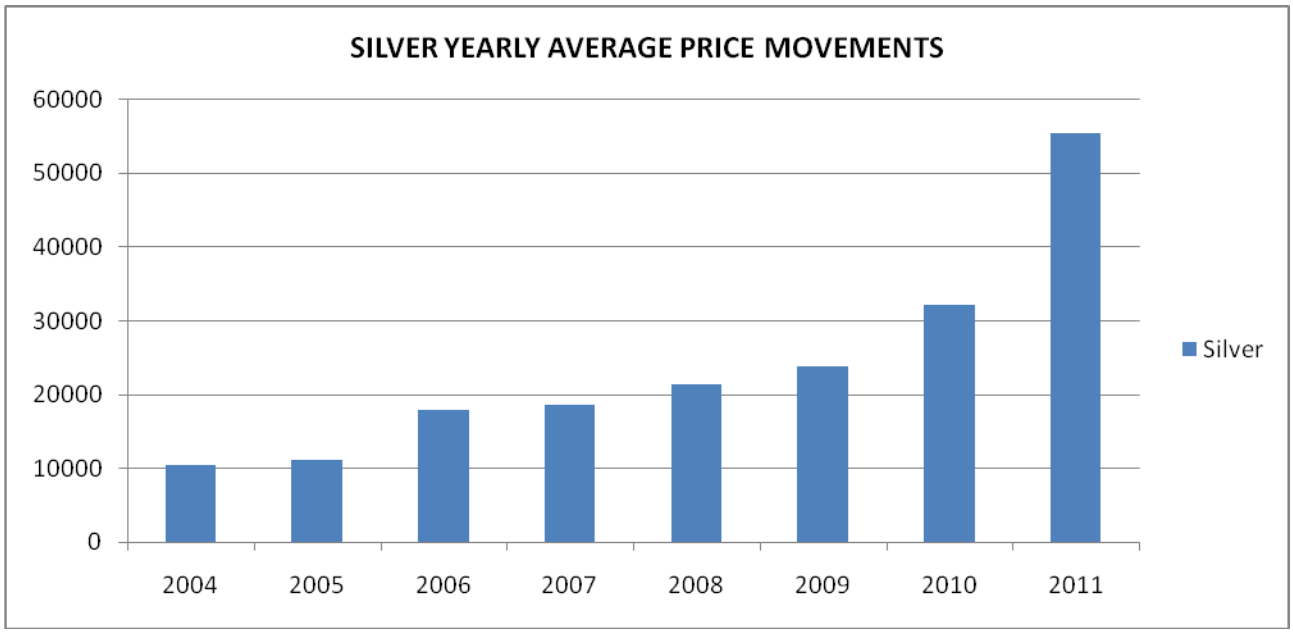
INTERPRETATION

The above chart shows the average price of Gold from 2004 to 2011. The highest average price of Gold was Rs. 24063 and it occurred during the year 2011 and the least average price of Gold was Rs. 6093 and it occurred during the year 2004. The overall average price of Gold was Rs. 12653.38. This chart shows a bullish trend from 2004 to 2011.

4.4.2 AVERAGE PRICE MOVEMENTS – SILVER

CHART 4.4.2 AVERAGE PRICE MOVEMENTS – SILVER

This bar chart shows the average price movements of Silver from the year 2004 to 2011



INTERPRETATION

The above chart shows the average price of Silver from 2004 to 2011. The highest average price of Silver was Rs. 55333 and it occurred during the year 2011 and the least average price of Silver was Rs. 10353 and it occurred during the year 2004. The overall average price of Silver was Rs. 23767.13. This chart shows a bullish trend from 2004 to 2011.

CHAPTER 5

5.1 SUMMARY OF FINDINGS

Historical Volatility – Gold

The study shows that the fluctuations in the price movements are high in the year of 2008. At that time the volatility was 26.85%. In the year 2004 the volatility rate was at a low of 9.26%.

The overall average Annual volatility for 8 years is 17.03%. The highest volatility is 1.5 times more than the average.

The hike in oil prices led to increase of higher volatility in gold price during the 2008.

Historical Volatility – Silver

The study shows that the fluctuations in the price movements are high in the year of 2011. At that time the volatility was 49.13%. In the year 2005 the volatility rate was at a low of 16.38%.

The overall average Annual volatility for 8 years is 29.1%. The highest volatility is 1.68 times more than the average.

China is one the leading producers of Silver. They reduced their export of silver during the year 2011 and it resulted in increase in industrial demand for the silver. This resulted in high price volatility.

Correlation

Correlation of Gold and Silver price volatility is 62.6%. It shows the positive relationship between the Gold and Silver price volatility.

5.2 SUGGESTIONS & RECOMMENDATIONS

The price of gold and silver increases and the volatility also increases at the same time. So it is suggested to always go with the trend. Investors having surplus money alone can enter into the markets with predetermined risk and return. It is suggested for participants to continuously research the behavior in the market to stay ahead in the pursuit of excess returns.

5.3 CONCLUSION

This study shows the positive relationship between the Gold and Silver (62.66%) price volatility. So there are 62.66% chances for both gold and silver to move in the same direction. It is observed that these two commodities should not be approached as separate markets and changes in the gold to silver ratio should be used to predict prices in the future. The volatility differs in the previous years based on the micro and macro economic factors.

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