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A STUDY OF PRICE VOLATILITY IN COMMODITY TRADING WITH RESPECT TO GOLD AND SILVER

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BONAFIDE CERTIFICATE

Certified that the Project report titled **A Study Of Price Volatility In Commodity Trading With Respect To Gold And Silver** is the bonafide work of **Mr.V. Kumaresan** who carried out the work 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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ABSTRACT

A study of price volatility in commodity trading with respect to gold and silver. For this study 34 years monthly data of gold and silver are collected from the Newyork Merchantile Exchange This study shows the fluctuations in the price movements of gold and silver. By studying the historical volatility one must identify market direction for long term. This study shows that there is a positive correlation between gold and silver. This research gives an edge for the investors to know about the trend prevailing in the market.

(V.KUMARESAN)

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Commodity futures trading in India has a long but chequered history extending over more than a century. Commodity futures trading have evolved from the need to ensure continuous supply of seasonal agricultural crops. India was perhaps the only country in the world, besides U.S.A and U.K., which could boast of having active futures markets in a large number of primary commodities and their products. The Indian experience in commodity futures market dates back to Thousands of years. References to such markets in India appear in Kautialya's Arthasastra. The words, Teji, Mandi, Gali, and Phatak have been commonly heard in Indian markets for centuries.

After the outbreak of the American Civil War in 1860s, when the U.S Supplies of cotton to the textile industry in Great Britain stopped, cotton from India Began to sail to the United Kingdom. Mumbai emerged as the largest cotton port and trading centre in the country. Around that time, a good deal of futures business began to be conducted in the city. To organize and regulate such business more systematically, the cotton buyers cum exporters established the Bombay Cotton Trade Association Ltd. in 1875.

The Bombay Cotton Trade Association had provided for three futures contracts in cotton, namely, Good Staple, Medium Staple and Belatee. Begin Dissatisfied over the functioning of the Bombay Cotton Trade Association, leading Indian cotton merchants and mill owners set up the Bombay cotton Exchange in 1893. These two trade bodies shared between themselves most of the ready, forward and future business in cotton from 1893 to 1918. It was around that time that cotton merchants also began to trade in options business.

During the First World War (1914-18), as many as eight associations, serving one or the other section of the trade and representing one or the other trading Community, carried on futures business in cotton. There were almost as many futures contracts in cotton as perhaps the number of major grades in it. Settlements being

yearly and periodical clearings absent, corners and squeezes were frequent, causing wide price fluctuations, which often resulted in defaults.

On the recommendation of the Indian Cotton Committee, which was then set up primarily to extent the cultivation of long staple cotton, the Government of India constituted a Cotton Contract Control Committee in June 1918 to frame suitable futures contracts and establish a clearing house for periodical settlement of differences. The Committee provided for five futures contracts in cotton and constituted three Committees – a Daily Rates Committee, a Clearing House Committee and an Appeal committee. The first settlement clearing was held on September 18, 1918.

After the War, the Government of Bombay enacted the Bombay Cotton Control Act, 1919. A Cotton Contracts Control Board was set up under the Act to regulate the Cotton trade. At the initiative of the Board, all sections of the cotton trade and industry Came together and formulated the East India Cotton Association (EICA) in 1921. In 1922, EICA was duly recognized under the Bombay Cotton Contracts Act, 1922 to regulate and Control futures contracts in cotton. Soon, futures markets in cotton were organized in several centres in the country such as Indore, Ujjain, Ahmedabad, Khamgon, Rajkot, Akola, etc.

In gold and silver, the futures market in Mumbai began in 1920, and subsequently similar markets sprang up at Rajkot, Jaipur, Jamnagar, Kanpur, Delhi and Kolkata. During the inter-War period (1918-39), several other exchanges also came into existence in the country to trade in such diverse commodities as pepper, turmeric, potato, sugar and Gur.

1.2 NEED FOR STUDY

The dawn of the 21st century and the third millennium on January 1, 2001 has opened a new era of knowledge and technology in the life of men, both at home and in his workplace as well as at leisure and travel. Techno-savvy pundits are already prognosticating mind boggling revolutionary changes in the human activities through the present century.

Technocrats, bureaucrats and their political masters in the country appear to be in a great hurry to ensure that India also keeps pace with the known and unknown technological developments likely to take the world surprise in the coming years.

As with information technology and industry sectors, with most innovative changes in the offing in especially the trade, transport and telecommunication systems, The commodity exchanges in India too seem to be in mad rush, at the behest of the government authorities, to get ready to face the new unforeseen challenges. It is necessary to enlighten the producers and industrial consumers of commodities on the risk management techniques of futures trading.

This study is needed to create awareness among the Investors and Analysts regarding the price volatility of gold and silver. This study is needed to know about the relationship between silver and gold.

1.3 OBJECTIVES

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

1.4 SCOPE OF THE STUDY

This study would deal with trading in US commodity markets. The closing price of every month is collected for 34 years of gold and silver. This study measures the historical volatility of gold and silver.

1.5 DELIVERABLES

This study shows the historical price volatility in gold and silver, correlation between gold and silver related to price volatility and also projects the future directions of gold and silver in terms of volatility.

CHAPTER 2

LITERATURE SURVEY

2.1 REVIEW OF LITERATURE

This chapter deals with research studies of volatility in commodity trading from 1976 to 2004.

Latane and Rendleman (1976)[1] showed that an options pricing model can be inverted to provide the volatility of the underlying asset until expiry, called volatility. Later papers showed that under risk-neutral pricing, should be approximately the conditional expectation of the realized volatility (RV) until expiry of the underlying asset. If it were not an unbiased and informationally efficient forecast of realized volatility, one could generate excess returns by hedging or trading with better forecasts.

Gardner (1977)[2] suggests that volatility needs to be put into welfare framework that will permit us to gauge the importance of efficiency and impacts of instability and to evaluate the gains and loses. This paper seeks to determine the magnitude of volatility in international commodity markets, to assess if volatility is uniformly increasing, and to contribute to the debate on the welfare effects of volatility by measuring the benefits of eliminating commodity price volatility.

Solt and swanson (1981)[3] examine the gold and silver markets of that time to evaluate the role of metals in portpolios. Solt and swanson analyze price changes in the markets and performs a number of tests, including an analysis of the distribution of

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- Latane, Henry A., and Richard J. Rendleman, Jr. (1976)[1]. "Standard Deviations of Stock Price Ratios Implied in Option Prices." Journal of Finance 31, 369-81.
- Gardner (1977)[2]. Measuring commodity price volatility and welfare consequences of eliminating volatility.
- Solt, Michael E. and Paul J. Swanson(1981)[3]; "On the Efficiency of the Markets for Gold and Silver." *The Journal of Business* , Vol. 54, No. 3 (July 1981), pp. 453-478.

results . Finally they consider whether trading strategies buying or selling based on the price changes of the immediate past could be profitable for investors. Overall, Solt and Swanson conclude that there is some inefficiency in the gold and silver markets, but that they are not so significant that speculators can profit from them.

Cornell (1981)[4], associates volatility with uncertainty and argues that such uncertainty should lead to an increase in both hedging and speculative trading in derivatives contracts. First, uncertainty may induce risk-averse economic agents to transfer risk to those better able to bear it, at least assuming that uncertainty will make some agents relatively more willing to bear that risk. Second, uncertainty is supposed to lead to differential or asymmetric information, thus greater uncertainty provides a speculative motive for trading.

Ruge-Murcia (1997)[5] extend the competitive storage model to show that volatility and the persistence of shocks to prices may increase if (1) there are long lays in production with supply stocks (2) forward multiperiod contracts that overlap provide unanticipated additional sources of supply in every period or (3) there is a convenience return to holding inventories. To date, the simulation results have failed to show volatility as high as that which is implied by volatility computed from data.

Dehn (2000)[6] constructs a single geometrically weighted index of commodity prices of dollars for 113 developing countries. Dehn's commodity index contains both agricultural and non-agricultural commodities. Using the constructed commodity price index he derives that (1) the unconditional standard deviation of prices substantially overestimates the degree of volatility. (2) that the condional price volatility is relatively lower for producers of food and lowest for producers of non-agricultural products.

- Cornell, B (1981)[4]: .The relationship between volume and price variability in futures markets, *Journal of Futures Markets*, vol 1, no 3, pp 303.16.
- Ruge –murcia (1997)[5] – The relationship between price changes and trading volume survey, journal of financial and quantitative economics.
- Dehn (2000)[6] - modeling the conditional volatility of commodity index futures, a journal

Ghosh, et. al. (2002)[7] study shows that the unusual price spikes of the 1970s and early 1980s are included in the gold investments and maintained their real value over that period. The past 20 years gold significantly underperformed diversified equity investments or corporate debt investments. However, the difficulty of analyzing, or even understanding, metal supply and demand curves makes gold and silver less desirable for investors. The supply curves are highly inelastic, because aboveground stocks are so much larger than newly mined gold each year (see USGS historical stats).

Don (2004)[8] says that terrorism's influence on the gold price does not make the metal a bad investment choice. He makes the point that the biggest increase in the gold price occurred during 1979 and early 1980, mostly due to tension between the United States and the Middle East, exemplified by the Iranian Hostage Crisis: a terrorist act. He goes on the say that people turn to gold during times of political instability and uncertainty, and that the success of the terrorist act in Spain (in changing the political climate there) indicates that we are likely to experience more such atrocities. Given that terrorism will continue to influence gold's future, the prospect of increased terrorist activity is a sound basis for investment.

2.2 RESEARCH GAP

This study is focused on long term price volatility while the previous research study was focused on short term price volatilities. In the previous research the silver and gold price volatility were studied separately. But in this research gold and silver volatility were studied together and its correlation were also given. This research study gives the direction for the future price volatility of gold and silver.

- Ghosh, Dipak; Eric J. Levin; Peter Macmillan; Robert E. Wright(2002)[7]; "Gold as an Inflation Hedge?" University of St. Andrews Discussion Paper Series, Department of Economics, number 0021: January 2002.
- Don (2004)[8] commodity price risk management: valuation of large trading portfolios under adverse and illiquid market settings.

CHAPTER 3

METHODOLOGY

3.1 TYPE OF STUDY

It is a descriptive type of study. The study identifies the price volatility in gold and silver. This research study would deal with trading in US commodity markets.

3.2 PERIOD OF STUDY

- To analyze the Objectives, 34 years monthly data are collected,(1975 to2008)
- The Commodity selected for the study is Gold and Silver.

3.3 METHOD OF DATA COLLECTION

The study is based on Secondary Data. The data required for the study is collected from the NYMEX (New York Merchentile Exchange).

3.4 PROCESS OF ANALYSIS OF DATA

To analyze the objective, that is "To analyze the Historic price Volatility in commodity trading" the following process is carried out:

The number of trading periods per year is calculated as follows:

$TP = (Tt / Pn) * 262$

TP is the total number of trading periods per year.

Tt is the total trading time in a day.

Pn is the length of the period.

262 is the number of weekdays per year.

The Silver, 5000oz trades from 6.55 p.m. to 11:55 p.m. ISD. That is a total trading time of 5 hours.

Total minutes of trading = 300 minutes

300 /10 minute bars = 30 trading periods per day

We have calculated the trading periods per day, to calculate the number of periods for the year.

*TP = (300)/10) * 262*

TP = 30 262*

TP = 7860

Next we calculated the logarithm of the price change for each price in the specified time span of n periods. The formula is:

LOGSi = LOG (Pi / Pi-1)

LOG is the logarithm function.

Pi is the current price

Pi-1 is the previous price

To calculate the total of the logarithms, the formula is:

$$T_{logs} = \sum_{i=1}^{n} (LOGS_i)$$

Tlogs is the total of the logarithm price ratio for the time span.

S indicates to sum all n logarithms.

LOGSi is the logarithm of the price change for period i.

n is the number of periods for the specified time span.

To calculate the average of the logs by dividing the total logarithm by the number of periods:

ALOGS = Tlogs / n

ALOGS is the average of the logarithms.

Tlogs is the total of the logarithm for the time span.

n is the number of periods for the specified time span.

To sum the squares of the difference between the individual logarithms for each period and the average logarithm. The formula is:

$$SSD = \sum_{i=1}^{n} (LOGSi - ALOGS)^2$$

SSD is the sum of the squared differences.

S indicates to total the squares of all n differences.

LOGSi is the logarithm of the price change for period i.

ALOGS is the average of the logarithms.

the formula calculates the historical volatility for a given period over a specified time span.

$$HV = \sqrt{\frac{SSD}{n-1}} * \sqrt{TP}$$

SSD is the sum of the squared differences.

n is the number of periods for the specified time span.

TP is the total number of trading periods for the year.

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

$$r = \frac{\Sigma(X-\bar{X})(Y-\bar{Y})}{\sqrt{\Sigma(X-\bar{X})^2 \Sigma(Y-\bar{Y})^2}}$$

X and Y are the variables (gold and silver)

$\bar{X}$ sample mean average

$\bar{Y}$ sample mean average

r correlation coefficient,

To analyze the third objective projecting the future price volatility for gold and silver trend lines are used.

3.5 TOOLS FOR ANALYSIS

3.5.1 Technical analysis

Technical analysis is the study of prices, with charts being the primary tool. Based on the technical analysis current and past market trends are reflected on the

CHAPTER 4

DATA ANALYSIS AND INTERPRETATION

The data collected for the purpose of the study is analysed and presented under the following sections.

4.1 HISTORICAL VOLATILITY OF GOLD

The price volatility of gold is calculated using the formula given in the process of analysis of data. The tabulated analysis for the period 1975 to 2008 is given below.

1975	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-74	182.5			
JAN	175.5	-0.01698575	-0.007442848	5.5396E-05
FEB	181.8	0.01531676	0.024859658	0.000618003
MAR	177.1	-0.01137532	-0.001832418	3.35775E-06
APR	165.8	-0.02863403	-0.019091135	0.000364471
MAY	166.5	0.00182971	0.011372612	0.000129336
JUN	166.5	0	0.0095429	9.10669E-05
JUL	167.6	0.00285978	0.012402676	0.000153826
AUG	159.1	-0.02260383	-0.013060935	0.000170588
SEP	140.5	-0.05399386	-0.044450955	0.001975887
OCT	142.3	0.00552858	0.015071476	0.000227149
NOV	137.3	-0.01553436	-0.005991463	3.58976E-05
DEC	140.2	0.00907748	0.018620376	0.000346718
TLOG		-0.11451486	SSD	0.004171698
N		12		
ALOG		-0.0095429		
TP		372		
HV		0.37560518		
HV(%)		37.5605179		

1976	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-75	140.2			
JAN	128.2	-0.03885999	-0.037572468	0.00141169
FEB	132.5	0.01432785	0.015615373	0.00024384
MAR	129.1	-0.01128964	-0.010002116	0.000100042
APR	128.5	-0.00202311	-0.000735595	5.41099E-07
MAY	126	-0.00853258	-0.007245063	5.24909E-05
JUN	123.2	-0.00975984	-0.008472317	7.17802E-05
JUL	112.1	-0.0410051	-0.039717575	0.001577486
AUG	102.6	-0.03845825	-0.037170732	0.001381663
SEP	115.7	0.052186	0.053473518	0.002859417
OCT	123.4	0.0279818	0.029269321	0.000856693
NOV	131.5	0.02761059	0.028898113	0.000835101
DEC	135.3	0.01237204	0.013659564	0.000186584
TLOG		-0.01545022	SSD	0.009577329
N		12		
ALOG		-0.00128752		

1977	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-76	135.3			
JAN	133	-0.00744616	-0.01491236	0.000222378
FEB	144.2	0.03511362	0.027647415	0.00076438
MAR	149.5	0.01567593	0.008209728	6.73996E-05
APR	147.6	-0.00555484	-0.013021039	0.000169547
MAY	143.5	-0.01223446	-0.01970066	0.000388116
JUN	143.3	-0.00060571	-0.008071915	6.51558E-05
JUL	145.1	0.00542122	-0.002044982	4.18195E-06
AUG	146	0.00268544	-0.004780761	2.28557E-05
SEP	154.6	0.02485663	0.01739043	0.000302427
OCT	161.8	0.01976903	0.012302824	0.000151359
NOV	160.2	-0.00431601	-0.01178221	0.00013882
DEC	166.3	0.01622974	0.008763533	7.67995E-05
TLOG		0.08959445	SSD	0.002373421
N		12		
ALOG		0.0074662		
TP		372		
HV		0.28331041		
HV(%)		28.3310406		

1978	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-77	166.3			
JAN	176.6	0.02609845	0.01483732	0.000220146
FEB	183.2	0.01593477	0.00467364	2.18429E-05
MAR	184.1	0.00212832	-0.009132811	8.34082E-05
APR	169.9	-0.03486041	-0.04612154	0.002127196
MAY	184.3	0.03533196	0.024070826	0.000579405
JUN	182.3	-0.00473867	-0.015999797	0.000255993
JUL	203.6	0.04799111	0.036729975	0.001349091
AUG	205.9	0.00487857	-0.006382557	4.0737E-05
SEP	217.9	0.02460088	0.013339754	0.000177949
OCT	238.8	0.03977709	0.028515962	0.00081316
NOV	193.2	-0.0920272	-0.10328833	0.010668479
DEC	227	0.07001874	0.058757605	0.003452456
TLOG		0.13513361	SSD	0.019789864
N		12		
ALOG		0.01126113		
TP		372		
HV		0.81808143		
HV(%)		81.8081433		

1979	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-78	227			
JAN	232.5	0.0103971	-0.020494679	0.000420032
FEB	250.7	0.03273138	0.001839598	3.38412E-06
MAR	239.5	-0.01984882	-0.050740595	0.002574608
APR	247	0.01339144	-0.017500343	0.000306262
MAY	276.8	0.04946913	0.018577354	0.000345118
JUN	281.9	0.00792899	-0.022962789	0.00052729
JUL	286.9	0.00763547	-0.023256307	0.000540856
AUG	317.6	0.04414995	0.013258167	0.000175779
SEP	395	0.0947166	0.063824823	0.004073608
OCT	380.7	-0.01601422	-0.046905998	0.002200173
NOV	419.1	0.04173478	0.010843005	0.000117571
DEC	533	0.10440955	0.073517769	0.005404862
TLOG		0.37070135	SSD	0.016689542
N		12		
ALOG		0.03089178		
TP		372		
HV		0.75127224		
HV(%)		75.1272239		

1980	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-79	533			
JAN	681.5	0.10673865	0.102981931	0.010605278
FEB	631	-0.0334365	-0.037193221	0.001383336
MAR	501.5	-0.09975842	-0.103515142	0.010715385
APR	501.6	8.659E-05	-0.00367013	1.34699E-05
MAY	545.2	0.03619832	0.032441599	0.001052457
JUN	647.4	0.07461685	0.070860128	0.005021158
JUL	619.7	-0.0189912	-0.022747919	0.000517468
AUG	635	0.01059223	0.006835509	4.67242E-05
SEP	671.5	0.02427229	0.020515572	0.000420889
OCT	636	-0.0235889	-0.027345621	0.000747783
NOV	624.6	-0.00785514	-0.011611856	0.000134835
DEC	591.3	-0.0237941	-0.027550821	0.000759048
TLOG		0.04508067	SSD	0.03141783
N		12		
ALOG		0.00375672		
TP		372		
HV		1.03077344		
HV(%)		103.077344		

1981	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-80	591.3			
JAN	501.7	-0.07136378	-0.057145668	0.003265627
FEB	481.5	-0.01784781	-0.0036297	1.31747E-05
MAR	513.8	0.02819781	0.042415918	0.00179911
APR	483.9	-0.02603848	-0.011820368	0.000139721
MAY	479.4	-0.00405759	0.010160518	0.000103236
JUN	423.5	-0.05384462	-0.039626505	0.00157026
JUL	403.5	-0.02100988	-0.006791766	4.61281E-05
AUG	425	0.02254539	0.036763501	0.001351555
SEP	432.7	0.00779797	0.022016075	0.000484708
OCT	427	-0.00575902	0.00845909	7.15562E-05
NOV	408.3	-0.0194485	-0.005230385	2.73569E-05
DEC	399.2	-0.00978885	0.004429263	1.96184E-05
TLOG		-0.17061735	SSD	0.008892051
N		12		
ALOG		-0.01421811		
TP		372		
HV		0.54837306		
HV(%)		54.8373061		

1982	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-81	399.2			
JAN	384.6	-0.01618125	-0.020508373	0.000420593
FEB	360.5	-0.02810401	-0.032431131	0.001051778
MAR	327.5	-0.04169396	-0.046021085	0.00211794
APR	342.7	0.0197028	0.01537568	0.000236412
MAY	322.2	-0.02678857	-0.031115688	0.000968186
JUN	314.8	-0.01009081	-0.014417932	0.000207877
JUL	342.7	0.03687938	0.032552261	0.00105965
AUG	408.6	0.07638426	0.072057138	0.005192231
SEP	398.5	-0.01087004	-0.015197157	0.000230954
OCT	419.7	0.02251064	0.018183523	0.000330641
NOV	442.6	0.02307244	0.01874532	0.000351387
DEC	449.9	0.00710458	0.002777464	7.7143E-06
TLOG		0.05192546	SSD	0.012175362
N		12		
ALOG		0.00432712		
TP		372		
HV		0.64167641		
HV(%)		64.1676414		

1983	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-82	449.9			
JAN	510.1	0.05453933	0.06016787	0.003620173
FEB	400.5	-0.1050528	-0.099424263	0.009885184
MAR	415.9	0.0163864	0.02201494	0.000484658
APR	430.3	0.01478243	0.020410966	0.000416608
MAY	412	-0.01887413	-0.01324559	0.000175446
JUN	415.5	0.00367381	0.009302352	8.65338E-05
JUL	412.8	-0.00283134	0.0027972	7.82433E-06
AUG	414.4	0.00168006	0.007308598	5.34156E-05
SEP	401.9	-0.01330174	-0.007673201	5.8878E-05
OCT	376.2	-0.02869921	-0.023070675	0.000532256
NOV	403	0.02988625	0.035514795	0.001261301
DEC	385.1	-0.01973153	-0.014102988	0.000198894
TLOG		-0.06754247	SSD	0.01678117
N		12		
ALOG		-0.00562854		
TP		372		
HV		0.75333171		
HV(%)		75.3331708		

1984	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-83	385.1			
JAN	373.8	-0.01293422	-0.004837232	2.33988E-05
FEB	395.8	0.02483649	0.032933483	0.001084614
MAR	387.5	-0.00920408	-0.001107093	1.22565E-06
APR	376.1	-0.01296837	-0.004871383	2.37304E-05
MAY	386.8	0.01218313	0.020280122	0.000411283
JUN	372.8	-0.01601056	-0.007913572	6.26246E-05
JUL	337.7	-0.04294484	-0.034847853	0.001214373
AUG	348.4	0.01354709	0.021644076	0.000468466
SEP	344.9	-0.00438495	0.003712038	1.37792E-05
OCT	333.6	-0.01446715	-0.006370162	4.0579E-05
NOV	329.1	-0.00589816	0.00219883	4.83485E-06
DEC	307.9	-0.02891819	-0.020821203	0.000433523
TLOG		-0.09716383	SSD	0.003782432
N		12		
ALOG		-0.00809699		
TP		372		
HV		0.35765201		
HV(%)		35.7652006		

1985	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-84	307.9			
JAN	304.1	-0.00539327	-0.007792119	6.07171E-05
FEB	287	-0.02513452	-0.027533373	0.000758087
MAR	329.6	0.06010531	0.057706456	0.003330035
APR	314.7	-0.02009046	-0.02248931	0.000505769
MAY	316.2	0.00206512	-0.000333727	1.11374E-07
JUN	315.7	-0.00068728	-0.003086134	9.52422E-06
JUL	327.1	0.01540596	0.013007112	0.000169185
AUG	333.2	0.00802445	0.005625599	3.16474E-05
SEP	322.8	-0.01377147	-0.016170317	0.000261479
OCT	324.7	0.00254876	0.000149913	2.24738E-08
NOV	322.9	-0.00241424	-0.004813094	2.31659E-05
DEC	329	0.00812785	0.005729003	3.28215E-05
TLOG		0.02878621	SSD	0.005182565
N		12		
ALOG		0.00239885		
TP		372		
HV		0.41864653		
HV(%)		41.8646533		

1986	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-85	329			
JAN	348.8	0.02538058	0.017867918	0.000319263
FEB	339	-0.01237678	-0.019889438	0.00039559
MAR	331.1	-0.01024052	-0.017753177	0.000315175
APR	346.2	0.01936788	0.011855223	0.000140546
MAY	344.1	-0.00264239	-0.010155051	0.000103125
JUN	345.7	0.00201471	-0.005497953	3.02275E-05
JUL	362.7	0.02084818	0.013335516	0.000177836
AUG	387.6	0.02883621	0.021323553	0.000454694
SEP	425.7	0.04071988	0.033207222	0.00110272
OCT	403.6	-0.02315249	-0.030665153	0.000940352
NOV	390.9	-0.01388549	-0.021398147	0.000457881
DEC	404.9	0.01528211	0.007769446	6.03643E-05
TLOG		0.09015188		0.004497772
N		12		
ALOG		0.00751266		
TP		372		
HV		0.39000832		
HV(%)		39.0008317		

1987	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-86	404.9			
JAN	405.1	0.00021447	-0.006407794	4.10598E-05
FEB	405.4	0.0003215	-0.006300759	3.96996E-05
MAR	418	0.01329254	0.006670277	4.44926E-05
APR	454.1	0.03597522	0.02935296	0.000861596
MAY	450.2	-0.00374601	-0.010368271	0.000107501
JUN	449.4	-0.00077242	-0.007394683	5.46813E-05
JUL	464.1	0.0139785	0.00735624	5.41143E-05
AUG	450.6	-0.01282038	-0.019442641	0.000378016
SEP	452.7	0.00201931	-0.004602953	2.11872E-05
OCT	468.8	0.01517711	0.008554849	7.31854E-05
NOV	491	0.02009389	0.013471629	0.000181485
DEC	486.2	-0.00426654	-0.010888798	0.000118566
TLOG		0.07946718	SSD	0.001975585
N		12		
ALOG		0.00662226		
TP		372		
HV		0.25847761		
HV(%)		25.8477612		

1988	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-87	486.2			
JAN	454.2	-0.02956782	-0.023398565	0.000547493
FEB	430.5	-0.02327397	-0.017104714	0.000292571
MAR	454.4	0.02346517	0.029634427	0.000878199
APR	451	-0.00326178	0.002907479	8.45344E-06
MAY	455	0.00383485	0.010004115	0.000100082
JUN	435.3	-0.01922273	-0.013053469	0.000170393
JUL	436.1	0.00079742	0.00696668	4.85346E-05
AUG	431.3	-0.00480663	0.001362631	1.85676E-06
SEP	394.4	-0.03884255	-0.032673292	0.001067544
OCT	412.7	0.01969756	0.025866823	0.000669093
NOV	424.8	0.01255004	0.018719299	0.000350412
DEC	410	-0.01540065	-0.009231391	8.52186E-05
TLOG		-0.0740311	SSD	0.004219851
N		12		
ALOG		-0.00616926		
TP		372		
HV		0.3777667		
HV(%)		37.7766702		

1989	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-88	410			
JAN	391.6	-0.01994117	-0.019273014	0.000371449
FEB	387.5	-0.00457098	-0.003902816	1.5232E-05
MAR	385.1	-0.00269819	-0.002030028	4.12101E-06
APR	377.9	-0.00819663	-0.007528467	5.66778E-05
MAY	363.3	-0.01711149	-0.016443334	0.000270383
JUN	374.6	0.01330238	0.013970535	0.000195176
JUL	370.5	-0.00477956	-0.004111401	1.69036E-05
AUG	359.6	-0.01296853	-0.012300369	0.000151299
SEP	367.2	0.00908299	0.009751149	9.50849E-05
OCT	374.7	0.00878102	0.009449181	8.9287E-05
NOV	411.6	0.04079167	0.041459833	0.001718918
DEC	402.5	-0.00970948	-0.009041321	8.17455E-05
TLOG		-0.00801797	SSD	0.003066277
N		12		
ALOG		-0.00066816		
TP		372		
HV		0.32201849		
HV(%)		32.2018488		

1990	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-89	402.5			
JAN	412.4	0.01055277	0.011123722	0.000123737
FEB	406.1	-0.00668567	-0.006114717	3.73898E-05
MAR	370.2	-0.04019658	-0.039625625	0.00157019
APR	371.4	0.00140548	0.001976435	3.9063E-06
MAY	364.3	-0.00838273	-0.007811778	6.10239E-05
JUN	357.9	-0.00769747	-0.007126523	5.07873E-05
JUL	370	0.01444003	0.015010976	0.000225329
AUG	382.3	0.01420257	0.014773524	0.000218257
SEP	403.8	0.02376202	0.024332967	0.000592093
OCT	381.3	-0.02489951	-0.024328559	0.000591879
NOV	383.3	0.00227201	0.002842964	8.08244E-06
DEC	396.2	0.01437565	0.014946602	0.000223401
TLOG		-0.00685141	SSD	0.003706076
N		12		
ALOG		-0.00057095		
TP		372		
HV		0.35402368		
HV(%)		35.4023681		

1991	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-90	396.2			
JAN	365.8	-0.03467077	-0.03060506	0.00093667
FEB	367.4	0.00189545	0.005961161	3.55354E-05
MAR	357.1	-0.0123493	-0.008283592	6.86179E-05
APR	355.9	-0.00146186	0.002603848	6.78002E-06
MAY	361.4	0.00666016	0.01072587	0.000115044
JUN	370	0.01021358	0.014279286	0.000203898
JUL	363.6	-0.00757785	-0.00351214	1.23351E-05
AUG	348.1	-0.01891985	-0.014854141	0.000220646
SEP	354	0.00729924	0.011364949	0.000129162
OCT	358.1	0.00500106	0.009066769	8.22063E-05
NOV	367.9	0.01172547	0.015791177	0.000249361
DEC	354.1	-0.01660386	-0.012538151	0.000157205
TLOG		-0.04878854	SSD	0.002217461
N		12		
ALOG		-0.00406571		
TP		372		
HV		0.27384392		
HV(%)		27.3843923		

1992	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-91	354.1			
JAN	357	0.00354229	0.005754899	3.31189E-05
FEB	354.1	-0.00354229	-0.001329679	1.76805E-06
MAR	343.7	-0.01294639	-0.010733785	0.000115214
APR	337.9	-0.00739134	-0.00517873	2.68192E-05
MAY	336.4	-0.0019322	0.000280405	7.86272E-08
JUN	344.4	0.01020716	0.012419766	0.000154251
JUL	357.4	0.01609141	0.018304015	0.000335037
AUG	343.6	-0.01710139	-0.014888783	0.000221676
SEP	347.8	0.00527642	0.007489033	5.60856E-05
OCT	340.1	-0.00972295	-0.007510336	5.64051E-05
NOV	334.3	-0.00747026	-0.005257645	2.76428E-05
DEC	333.1	-0.00156174	0.000650866	4.23627E-07
TLOG		-0.02655129	SSD	0.00102852
N		12		
ALOG		-0.00221261		
TP		372		
HV		0.1865011		
HV(%)		18.6501102		

1993	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-92	333.1			
JAN	330.2	-0.00379756	-0.009680954	9.37209E-05
FEB	329	-0.00158117	-0.007464561	5.57197E-05
MAR	337.6	0.01120654	0.00532315	2.83359E-05
APR	357.2	0.02450901	0.018625622	0.000346914
MAY	378.3	0.02492489	0.019041501	0.000362579
JUN	379.2	0.00103199	-0.004851403	2.35361E-05
JUL	407	0.03072608	0.024842691	0.000617159
AUG	373.9	-0.03683894	-0.042722334	0.001825198
SEP	355.1	-0.02240479	-0.028288183	0.000800221
OCT	369.6	0.01738129	0.0114979	0.000132202
NOV	369.8	0.00023494	-0.005648446	3.19049E-05
DEC	391.9	0.02520836	0.019324967	0.000373454
TLOG		0.07060063	SSD	0.004690945
N		12		
ALOG		0.00588339		
TP		372		
HV		0.39829539		
HV(%)		39.8295386		

1994	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-93	391.9			
JAN	381.6	-0.0115669	-0.010867577	0.000118104
FEB	382.5	0.00102307	0.001722393	2.96664E-06
MAR	391.8	0.01043299	0.011132312	0.000123928
APR	377.8	-0.01580248	-0.015103158	0.000228105
MAY	387.1	0.01056122	0.011260538	0.0001268
JUN	387.3	0.00022433	0.000923646	8.53121E-07
JUL	383	-0.00484872	-0.004149403	1.72175E-05
AUG	387.8	0.00540903	0.006108351	3.73119E-05
SEP	394.2	0.00710882	0.007808135	6.0967E-05
OCT	384.9	-0.01036871	-0.009669389	9.34971E-05
NOV	380.7	-0.00476503	-0.004065714	1.653E-05
DEC	384.4	0.0042005	0.004899822	2.40083E-05
TLOG		-0.00839188	SSD	0.000850289
N		12		
ALOG		-0.00069932		
TP		372		
HV		0.1695737		
HV(%)		16.9573696		

1995	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-94	384.4			
JAN	375.4	-0.01028911	-0.010635801	0.00011312
FEB	378.3	0.00334207	0.002995383	8.97232E-06
MAR	392.2	0.01567125	0.015324558	0.000234842
APR	388.5	-0.00411657	-0.004463256	1.99207E-05
MAY	385.1	-0.0038175	-0.004164195	1.73405E-05
JUN	385.6	0.00056351	0.000216817	4.70094E-08
JUL	382.3	-0.00373273	-0.004079417	1.66416E-05
AUG	384.2	0.00215306	0.001806373	3.26298E-06
SEP	383.8	-0.00045239	-0.00079908	6.38529E-07
OCT	384.3	0.00056541	0.000218724	4.78402E-08
NOV	387.2	0.00326496	0.002918274	8.51632E-06
DEC	388.1	0.00100829	0.000661604	4.3772E-07
TLOG		0.00416026	SSD	0.000423788
N		12		
ALOG		0.00034669		
TP		372		
HV		0.11971523		
HV(%)		11.9715226		

1996	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-95	388.1			
JAN	405.6	0.0191543	0.020961134	0.000439369
FEB	401.2	-0.00473702	-0.002930192	8.58603E-06
MAR	395.8	-0.00588513	-0.004078304	1.66326E-05
APR	393.5	-0.00253105	-0.000724223	5.24499E-07
MAY	390.9	-0.00287907	-0.001072236	1.14969E-06
JUN	381.6	-0.0104573	-0.008650474	7.48307E-05
JUL	387.5	0.00666334	0.008470171	7.17438E-05
AUG	388.3	0.00089568	0.002702514	7.30358E-06
SEP	377.7	-0.01202041	-0.010213576	0.000104317
OCT	379.1	0.0016068	0.00341363	1.16529E-05
NOV	373	-0.00704495	-0.005238123	2.74379E-05
DEC	369.2	-0.00444714	-0.002640309	6.97123E-06
TLOG		-0.02168195	SSD	0.000770519
N		12		
ALOG		-0.00180683		
TP		372		
HV		0.16142353		
HV(%)		16.1423531		

1997	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-96	369.2			
JAN	344.9	-0.0295685	-0.020817378	0.000433363
FEB	365.1	0.02471864	0.033469759	0.001120225
MAR	351	-0.01710472	-0.008353596	6.97826E-05
APR	341.2	-0.01229809	-0.003546974	1.2581E-05
MAY	344.8	0.00455823	0.013309355	0.000177139
JUN	335.3	-0.0121337	-0.003382584	1.14419E-05
JUL	324.1	-0.01475452	-0.006003402	3.60408E-05
AUG	325.5	0.00187196	0.010623082	0.00011285
SEP	334.3	0.01158538	0.020336504	0.000413573
OCT	313.2	-0.02831462	-0.019563503	0.000382731
NOV	296.9	-0.02321156	-0.014460436	0.000209104
DEC	289.9	-0.01036198	-0.001610862	2.59488E-06
TLOG		-0.10501348	SSD	0.002981426
N		12		
ALOG		-0.00875112		
TP		372		
HV		0.31753175		
HV(%)		31.7531751		

1998	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-97	289.9			
JAN	302.9	0.01905106	0.019141058	0.00036638
FEB	300.1	-0.00403328	-0.003943278	1.55494E-05
MAR	300.5	0.00057848	0.000668481	4.46867E-07
APR	307.9	0.01056521	0.010655213	0.000113534
MAY	292.3	-0.02258087	-0.022490874	0.000505839
JUN	298.1	0.00853316	0.008623161	7.43589E-05
JUL	286.3	-0.01754063	-0.017450628	0.000304524
AUG	276.5	-0.01512621	-0.015036212	0.000226088
SEP	296.4	0.03018306	0.030273064	0.000916458
OCT	293.7	-0.00397425	-0.003884253	1.50874E-05
NOV	292.5	-0.00177808	-0.001688076	2.8496E-06
DEC	289.2	-0.00492758	-0.004837582	2.34022E-05
TLOG		-0.00104993	SSD	0.002564518
N		12		
ALOG		-0.00009		
TP		372		
HV		0.29449505		
HV(%)		29.449505		

1999	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-98	289.2			
JAN	286.3	-0.00437694	-0.004286941	1.83779E-05
FEB	288.3	0.00302329	0.003113294	9.6926E-06
MAR	279.8	-0.01299693	-0.012906932	0.000166589
APR	287.8	0.01224308	0.012333079	0.000152105
MAY	270.4	-0.0270841	-0.026994102	0.000728682
JUN	263.6	-0.01106128	-0.010971281	0.000120369
JUL	256.9	-0.0111813	-0.011091302	0.000123017
AUG	256.7	-0.00033824	-0.000248236	6.16209E-08
SEP	297.9	0.06464463	0.064734635	0.004190573
OCT	300.3	0.00348483	0.003574829	1.27794E-05
NOV	290.1	-0.0150076	-0.014917603	0.000222535
DEC	288.5	-0.00240191	-0.002311911	5.34493E-06
TLOG		-0.00105247	SSD	0.005750126
N		12		
ALOG		-0.00009		
TP		372		
HV		0.44097482		
HV(%)		44.0974818		

2000	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-99	288.5			
JAN	283.2	-0.00805257	-0.005921158	3.50601E-05
FEB	292.4	0.01388412	0.016015529	0.000256497
MAR	278.4	-0.02130814	-0.019176727	0.000367747
APR	273.1	-0.00834753	-0.006216121	3.86402E-05
MAY	274.8	0.00269503	0.004826438	2.32945E-05
JUN	290.1	0.023531	0.02566241	0.000658559
JUL	276.8	-0.02038164	-0.018250233	0.000333071
AUG	279.6	0.00437108	0.006502491	4.22824E-05
SEP	273.6	-0.00942107	-0.007289664	5.31392E-05
OCT	264.9	-0.01403413	-0.011902725	0.000141675
NOV	270.1	0.00844263	0.010574036	0.00011181
DEC	272	0.00304432	0.00517573	2.67882E-05
TLOG		-0.02557691	SSD	0.002088564
N		12		
ALOG		-0.00213141		
TP		372		
HV		0.26576576		
HV(%)		26.5765757		

2001	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-00	272			
JAN	265.6	-0.01034083	-0.011260443	0.000126798
FEB	266.8	0.00195775	0.001038145	1.07774E-06
MAR	257.9	-0.01473448	-0.015654093	0.000245051
APR	264	0.01015258	0.009232975	8.52478E-05
MAY	266.9	0.00474465	0.003825037	1.46309E-05
JUN	271.3	0.00710122	0.00618161	3.82123E-05
JUL	269.2	-0.00337474	-0.004294348	1.84414E-05
AUG	276.5	0.01162008	0.01070047	0.0001145
SEP	294	0.02665219	0.025732585	0.000662166
OCT	280.5	-0.02041446	-0.021334075	0.000455143
NOV	274.9	-0.00875813	-0.009677736	9.36586E-05
DEC	279	0.00642946	0.005509853	3.03585E-05
TLOG		0.0110353	SSD	0.001885284
N		12		
ALOG		0.00091961		
TP		372		
HV		0.25250126		
HV(%)		25.2501255		

2002	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-01	279			
JAN	282.9	0.00602874	-0.001989966	3.95996E-06
FEB	297.1	0.0212697	0.013250994	0.000175589
MAR	303.7	0.00954214	0.00152343	2.32084E-06
APR	309.2	0.00779469	-0.000224017	5.01835E-08
MAY	327.5	0.02497182	0.016953109	0.000287408
JUN	313.9	-0.01841999	-0.026438699	0.000699005
JUL	303.2	-0.01506212	-0.023080829	0.000532725
AUG	312.4	0.01298183	0.004963118	2.46325E-05
SEP	323.9	0.01569992	0.007681213	5.9001E-05
OCT	318.4	-0.00743789	-0.015456599	0.000238906
NOV	316.8	-0.00218789	-0.010206596	0.000104175
DEC	348.2	0.04104359	0.033024884	0.001090643
TLOG		0.09622456	SSD	0.003218415
N		12		
ALOG		0.00801871		
TP		372		
HV		0.3299105		
HV(%)		32.9910497		

2003	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-02	348.2			
JAN	368.3	0.02437295	0.017925542	0.000321325
FEB	350.3	-0.02176158	-0.028208992	0.000795747
MAR	335.9	-0.01823013	-0.024677543	0.000608981
APR	339.4	0.00450183	-0.001945576	3.78527E-06
MAY	364.5	0.03098569	0.024538285	0.000602127
JUN	346.3	-0.02224504	-0.028692451	0.000823257
JUL	354	0.00955077	0.00310336	9.63085E-06
AUG	375.8	0.02595351	0.019506104	0.000380488
SEP	385.4	0.01095493	0.004507525	2.03178E-05
OCT	384.6	-0.00090243	-0.00734984	5.40202E-05
NOV	396.8	0.01356238	0.007114974	5.06228E-05
DEC	416.1	0.02062605	0.014178642	0.000201034
TLOG		0.07736895	SSD	0.003871336
N		12		
ALOG		0.00644741		
TP		372		
HV		0.36183084		
HV(%)		36.1830845		

2004	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-03	416.1			
JAN	402.2	-0.01475565	-0.01664505	0.000277058
FEB	396.8	-0.0058704	-0.007759803	6.02145E-05
MAR	427.3	0.03216123	0.030271829	0.000916384
APR	387.5	-0.04246119	-0.044350586	0.001966974
MAY	394	0.00722451	0.005335115	2.84635E-05
JUN	393	-0.00110367	-0.002993071	8.95848E-06
JUL	391	-0.00221579	-0.004105193	1.68526E-05
AUG	410.9	0.02155938	0.019669984	0.000386908
SEP	418.7	0.00816682	0.00627742	3.9406E-05
OCT	429.4	0.01095908	0.009069679	8.22591E-05
NOV	451.3	0.02160329	0.019713893	0.000388638
DEC	438.4	-0.01259479	-0.014484188	0.000209792
TLOG		0.02267283	SSD	0.004381908
N		12		
ALOG		0.0018894		
TP		372		
HV		0.38495213		
HV(%)		38.4952134		

2005	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-04	438.4			
JAN	421.8	-0.01676397	-0.02286506	0.000522811
FEB	437.6	0.01597074	0.009869648	9.741E-05
MAR	428.7	-0.00892383	-0.01502492	0.000225748
APR	436.1	0.0074326	0.001331513	1.77293E-06
MAY	416.3	-0.02017968	-0.026280766	0.000690679
JUN	437.1	0.0211744	0.015073306	0.000227205
JUL	429.9	-0.00721336	-0.013314451	0.000177275
AUG	435.1	0.00522164	-0.000879452	7.73436E-07
SEP	469	0.03258376	0.026482669	0.000701332
OCT	466.9	-0.00194897	-0.008050059	6.48034E-05
NOV	494.6	0.02503024	0.018929148	0.000358313
DEC	518.9	0.02082956	0.014728469	0.000216928
TLOG		0.07321313	SSD	0.003285049
N		12		
ALOG		0.00610109		
TP		372		
HV		0.33330824		
HV(%)		33.3308241		

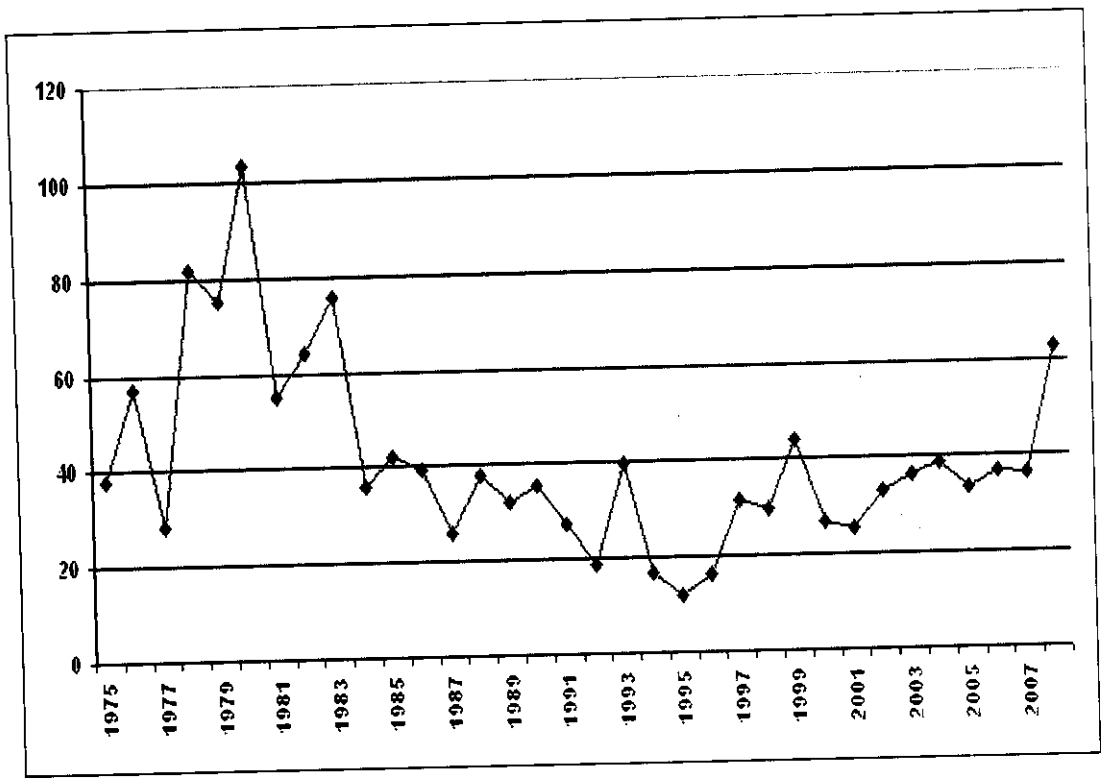
2006	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-05	518.9			
JAN	545.2	0.02147218	0.015371086	0.00023627
FEB	572	0.02084018	0.014739092	0.000217241
MAR	568.4	-0.00274196	-0.00884305	7.81995E-05
APR	590.2	0.01634514	0.010244046	0.00010494
MAY	655	0.04524209	0.039141005	0.001532018
JUN	648	-0.00466629	-0.010767384	0.000115937
JUL	630	-0.01223446	-0.018335546	0.000336192
AUG	644	0.00954532	0.003444228	1.18627E-05
SEP	642	-0.00135084	-0.007451929	5.55313E-05
OCT	604	-0.02649809	-0.032599179	0.001062707
NOV	610	0.0042929	-0.001808194	3.26956E-06
DEC	645.8	0.02476821	0.018667116	0.000348461
TLOG		0.09501437	SSD	0.004102629
N		12		
ALOG		0.00791786		
TP		372		
HV		0.37248284		
HV(%)		37.2482843		

2007	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-06	645.8			
JAN	635	-0.00732432	-0.013425405	0.000180242
FEB	665	0.02004792	0.01394683	0.000194514
MAR	645	-0.01326193	-0.019363021	0.000374927
APR	660.5	0.01031311	0.004212017	1.77411E-05
MAY	670.4	0.00646118	0.000360094	1.29667E-07
JUN	672	0.00103527	-0.005065823	2.56626E-05
JUL	658	-0.00914338	-0.015244469	0.000232394
AUG	668	0.00655057	0.000449479	2.02031E-07
SEP	675.3	0.00472029	-0.001380803	1.90662E-06
OCT	754.5	0.04816249	0.042061404	0.001769162
NOV	790.2	0.02007778	0.013976691	0.000195348
DEC	860.5	0.03701385	0.030912759	0.000955599
TLOG		0.12465283	SSD	0.003947826
N		12		
ALOG		0.01038774		
TP		372		
HV		0.36538789		
HV(%)		36.5387886		

2008	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-07	860.5			
JAN	865.4	0.00246602	-0.003635074	1.32138E-05
FEB	910.2	0.02191994	0.01581885	0.000250236
MAR	975.6	0.03013496	0.02403387	0.000577627
APR	880.5	-0.04454243	-0.050643521	0.002564766
MAY	878	-0.00123484	-0.007335934	5.38159E-05
JUN	890.4	0.00609064	-1.04546E-05	1.09298E-10
JUL	950.6	0.02841266	0.022311569	0.000497806
AUG	874.5	-0.036238	-0.042339086	0.001792598
SEP	805	-0.03596393	-0.042065023	0.001769466
OCT	835.4	0.01609859	0.009997501	9.995E-05
NOV	738.5	-0.05354397	-0.059645061	0.003557533
DEC	782.6	0.02518934	0.019088254	0.000364361
TLOG		-0.04121103	SSD	0.011541374
N		12		
ALOG		-0.00343425		
TP		372		
HV		0.62474658		
HV(%)		62.4746585		

4.1.1 HISTORICAL VOLATILITY OF GOLD (1975-2008)

This diagram shows the historical price volatility of gold for the period 1975 to 2008



INTERPRETATION

The Chart above shows the Historical volatility of Gold from 1975 to 2008. The more Historical volatility happened in the year 1980 i.e.103.08% and less happened in the year 1995 i.e. 11.97%. If the overall average of Annual volatility for 34 years it seems to be 40.89%. Where the highest volatility is compared with the average it seems 2.5 times more than the average.

4.2 HISTORICAL VOLATILITY OF SILVER

The price volatility of silver is calculated using the formula given in the process of analysis of data. The tabulated analysis for the period 1975 to 2008 is given below.

1975	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-74	432.8			
JAN	407.2	-0.02647948	-0.025228893	0.000636497
FEB	445.4	0.03894244	0.040193033	0.00161548
MAR	425	-0.02036128	-0.019110693	0.000365219
APR	430.6	0.0056851	0.006935685	4.81037E-05
MAY	449	0.01817232	0.019422906	0.000377249
JUN	461	0.01145458	0.012705174	0.000161421
JUL	501.2	0.03631014	0.037560727	0.001410808
AUG	455.8	-0.04123674	-0.039986151	0.001598892
SEP	445.5	-0.00992661	-0.008676022	7.52734E-05
OCT	417.2	-0.02850341	-0.027252819	0.000742716
NOV	410	-0.00756044	-0.006309853	3.98142E-05
DEC	418.1	0.00849631	0.009746901	9.50021E-05
TLOG		-0.01500708	SSD	0.007166476
N		12		
ALOG		-0.00125059		
TP		360		
HV		0.4842925		
HV(%)		48.4292499		

1976	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-75	418.1			
JAN	395	-0.02468307	-0.026117162	0.000682106
FEB	420.2	0.02685895	0.025424862	0.000646424
MAR	404.1	-0.0169672	-0.018401288	0.000338607
APR	445.8	0.04265121	0.041217124	0.001698851
MAY	469	0.02203278	0.020598689	0.000424306
JUN	483.7	0.01340324	0.011969155	0.000143261
JUL	448.6	-0.03271682	-0.034150908	0.001166285
AUG	408.2	-0.04098627	-0.042420359	0.001799487
SEP	433.9	0.02651665	0.02508256	0.000629135
OCT	431.7	-0.0022076	-0.003641691	1.32619E-05
NOV	427.3	-0.00444916	-0.005883246	3.46126E-05
DEC	435	0.00775636	0.006322274	3.99712E-05
TLOG		0.01720909		0.007616307
N		12		
ALOG		0.00143409		
TP		360		
HV		0.49926041		

1977	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-76	435			
JAN	447.3	0.01210964	0.008630011	7.44771E-05
FEB	473.2	0.02444584	0.020966208	0.000439582
MAR	480.9	0.00701004	0.003530411	1.24638E-05
APR	476	-0.00444782	-0.007927454	6.28445E-05
MAY	454.4	-0.02016863	-0.02364826	0.00055924
JUN	447.8	-0.00635423	-0.009833863	9.67049E-05
JUL	449.8	0.00193536	-0.001544268	2.38476E-06
AUG	446.4	-0.00329527	-0.006774895	4.58992E-05
SEP	463.5	0.01632555	0.012845923	0.000165018
OCT	486.4	0.02094383	0.017464198	0.000304998
NOV	476.4	-0.00902181	-0.012501443	0.000156286
DEC	478.9	0.00227308	-0.001206546	1.45575E-06
TLOG		0.04175558	SSD	0.001921354
N		12		
ALOG		0.00347963		
TP		360		
HV		0.2507602		
HV(%)		25.0760204		

1978	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-77	478.9			
JAN	496.7	0.01584932	0.007330343	5.37339E-05
FEB	495.8	-0.00078764	-0.009306618	8.66131E-05
MAR	545.5	0.04148823	0.032969252	0.001086972
APR	497.1	-0.04035099	-0.048869972	0.002388274
MAY	539.8	0.03578912	0.027270137	0.00074366
JUN	521.4	-0.01506185	-0.023580833	0.000556056
JUL	564.6	0.03456985	0.026050867	0.000678648
AUG	547.8	-0.01311885	-0.021637826	0.000468196
SEP	563.2	0.01204062	0.003521638	1.24019E-05
OCT	616.8	0.03948172	0.030962739	0.000958691
NOV	600	-0.01199311	-0.020512095	0.000420746
DEC	606	0.00432137	-0.004197606	1.76199E-05
TLOG		0.10222779		0.007471611
N		12		
ALOG		0.00851898		
TP		360		
HV		0.49449515		
HV(%)		49.4495152		

1979	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-78	606			
JAN	670	0.04360218	-0.018974331	0.000360025
FEB	771.2	0.06109222	-0.001484292	2.20312E-06
MAR	745.1	-0.01495246	-0.077528967	0.006010741
APR	798.5	0.03006036	-0.032516153	0.0010573
MAY	870	0.03724433	-0.025332178	0.000641719
JUN	865.3	-0.00235255	-0.064929059	0.004215783
JUL	897	0.01562574	-0.046950771	0.002204375
AUG	1061.5	0.07312756	0.010551045	0.000111325
SEP	1640	0.18892385	0.12634734	0.01596365
OCT	1656	0.00421648	-0.058360026	0.003405893
NOV	1882	0.05555929	-0.007017223	4.92414E-05
DEC	3415	0.25877109	0.196194579	0.038492313
TLOG		0.75091808	SSD	0.072514568
N		12		
ALOG		0.06257651		
TP		360		
HV		1.5405207		
HV(%)		154.05207		

1980	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-79	3415			
JAN	3460	0.00568539	0.033832691	0.001144651
FEB	3530	0.00869861	0.036845907	0.001357621
MAR	1420	-0.39548636	-0.367339061	0.134937986
APR	1250	-0.05537833	-0.027231031	0.000741529
MAY	1395	0.04766419	0.075811495	0.005747383
JUN	1665	0.07684003	0.10498733	0.01102234
JUL	1540.5	-0.03375254	-0.005605235	3.14187E-05
AUG	1630	0.0245259	0.052673202	0.002774466
SEP	2072	0.10420215	0.132349447	0.017516376
OCT	1890	-0.03992795	-0.011780647	0.000138784
NOV	1859	-0.00718241	0.020964886	0.000439526
DEC	1569	-0.07365645	-0.045509146	0.002071082
TLOG		-0.33776776		0.177923162
N		12		
ALOG		-0.02814731		
TP		360		
HV		2.41307684		
HV(%)		241.307684		

1981	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-80	1569			
JAN	1325	-0.07340707	-0.049590435	0.002459211
FEB	1217.5	-0.03674691	-0.012930278	0.000167192
MAR	1189.5	-0.01010452	0.013712106	0.000188022
APR	1109	-0.0304329	-0.00661627	4.3775E-05
MAY	1073	-0.01433182	0.009484806	8.99615E-05
JUN	855.5	-0.09837971	-0.074563078	0.005559653
JUL	852	-0.00178042	0.022036211	0.000485595
AUG	929.5	0.0378098	0.061626429	0.003797817
SEP	914	-0.0073032	0.016513432	0.000272693
OCT	915	0.0004749	0.024291528	0.000590078
NOV	820.5	-0.04734251	-0.023525879	0.000553467
DEC	812.5	-0.00425522	0.019561414	0.000382649
TLOG		-0.28579957	SSD	0.014590113
N		12		
ALOG		-0.02381663		
TP		360		
HV		0.69100986		
HV(%)		69.1009857		

1982	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-81	812.5			
JAN	819.6	0.00377858	-0.00695449	4.83649E-05
FEB	774.5	-0.02458053	-0.035313598	0.00124705
MAR	714.5	-0.03501919	-0.045752259	0.002093269
APR	686	-0.01767812	-0.028411187	0.000807196
MAY	623	-0.04183607	-0.052569139	0.002763514
JUN	602.1	-0.01481942	-0.025552489	0.00065293
JUL	668.2	0.04523784	0.034504774	0.001190579
AUG	784	0.06940959	0.058676521	0.003442934
SEP	812	0.01523997	0.004506897	2.03121E-05
OCT	1001.5	0.09109492	0.080361854	0.006458028
NOV	1009	0.00324021	-0.007492857	5.61429E-05
DEC	1093	0.034729	0.023995926	0.000575804
TLOG		0.12879679		0.019356125
N		12		
ALOG		0.01073307		
TP		360		
HV		0.79591028		
HV(%)		79.5910279		

1983	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-82	1093			
JAN	1425	0.1151947	0.122145842	0.014919607
FEB	1030	-0.14097764	-0.1340265	0.017963103
MAR	1068.2	0.01581535	0.022766489	0.000518313
APR	1205.8	0.05262271	0.059573846	0.003549043
MAY	1290	0.02931443	0.036265571	0.001315192
JUN	1158.2	-0.04680615	-0.03985501	0.001588422
JUL	1181.5	0.00865017	0.015601305	0.000243401
AUG	1210	0.01035164	0.017302784	0.000299386
SEP	1090	-0.04535887	-0.038407732	0.001475154
OCT	840	-0.11314721	-0.106196072	0.011277606
NOV	962	0.05889579	0.065846926	0.004335818
DEC	902	-0.02796853	-0.021017394	0.000441731
TLOG				
N		-0.08341362	SSD	0.057926774
ALOG		12		
TP		-0.00695114		
HV		360		
HV(%)		1.37687521		
		137.687521		

1984	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-83	902			
JAN	860.5	-0.02045566	-0.007438063	5.53248E-05
FEB	966	0.05022625	0.063243852	0.003999785
MAR	982	0.00713436	0.020151961	0.000406102
APR	895.5	-0.0400459	-0.027028298	0.000730529
MAY	926.1	0.01459229	0.027609894	0.000762306
JUN	838	-0.04341387	-0.030396266	0.000923933
JUL	701.8	-0.07703065	-0.064013055	0.004097671
AUG	745.2	0.02605948	0.039077082	0.001527018
SEP	748	0.00162875	0.014646352	0.000214516
OCT	722.3	-0.01518398	-0.002166383	4.69322E-06
NOV	701.9	-0.01244237	0.000575228	3.30887E-07
DEC	629.5	-0.04727951	-0.034261908	0.001173878
TLOG		-0.1562108		0.013896087
N		12		
ALOG		-0.01301757		
TP		360		
HV		0.67437454		
HV(%)		67.4374541		

1985	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-84	629.5			
JAN	635.2	0.00391475	0.006716855	4.51161E-05
FEB	562.5	-0.05278796	-0.049985863	0.002498586
MAR	668.7	0.0751088	0.077910896	0.006070108
APR	616.5	-0.03529824	-0.032496142	0.001055999
MAY	615.6	-0.00063447	0.00216763	4.69862E-06
JUN	610.8	-0.00339958	-0.000597483	3.56986E-07
JUL	628.4	0.01233715	0.015139248	0.000229197
AUG	624	-0.00305159	-0.000249487	6.22436E-08
SEP	601.3	-0.01609339	-0.013291286	0.000176658
OCT	608.4	0.005098	0.007900102	6.24116E-05
NOV	607.7	-0.00049997	0.002302131	5.29981E-06
DEC	582.6	-0.01831876	-0.015516656	0.000240767
TLOG		-0.03362525	SSD	0.010389261
N		12		
ALOG		-0.0028021		
TP		360		
HV		0.58310562		
HV(%)		58.3105622		

1986	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-85	582.6			
JAN	603.7	0.0154507	0.018198756	0.000331195
FEB	563	-0.0303128	-0.027564721	0.000759814
MAR	513	-0.040391	-0.03764297	0.001416993
APR	512.7	-0.000254	0.002494012	6.2201E-06
MAY	523.9	0.00938508	0.012133141	0.000147213
JUN	510.2	-0.0115079	-0.008759884	7.67356E-05
JUL	509.8	-0.0003406	0.002407437	5.79575E-06
AUG	514.7	0.00415434	0.006902397	4.76431E-05
SEP	556.9	0.03422305	0.03697111	0.001366863
OCT	565.4	0.00657859	0.009326646	8.69863E-05
NOV	538.9	-0.0208476	-0.018099561	0.000327594
DEC	540	0.00088558	0.003633636	1.32033E-05
TLOG		-0.0329767		0.004586256
N		12		
ALOG		-0.0027481		
TP		360		
HV		0.3874218		
HV(%)		38.7421801		

1987	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-86	540			
JAN	549.7	0.00773198	0.000376367	1.41652E-07
FEB	542.8	-0.0054859	-0.012841508	0.000164904
MAR	618.3	0.05655941	0.049203798	0.002421014
APR	798.4	0.11102128	0.103665672	0.010746572
MAY	762	-0.0202656	-0.027621167	0.000762929
JUN	731.2	-0.0179188	-0.025274399	0.000638795
JUL	830	0.05504191	0.0476863	0.002273983
AUG	738.3	-0.0508452	-0.058200834	0.003387337
SEP	750	0.00682839	-0.000527215	2.77956E-07
OCT	695	-0.0330765	-0.040432069	0.001634752
NOV	703.7	0.00540275	-0.001952864	3.81368E-06
DEC	661.7	-0.0267264	-0.034082026	0.001161585
TLOG		0.08826737	SSD	0.023196104
N		12		
ALOG		0.00735561		
TP		360		
HV		0.8712894		
HV(%)		87.1289399		

1988	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-87	661.7			
JAN	650.5	-0.0074138	-0.004099834	1.68086E-05
FEB	623.9	-0.0181323	-0.014818315	0.000219582
MAR	675.5	0.03451037	0.037824368	0.001430683
APR	649.8	-0.0168456	-0.013531646	0.000183105
MAY	660	0.00676423	0.010078229	0.000101571
JUN	667.8	0.00510248	0.008416479	7.08371E-05
JUL	680.7	0.00830934	0.011623336	0.000135102
AUG	655.6	-0.0163168	-0.013002806	0.000169073
SEP	613.5	-0.0288244	-0.025510378	0.000650779
OCT	630.3	0.01173274	0.01504674	0.000226404
NOV	613.6	-0.011662	-0.008347956	6.96884E-05
DEC	603.8	-0.0069922	-0.003678242	1.35295E-05
TLOG		-0.039768	SSD	0.003287164
N		12		
ALOG		-0.003314		
TP		360		
HV		0.32799375		
HV(%)		32.7993752		

1989	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-88	603.8			
JAN	579.2	-0.0180646	-0.012712715	0.000161613
FEB	582.4	0.00239281	0.007744653	5.99797E-05
MAR	577.8	-0.0034438	0.001908011	3.64051E-06
APR	560.1	-0.013512	-0.008160125	6.65876E-05
MAY	516	-0.0356159	-0.030264031	0.000915912
JUN	515.5	-0.000421	0.004930808	2.43129E-05
JUL	526.9	0.00949953	0.014851369	0.000220563
AUG	504.5	-0.018867	-0.013515188	0.00018266
SEP	522.6	0.01530823	0.020660075	0.000426839
OCT	521.8	-0.0006653	0.004686509	2.19634E-05
NOV	566.8	0.03592577	0.041277607	0.001703841
DEC	520.8	-0.0367589	-0.031407026	0.000986401
TLOG		-0.0642221	SSD	0.004774313
N		12		
ALOG		-0.0053518		
TP		360		
HV		0.39528502		
HV(%)		39.5285016		

1990	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-89	520.8			
JAN	519.4	-0.001169	0.00668511	4.46907E-05
FEB	512.7	-0.0056386	0.002215512	4.90849E-06
MAR	494.5	-0.015697	-0.007842882	6.15108E-05
APR	493.2	-0.0011432	0.006710912	4.50363E-05
MAY	507.4	0.01232739	0.020181535	0.000407294
JUN	488.7	-0.0163081	-0.008453984	7.14698E-05
JUL	482.2	-0.0058151	0.002039007	4.15755E-06
AUG	475.9	-0.0057115	0.002142639	4.5909E-06
SEP	475.1	-0.0007307	0.007123466	5.07438E-05
OCT	415.3	-0.0584231	-0.050568959	0.00255722
NOV	412.2	-0.0032539	0.004600196	2.11618E-05
DEC	419.2	0.00731329	0.015167427	0.000230051
TLOG		-0.0942497	SSD	0.003502835
N		12		
ALOG		-0.0078541		
TP		360		
HV		0.33858269		
HV(%)		33.8582688		

1991	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-90	419.2			
JAN	383	-0.0392225	-0.03645134	0.0013287
FEB	372.9	-0.0116064	-0.008835231	7.80613E-05
MAR	384.9	0.01375553	0.016526688	0.000273131
APR	396.9	0.01333319	0.016104348	0.00025935
MAY	409.8	0.01389086	0.016662015	0.000277623
JUN	442.4	0.03324316	0.036014324	0.001297032
JUL	405.5	-0.0378243	-0.0350531	0.00122872
AUG	380.7	-0.027408	-0.024636822	0.000606973
SEP	413	0.03536717	0.038138335	0.001454533
OCT	409	-0.0042267	-0.001455584	2.11872E-06
NOV	405.7	-0.0035183	-0.00074714	5.58219E-07
DEC	388.3	-0.0190376	-0.016266457	0.000264598
TLOG		-0.0332539	SSD	0.007071397
N		12		
ALOG		-0.0027712		
TP		360		
HV		0.48106917		
HV(%)		48.1069167		

1992	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-91	388.3			
JAN	418	0.03200889	0.033853981	0.001146092
FEB	410	-0.0083924	-0.006547335	4.28676E-05
MAR	414.3	0.00453108	0.006376167	4.06555E-05
APR	398.8	-0.0165598	-0.014714694	0.000216522
MAY	401.3	0.00271401	0.0045591	2.07854E-05
JUN	402.8	0.0016203	0.003465392	1.20089E-05
JUL	392.7	-0.0110286	-0.009183471	8.43361E-05
AUG	373	-0.0223521	-0.020506979	0.000420536
SEP	376.2	0.00370996	0.005555049	3.08586E-05
OCT	376.2	0	0.00184509	3.40436E-06
NOV	373.1	-0.0035935	-0.001748452	3.05709E-06
DEC	369	-0.0047989	-0.002953793	8.72489E-06
TLOG		-0.022141	SSD	0.002029849
N		12		
ALOG		-0.0018451		
TP		360		
HV		0.25774293		
HV(%)		25.7742933		

1993	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-92	369			
JAN	365.2	-0.0044956	-0.016328017	0.000266604
FEB	356.5	-0.0104712	-0.022303655	0.000497453
MAR	388	0.03677219	0.024939771	0.000621992
APR	438.9	0.05353386	0.041701435	0.00173901
MAY	462.2	0.02246436	0.01063194	0.000113038
JUN	455.8	-0.0060556	-0.01788804	0.000319982
JUL	540.8	0.07426236	0.062429942	0.003897498
AUG	483.8	-0.0483708	-0.060203239	0.00362443
SEP	408.2	-0.0737929	-0.085625284	0.007331689
OCT	436.7	0.02931019	0.017477772	0.000305472
NOV	442	0.00523908	-0.006593343	4.34722E-05
DEC	511.7	0.06359315	0.051760728	0.002679173
TLOG		0.14198905	SSD	0.021439814
N		12		
ALOG		0.01183242		
TP		360		
HV		0.83765544		
HV(%)		83.7655435		

1994	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-93	511.7			
JAN	513.5	0.00152503	0.002967961	8.80879E-06
FEB	535.6	0.01830012	0.01974305	0.000389788
MAR	577.1	0.03241051	0.033853436	0.001146055
APR	533.8	-0.0338725	-0.032429575	0.001051677
MAY	553	0.01534656	0.016789492	0.000281887
JUN	538	-0.0119429	-0.010499926	0.000110248
JUL	533.2	-0.0038921	-0.002449205	5.9986E-06
AUG	544.3	0.00894819	0.010391124	0.000107975
SEP	565.7	0.01674784	0.018190774	0.000330904
OCT	526.2	-0.0314353	-0.029992405	0.000899544
NOV	489.6	-0.0313094	-0.029866505	0.000892008
DEC	491.7	0.0018588	0.003301729	1.09014E-05
TLOG		-0.0173152	SSD	0.005235797
N		12		
ALOG		-0.0014429		
TP		360		
HV		0.41394849		
HV(%)		41.3948493		

1995	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-94	491.7			
JAN	466.3	-0.0230348	-0.025108743	0.000630449
FEB	451.3	-0.0142001	-0.016274032	0.000264844
MAR	531	0.07062919	0.068555238	0.004699821
APR	572.2	0.03245333	0.030379382	0.000922907
MAY	531	-0.0324533	-0.034527282	0.001192133
JUN	501.4	-0.0249102	-0.026984141	0.000728144
JUL	505.2	0.00327901	0.001205062	1.45218E-06
AUG	531.1	0.02171296	0.01963901	0.000385691
SEP	548.5	0.01400033	0.01192638	0.000142239
OCT	536	-0.0100118	-0.012085792	0.000146066
NOV	518.6	-0.0143323	-0.016406227	0.000269164
DEC	520.7	0.00175507	-0.000318885	1.01687E-07
TLOG		0.02488737	SSD	0.009383011
N		12		
ALOG		0.00207395		
TP		360		
HV		0.55414833		
HV(%)		55.4148333		

1996	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-95	520.7			
JAN	556.5	0.02887759	0.031898601	0.001017521
FEB	549.7	-0.0053394	-0.002318422	5.37508E-06
MAR	554	0.00338403	0.006405038	4.10245E-05
APR	529.1	-0.019972	-0.016950993	0.000287336
MAY	540.3	0.00909721	0.012118216	0.00014685 1
JUN	497.9	-0.0354928	-0.032471831	0.00105442
JUL	514.8	0.01449641	0.017517422	0.00030686
AUG	517.4	0.00218789	0.005208896	2.71326E-05
SEP	487.7	-0.0256737	-0.022652659	0.000513143
OCT	480.8	-0.0061883	-0.003167287	1.00317E-05
NOV	471.4	-0.0085749	-0.005553871	3.08455E-05
DEC	479	0.00694594	0.009966945	9.934E-05
TLOG		-0.0362521	SSD	0.00353988
N		12		
ALOG		-0.003021		
TP		360		
HV		0.34036837		
HV(%)		34.0368371		

1997	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-96	479			
JAN	492	0.01162959	0.003884689	1.50908E-05
FEB	531	0.03312942	0.025384518	0.000644374
MAR	507.5	-0.0196585	-0.027403374	0.000750945
APR	464.7	-0.0382634	-0.046008274	0.002116761
MAY	467.5	0.00260894	-0.005135957	2.63781E-05
JUN	460	-0.0070238	-0.014768684	0.000218114
JUL	449	-0.0105115	-0.018256391	0.000333296
AUG	461.6	0.01201946	0.004274559	1.82719E-05
SEP	523.2	0.05440194	0.046657035	0.002176879
OCT	473.7	-0.0431644	-0.050909251	0.002591752
NOV	522.1	0.04225031	0.034505408	0.001190623
DEC	593.3	0.05552066	0.047775755	0.002282523
TLOG		0.09293883	SSD	0.012365007
N		12		
ALOG		0.0077449		
TP		360		
HV		0.63613911		
HV(%)		63.6139108		

1998	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-97	593.3			
JAN	612.5	0.01383174	0.020111745	0.000404482
FEB	643	0.02110488	0.02738488	0.000749932
MAR	646.7	0.00249189	0.008771888	7.6946E-05
APR	618.8	-0.0191526	-0.012872556	0.000165703
MAY	508.5	-0.0852593	-0.078979348	0.006237737
JUN	550.7	0.03462412	0.040904119	0.001673147
JUL	545.8	-0.0038815	0.002398455	5.75259E-06
AUG	461.8	-0.0725796	-0.066299603	0.004395637
SEP	536	0.06471086	0.070990861	0.005039702
OCT	504.3	-0.0264758	-0.020195822	0.000407871
NOV	482.5	-0.0191917	-0.01291165	0.000166711
DEC	498.8	0.01442913	0.020709127	0.000428868
TLOG		-0.0753479	SSD	0.019752489
N		12		
ALOG		-0.00628		
TP		360		
HV		0.8040181		
HV(%)		80.4018096		

1999	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-98	498.8			
JAN	523.5	0.02099024	0.018030241	0.00032509
FEB	563.5	0.03197723	0.029017234	0.000842
MAR	497	-0.0545375	-0.057497532	0.003305966
APR	540.7	0.03659998	0.033639981	0.001131648
MAY	489.5	-0.0432037	-0.046163673	0.002131085
JUN	529.1	0.03378507	0.030825065	0.000950185
JUL	546.5	0.0140524	0.011092405	0.000123041
AUG	515.2	-0.0256143	-0.028574312	0.000816491
SEP	561.5	0.03737391	0.034413906	0.001184317
OCT	518	-0.03502	-0.037980001	0.00144248
NOV	518	0	-0.00296	8.7616E-06
DEC	541.3	0.01910827	0.016148267	0.000260767
TLOG		0.03551158	SSD	0.012521832
N		12		
ALOG		0.00296		
TP		360		
HV		0.64016045		
HV(%)		64.0160448		

2000	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-99	541.3			
JAN	531.7	-0.0077714	-0.001763147	3.10869E-06
FEB	504.8	-0.0225473	-0.016539094	0.000273542
MAR	504.2	-0.0005165	0.005491715	3.01589E-05
APR	496	-0.0071212	-0.001112945	1.23865E-06
MAY	496.5	0.00043758	0.006445796	4.15483E-05
JUN	503.3	0.00590768	0.011915898	0.000141989
JUL	500.6	-0.0023361	0.003672135	1.34846E-05
AUG	500.3	-0.0002603	0.005747878	3.30381E-05
SEP	492.2	-0.0070889	-0.001080674	1.16786E-06
OCT	475.4	-0.0150824	-0.009074212	8.23413E-05
NOV	467.5	-0.0072776	-0.001269342	1.61123E-06
DEC	458.5	-0.0084423	-0.002434055	5.92462E-06
TLOG		-0.0720987	SSD	0.000629153
N		12		
ALOG		-0.0060082		
TP		360		
HV		0.14349371		
HV(%)		14.3493713		

2001	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-00	458.5			
JAN	481.5	0.02125695	0.021236951	0.000451008
FEB	447.2	-0.0320945	-0.032114497	0.001031341
MAR	427.8	-0.019261	-0.019281015	0.000371758
APR	431	0.00323649	0.00321649	1.03458E-05
MAY	441	0.00996132	0.009941319	9.88298E-05
JUN	432.7	-0.0082517	-0.008271694	6.84209E-05
JUL	422.8	-0.0100519	-0.010071917	0.000101444
AUG	421	-0.0018529	-0.001872883	3.50769E-06
SEP	467.5	0.04549952	0.045479519	0.002068387
OCT	422.5	-0.0439549	-0.043974902	0.001933792
NOV	415.7	-0.0070467	-0.007066689	4.99381E-05
DEC	458.8	0.04284338	0.042823385	0.001833842
TLOG		0.00028407	SSD	0.008022613
N		12		
ALOG		0.00002		
TP		360		
HV		0.51240439		
HV(%)		51.2404386		

2002	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-01	458.8			
JAN	422.3	-0.0360023	-0.037644688	0.001417123
FEB	451.7	0.02922901	0.027586649	0.000761023
MAR	465	0.01260286	0.010960502	0.000120133
APR	455.5	-0.0089646	-0.010606932	0.000112507
MAY	504.2	0.04411446	0.0424721	0.001803879
JUN	483.3	-0.018386	-0.020028406	0.000401137
JUL	459.8	-0.0216478	-0.023290188	0.000542433
AUG	443.7	-0.0154795	-0.017121898	0.000293159
SEP	453	0.00900877	0.007366413	5.4264E-05
OCT	450.5	-0.0024034	-0.004045767	1.63682E-05
NOV	441.4	-0.0088625	-0.010504826	0.000110351
DEC	480.1	0.03649938	0.034857017	0.001215012
TLOG		0.0197083	SSD	0.006847389
N		12		
ALOG		0.00164236		
TP		360		
HV		0.47338819		
HV(%)		47.3388186		

2003	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-02	480.1			
JAN	486	0.00530456	-0.002479117	6.14602E-06
FEB	458.5	-0.0252969	-0.033080609	0.001094327
MAR	446.5	-0.0115179	-0.019301557	0.00037255
APR	463.8	0.01650928	0.008725601	7.61361E-05
MAY	453.3	-0.009945	-0.017728705	0.000314307
JUN	455.7	0.00229331	-0.00549037	3.01442E-05
JUL	512	0.05059093	0.042807252	0.001832461
AUG	510.9	-0.0009341	-0.008717738	7.5999E-05
SEP	514.2	0.00279617	-0.00498751	2.48753E-05
OCT	506.5	-0.0065526	-0.014336303	0.00020553
NOV	535.5	0.02418003	0.016396345	0.00026884
DEC	595.3	0.04597641	0.038192727	0.001458684
TLOG		0.09340418	SSD	0.005759999
N		12		
ALOG		0.00778368		
TP		360		
HV		0.43417631		
HV(%)		43.417631		

2004	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-03	595.3			
JAN	625	0.02114413	0.016292475	0.000265445
FEB	669.6	0.02993543	0.025083768	0.000629195
MAR	794.5	0.07427846	0.069426797	0.00482008
APR	607.8	-0.1163332	-0.121184866	0.014685772
MAY	611	0.00228051	-0.002571146	6.61079E-06
JUN	577.6	-0.024414	-0.029265686	0.00085648
JUL	656	0.05527665	0.050424995	0.00254268
AUG	677.1	0.01374897	0.008897314	7.91622E-05
SEP	693.8	0.01058148	0.005729822	3.28309E-05
OCT	730.5	0.02238592	0.017534265	0.00030745
NOV	772.3	0.02416581	0.019314155	0.000373037
DEC	680.7	-0.0548303	-0.059681944	0.003561934
TLOG		0.05821987	SSD	0.028160678
N		12		
ALOG		0.00485166		
TP		360		
HV		0.96001155		
HV(%)		96.0011552		

2005	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-04	680.7			
JAN	674.7	-0.003845	-0.01322111	0.000174798
FEB	735.9	0.03770809	0.028332023	0.000802704
MAR	718	-0.0106944	-0.020070429	0.000402822
APR	690.3	-0.0170866	-0.026462641	0.000700271
MAY	745.2	0.03323497	0.023858903	0.000569247
JUN	702.8	-0.0254411	-0.034817163	0.001212235
JUL	726.2	0.01422449	0.004848422	2.35072E-05
AUG	678.1	-0.0297625	-0.03913857	0.001531828
SEP	751.2	0.04446183	0.035085765	0.001231011
OCT	758	0.00391363	-0.005462444	2.98383E-05
NOV	828	0.03836113	0.028985061	0.000840134
DEC	882	0.02743825	0.018062178	0.000326242
TLOG		0.11251283	SSD	0.007844637
N		12		
ALOG		0.00937607		
TP		360		
HV		0.50668883		
HV(%)		50.6688833		

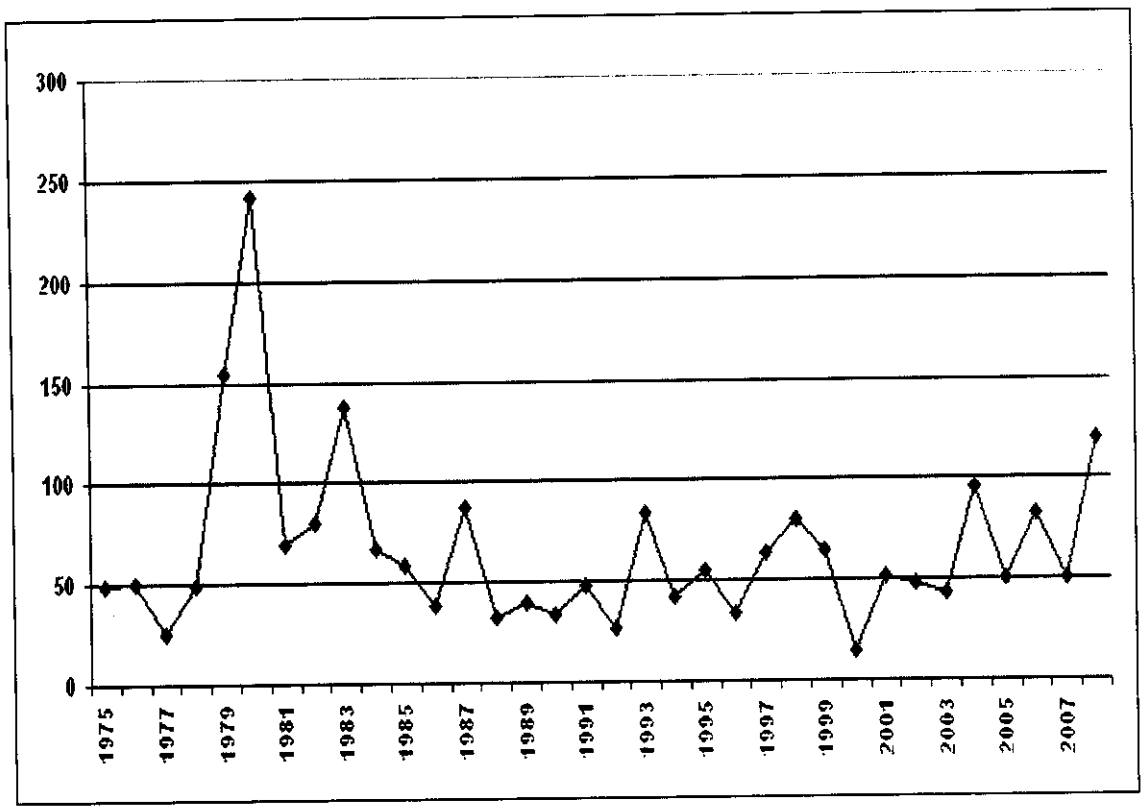
2006	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-05	882			
JAN	965	0.03905873	0.029682658	0.00088106
FEB	987.5	0.01000979	0.000633721	4.01602E-07
MAR	984	-0.001542	-0.010918076	0.000119204
APR	1185.6	0.08094309	0.071567022	0.005121839
MAY	1378.4	0.06543707	0.056061004	0.003142836
JUN	1235.6	-0.0474974	-0.056873435	0.003234588
JUL	1165.4	-0.0254029	-0.034778956	0.001209576
AUG	1144.6	-0.0078213	-0.017197342	0.000295749
SEP	1305.4	0.05708987	0.047713797	0.002276606
OCT	1174.2	-0.0460015	-0.055377602	0.003066679
NOV	1272.8	0.03501809	0.025642021	0.000657513
DEC	1402.3	0.04208077	0.032704697	0.001069597
TLOG		0.20137235	SSD	0.021075649
N		12		
ALOG		0.01678103		
TP		360		
HV		0.83051099		
HV(%)		83.0510988		

2007	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-06	1402.3			
JAN	1305	-0.0312304	-0.040606492	0.001648887
FEB	1355.6	0.01652105	0.007144978	5.10507E-05
MAR	1297.4	-0.0190577	-0.028433737	0.000808477
APR	1335.6	0.01260252	0.003226447	1.041E-05
MAY	1332.4	-0.0010418	-0.010417856	0.000108532
JUN	1382.5	0.01603052	0.006654446	4.42817E-05
JUL	1254.3	-0.0422637	-0.051639788	0.002666668
AUG	1298	0.01487327	0.0054972	3.02192E-05
SEP	1245.6	-0.0178961	-0.027272163	0.000743771
OCT	1387.5	0.04685439	0.037478322	0.001404625
NOV	1438.6	0.01570706	0.006330994	4.00815E-05
DEC	1432.5	-0.0018454	-0.011221495	0.000125922
TLOG		0.0092537	SSD	0.007682924
N		12		
ALOG		0.00077114		
TP		360		
HV		0.50143909		
HV(%)		50.1439094		

2008	Pi	LOG(pi/pi-1)	(LOGSi-ALOG)	(LOGSi-ALOG)2
Dec-07	1432.5			
JAN	1530	0.0285968	0.01922073	0.000369436
FEB	1685	0.04190847	0.032532404	0.001058357
MAR	2010	0.07659615	0.067220082	0.004518539
APR	1702	-0.0722365	-0.081612572	0.006660612
MAY	1595	-0.0281989	-0.037574938	0.001411876
JUN	1692	0.02563967	0.016263601	0.000264505
JUL	1808	0.02879807	0.019421997	0.000377214
AUG	1734	-0.0181493	-0.027525403	0.000757648
SEP	1294	-0.1271148	-0.136490887	0.018629762
OCT	1105	-0.068572	-0.077948068	0.006075901
NOV	985.4	-0.0497497	-0.05912579	0.003495859
DEC	965.4	-0.0089053	-0.018281333	0.000334207
TLOG		-0.1713873	SSD	0.043953917
N		12		
ALOG		-0.0142823		
TP		360		
HV		1.19937144		
HV(%)		119.937144		

4.2.1 HISTORICAL VOLATILITY OF SILVER (1975 - 2008)

This diagram shows the historical price volatility of silver for the period 1975 to 2008



INTERPRETATION

The Chart above shows the Historical volatility of Silver from 1975 to 2008. The more Historical volatility happened in the year 1980 i.e. 241.31% and less happened in the year 2000 i.e. 14.35%. If the overall average of Annual volatility for 34 years it seems to be 66.58%. Where the highest volatility is compared with the average it seems 3.7 times more than the average.

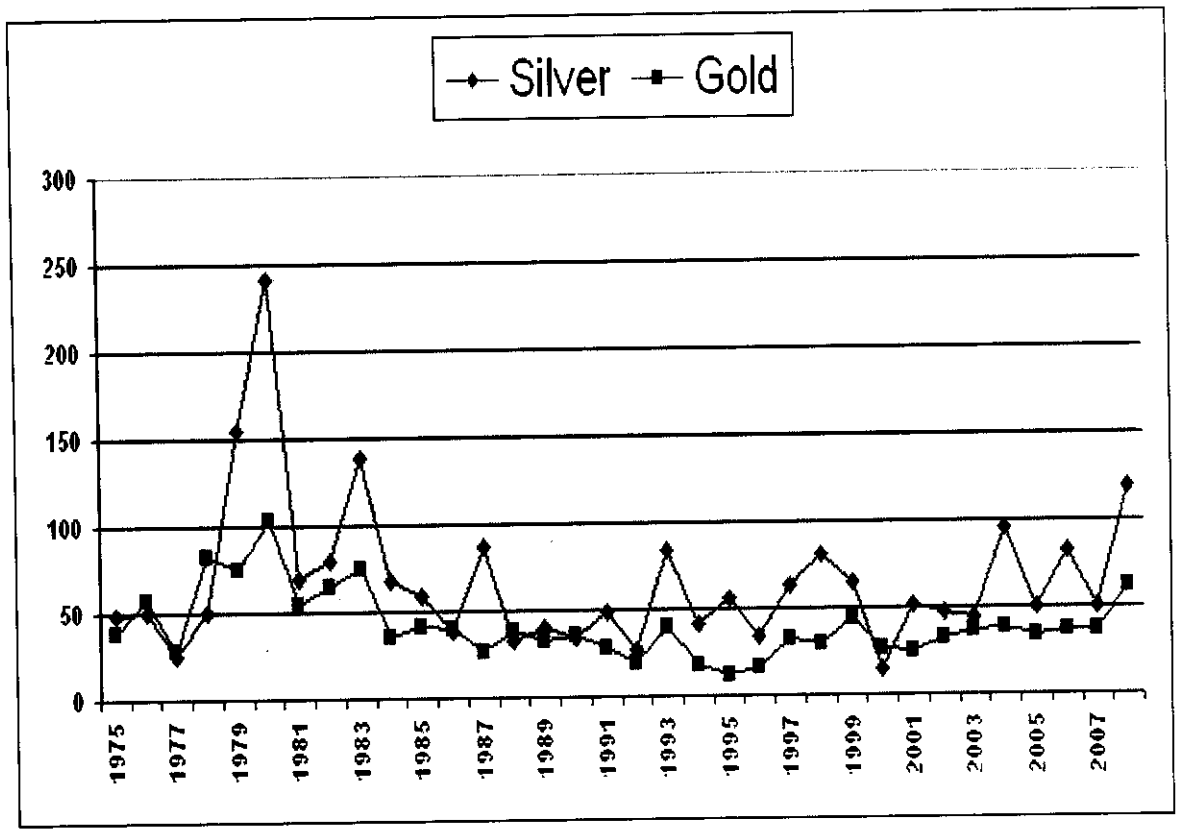
4.3 PRICE VOLATILITY OF GOLD VS SLIVER

The correlation of gold and silver price volatility is calculated using the formula given in the process of analysis of data. The tabulated analysis for the period 1975 to 2008 is given below

GOLD	X	$X-\overline{X}$	$(X-\overline{X})^2$	SILVER	Y	$Y-\overline{Y}$	$(Y-\overline{Y})^2$
1975	37.56	-3.32	11.02	**1975**	48.43	-18.14	327.61
1976	56.91	16.02	256.64	**1976**	49.93	-16.64	276.88
1977	28.33	-12.55	157.5	**1977**	25.08	-41.49	1721.42
1978	81.81	40.92	1674.44	**1978**	49.45	-17.12	292.41
1979	75.13	34.24	1172.44	**1979**	154.05	87.49	7638.76
1980	103.08	62.19	3867.59	**1980**	241.31	174.74	30520.09
1981	54.84	13.95	194.6	**1981**	69.10	2.54	6.45
1982	64.17	23.28	540.6	**1982**	79.59	13.03	169.78
1983	75.33	34.45	1186.8	**1983**	137.69	71.12	5058.05
1984	35.77	-5.12	26.21	**1984**	67.44	0.87	0.756
1985	41.86	0.98	0.96	**1985**	58.31	-8.25	68.03
1986	39.00	-1.88	3.534	**1986**	38.74	-27.82	773.95
1987	25.85	-15.04	226.2	**1987**	87.13	20.56	422.71
1988	37.78	-3.11	9.67	**1988**	32.80	-33.77	1140.41
1989	32.20	-8.68	75.34	**1989**	39.53	-27.04	731.16
1990	35.40	-5.48	30.03	**1990**	33.86	-32.71	1069.94
1991	27.38	-13.5	182.25	**1991**	48.11	-18.46	338.56
1992	18.65	-22.23	494.17	**1992**	25.77	-41.19	1696.61
1993	39.83	-10.6	112.57	**1993**	83.77	17.2	295.84
1994	16.96	-23.93	572.6	**1994**	41.39	-25.17	633.52
1995	11.97	-28.91	835.78	**1995**	55.41	-11.15	124.32
1996	16.14	-24.74	612.06	**1996**	34.04	-32.53	1058.2
1997	31.75	-9.13	82.81	**1997**	63.61	-2.95	8.7
1998	29.45	-11.44	129.96	**1998**	80.40	13.84	191.54
1999	44.10	3.21	10.3	**1999**	64.02	-2.55	6.5
2000	26.58	-14.31	204.49	**2000**	14.35	-52.22	2726.9
2001	25.25	-15.63	243.36	**2001**	51.24	-15.32	234.09
2002	32.99	-7.89	62.25	**2002**	47.34	-19.23	369.79
2003	36.18	-4.7	22.09	**2003**	43.42	-23.15	535.92
2004	38.50	-2.39	5.29	**2004**	96.00	29.44	866.71
2005	33.33	-7.55	56.25	**2005**	50.67	-15.9	252.81
2006	37.33	-3.55	12.25	**2006**	83.00	16.44	270.27
2007	36.53	-4.35	18.49	**2007**	50.00	-16.64	277.22
2008	62.47	21.59	462.25	**2008**	119.00	52.44	2749.95
SUM	1390.41	9.2	13552.79		2263.97	0.25	62856.78
AVERAGE	40.89				66.58		

4.3.1 PRICE VOLATILITY OF GOLD VS SLIVER (1975 -2008)

This diagram shows the correlation of gold and silver price volatility for the period 1975 to 2008



INTERPRETATION

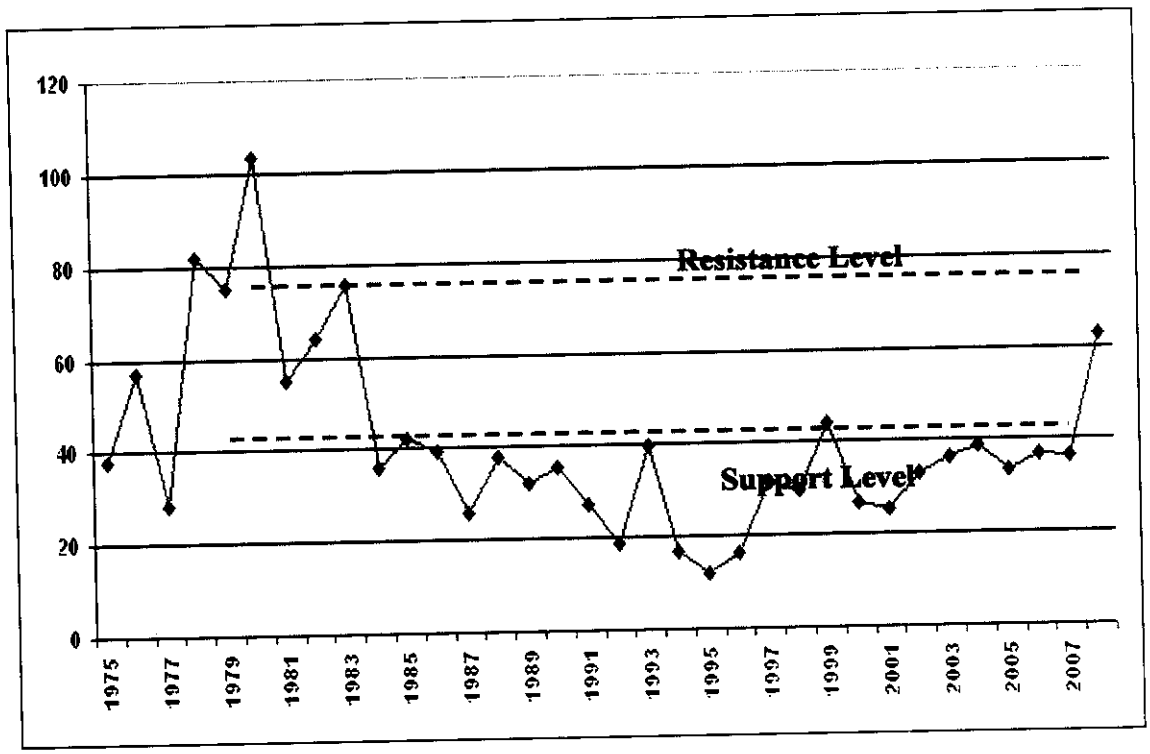
According to the above chart, it shows the Historical volatility of Gold and Silver. This line chart indicates the relationship between Gold Historical volatility and Silver Historical volatility to find out the relationship we calculated correlation of the both Gold H.V and Silver H.V is 0.7419 which shows 74.19% relationship between Gold Annual volatility and Silver Annual volatility. Silver tended to be more volatile near highs and less volatile near lows. But Gold is a timeless investors favourite so the ratio of investors to speculators is much higher.

4.4 FUTURE PROJECTION

Future projection for the volatility of gold and silver presented below.

4.4.1 FUTURE PROJECTION FOR PRICE VOLATILITY - GOLD

This diagram projects the future price volatility in gold using the trend lines.

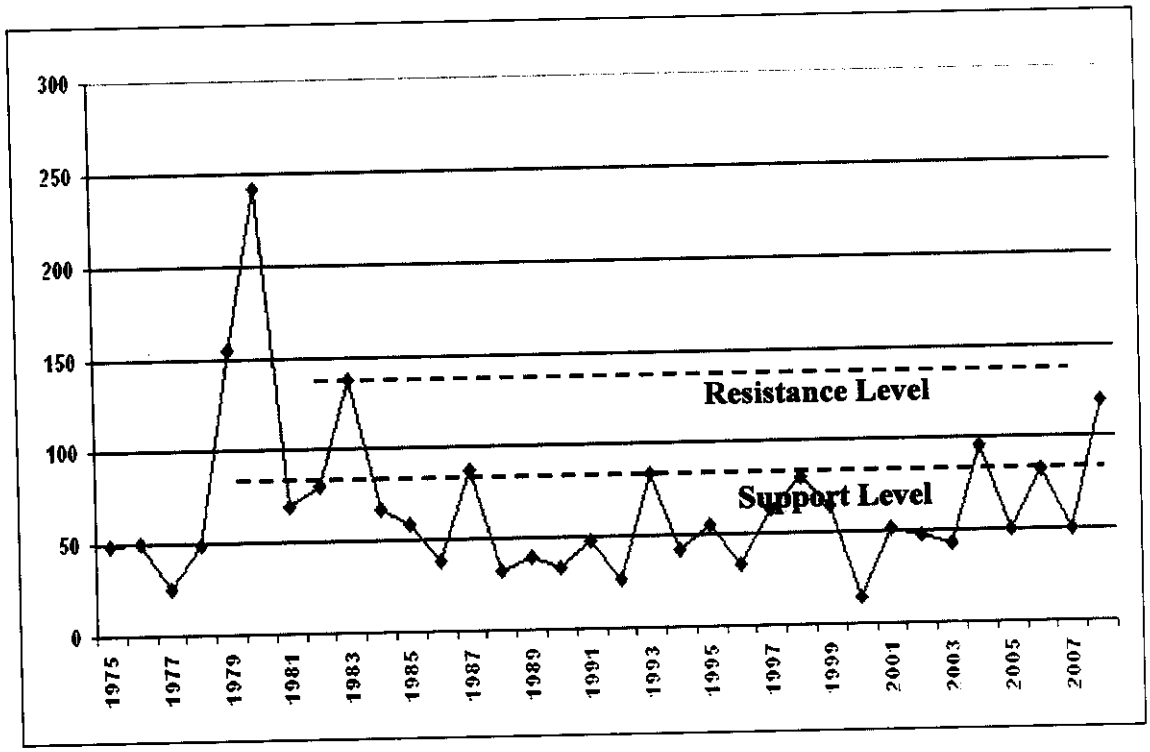


INTERPRETATION

In the above chart the first neck line denotes 75% volatility. This is the first resistance level if the price volatility breaks this level then in the future period it goes beyond 120% of volatility. From the above chart the percentage of volatility breaks the support level 45% then it goes to 25% of volatility in the future.

4.4.2 FUTURE PROJECTION FOR THE PRICE VOLATILITY - SILVER

This diagram projects the future price volatility in silver using the trend lines.



INTERPRETATION

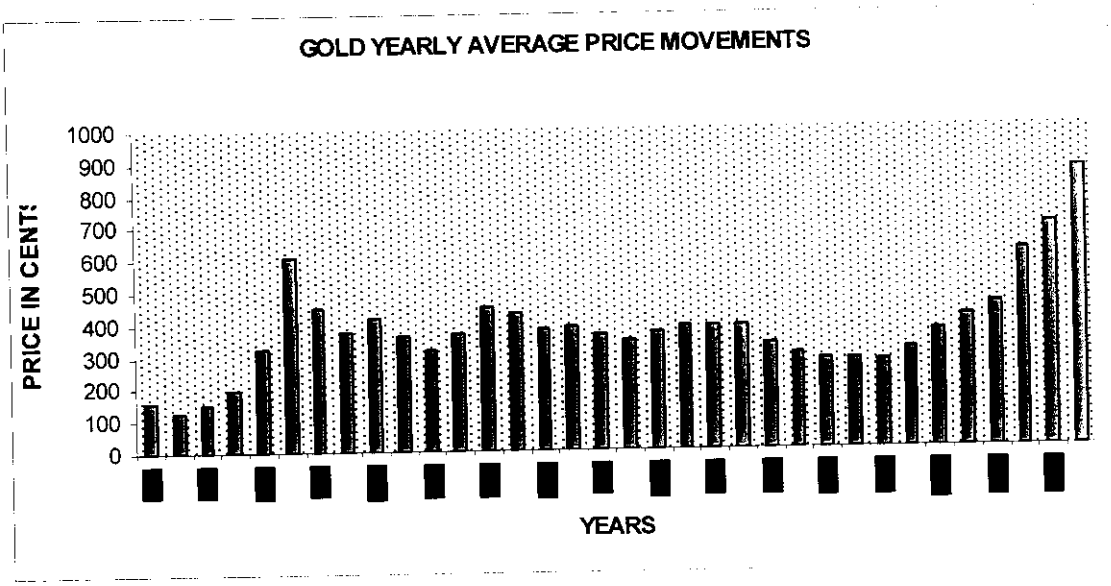
From the above chart it is clear that the first resistance level is 140%. If the price volatility breaks that resistance level, it may reach 200% of volatility. Also in the reverse side 90% of volatility is the first support level, if the price volatility breaks this support level then the price volatility tests 50% fluctuations level.

4.5 AVERAGE PRICE MOVEMENTS

The average price movements for gold and silver shown below.

4.5.1 AVERAGE PRICE MOVEMENTS-GOLD

This bar chart shows the gold average price movements from 1975 to 2008.

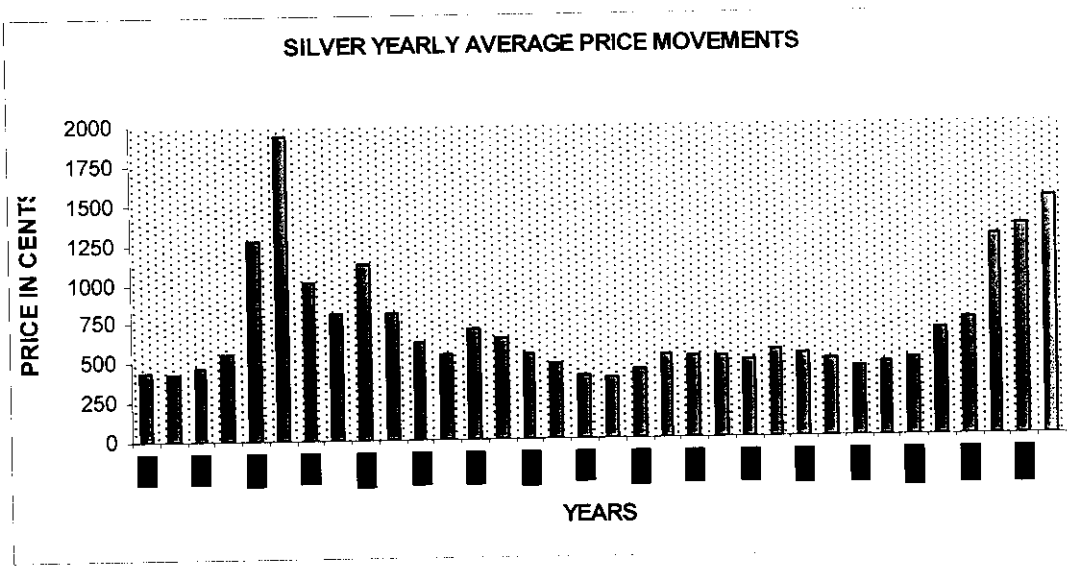


INTERPRETATION

The Chart above shows the average prices of Gold from 1975 to 2008. The more average price of Gold in the year1980 was $607 and less happened in the year 1976 was $124. If the overall average of Gold for 34 years it seems to be $345. Where the 2005 average was $449. It shows the increase in prices of Gold. In the Chart it shows a bullish run from 1975 to 1980 from there it had shown the bearish trend till 2001 and now once again the market is in bullish trend.

4.5.2 AVERAGE PRICE MOVEMENTS - SILVER

This bar chart shows the silver average price movements from 1975 to 2008.



INTERPRETATION

The Chart above shows the average prices of Silver from 1975 to 2008. The average price of Silver in the year1980 was 1940cents and less happened in the year 1992 was 392 cents cents. If the overall average of Silver averages of 34years it seems to be 645 cents. Where the 2005 average was 926 cents. It shows the increase in prices of Silver. In the Chart it shows a bullish run from 1975 to 1980 from there it had shown the bearish trend till 1992 and now once again the market is in bullish trend.

CHAPTER 5

CONCLUSIONS

5.1 SUMMARY OF FINDINGS

5.1.1 Historical Volatility-Gold

The study shows that the fluctuations in the price movements are high in the year1979 and 1980. the biggest increase in the gold price occurred during 1979 and early 1980, mostly due to tension between the United States and the Middle East, exemplified by the Iranian Hostage Crisis: a terrorist act and also low volume in the market. At that time the volatility was 75.13%, 103.08% for 1979, 1980 respectively. At that period only the highest volatility was predicted. After that there was decrease in the volatility percentage even it has given a low volatility of 11.97% in 1995.

5.1.2 Historical Volatility-Silver

The study shows that the fluctuations in the price movements are high in the year1979 and 1980. the biggest increase in the Silver price occurred during 1979 and early 1980,due to increase in Gold prices, mostly due to tension between the United States and the Middle East, exemplified by the Iranian Hostage Crisis: a terrorist act and also low volume in the market. At that time the volatility was 154.05%, 241.31% for 1979, 1980 respectively. At that period only the highest volatility was predicted. After that there was decrease in the volatility percentage even it has given a low volatility of 14.35% in 2000

5.2 SUGGESTIONS & RECOMMENDATIONS:

It is suggested that always go with the trend, now the trend is in bullish mode. Due to high volatility in Gold and Silver markets, investors only having surplus money can enter into the markets with pre determined risk and return. The zero sum game of futures trading forces all participants to continuously research the behaviour of their peers and to adapt their strategy in an effort to stay ahead in the pursuit of excess returns. Investors follow these volatility trends can given a tremendous trading advantage.

5.3 CONCLUSIONS

This study shows that there a positive relation between Gold and Silver. It is suggested that if one of these two is in bull trend, then more than 75% of chances are there that the other will also moves in the same direction. Will holding the positions in the market conform the volume is good. If the investor wants to hold his position it is always better to hold the long position rather than holding the short positions. The systematic approach if properly adhered to, gives investors a better basis for estimating future returns and risk.

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