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"EMPLOYABILITYOF THE MULTIPLE VARIABLE REGRESSION AND ARIMA TO ESTABLISH A RELATIONSHIP BETWEEN THE GOLD COSTS IN INDIA AS CONNECTED TO REMOTE VALUE VACILLATIONS"

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1. INTRODUCTION

Among every one of universes' products, Gold has a remarkable position. It is exchanged globally, and it has been built up as adequate esteem store for quite a while now. Individuals view it as a superior venture product than the level paper cash. Money is fluctuating and unusual which isn't so much the case with Gold. This is the reason it is fame said that Gold is until the end of time! It is recyclable, and we see that gold mined forever and a day prior in history is still available for use in some shape or the other.

1.1 Why is Gold critical

Gold assumes a double part, as aware and as cash as well, because of which its cost isn't practically identical to different items or administrations in the market. Gold can't be seen just in one viewpoint that is from US showcase alone. This is because political and financial occasions which are going on overall additionally affect the gold market exceeding the improvements saw to gold as a trade medium.

Speculators call an advantage a sanctuary where they know they can put their riches even in budgetary turmoil. A steady, genuine esteem and a consistent ostensible esteem demonstrate an uncontroversial shelter for Investors. It enables the holder to exchange without misfortunes at any given point in time. Treasury Bills and obligations of government originating from low yield countries at this paradigm to some degree. This is the point at which it realizes that they can hold to the development and that the danger of defaulting is immaterial.

In light of the meaning of the place of refuge above, we see that Gold seems, by all accounts, to be a decent hopeful fitting into the defined parameters. This on account of following reasons:

1. The ostensible esteem isn't remarkably steady for Gold, however ever, it went about as standard trade recommendation for the universal money related framework. This clues it has ended up being the last resort even in vexed circumstances.

2. In spite of the fact that easy to refute, Gold has additionally been viewed as a fence against Inflation as examined by Jaffee in 1989. This implies gold jelly its positive incentive on a normal over an expanded period. As indicated by Baur and Lucey (2010), it has likewise been looked into that Gold costs doesn't correspond with stock costs. So they are inactive to fluctuating stock esteems.

3. Gold is even considered as a fluid resource as per cites frame spot and prospects markets. Additionally, it has the property of being efficiently exchanged.

4. Another vital thing about Gold is that it is a worldwide resource autonomous of a specific state's choices.

Amid the monetary and money related distress, resources thought to be safe house are extremely looked for after. The costs of unsafe supplies tend to dive in these periods utilizing different irresistible channels. A few instruments add to the spread of value falls. For instance, misfortune acknowledgment in one market constraints financial specialists to pull back their position shape different markets. This builds the negligible rings and ensuing becoming scarce of liquidity. At that point, there are more tightly chance administration rules which additionally trigger the offer offs of benefits that are hazardous. Presently, these outcomes in a hurry to purchase safe resources like government bonds, T-Bills, and stable monetary standards as well. In this rundown, Gold incorporates as protected resource item. These circumstances compel the costs of safety advantages for a surge. We can see that July 2, 2007, to 9 March 2009 S&P stock record went around 55% through the gold revived by 40%.

Since the rally in Gold began in 2001, Gold expenses have jumped on the back of a few issues

Counting the weaker dollar, expanded geopolitical hazard, higher oil costs, portfolio broadening, maker DE-supporting, falling mine generation and, till as of late, robust and flexible Asian gems request. In any case, some of these bullish hidden patterns are as of now changing, for example, maker DE-supporting has all yet run its course, Gold generation is climbing however again, adornments request has fallen pointedly, and oil costs are similarly low. The one factor that has turned a considerable measure of positive for Gold is that the decrease in official part deals and hence the likelihood that this division may flip a web purchaser. Regardless, the progressions are unwilling to Gold's basics. In any case, one issue that has not altered is financial specialists' interest for Gold. The cash emergency and accordingly the sovereign obligation emergency has expanded the importance of a place of refuge ventures.

The 10-year gold rally proceeds from unabated. Gold has been one in everything about a couple of recipients of the worldwide cash emergency and its outcome. It encouraged at each phase of the crisis as this advanced from an area subprime contract explode, beginning in 2007, to an out and out world credit and the financial turndown in 2008-09, preceding transforming yet again, this point into a sovereign obligation catastrophe from 2010. Gold beat vying for resource classifications all through this whole sum. The reaction to the emergency was extraordinary among policymakers crosswise over Organization for Economic Cooperation and Development (OECD) part states in regards to significant monetary consumptions, elective money related arrangements, and in this manner the most reduced loan costs on record. This started fears of swelling and issues concerning long haul ramifications of significant shortfalls, and financial specialists rushed to gold.

1.2 Factors Driving Gold Costs

The dollar– because the cash emergency grabbed hold in mid-2008, the dollar discovered some help as a place of refuge shopping into US Treasuries prompted dollar looking for as well. In any case, the discrepancy is that the US's dependence on QE in result debilitates to spoil the dollar, transforming it even a great deal of into a fiat cash. Without a doubt, there's a stress that obligation levels may get in this way high that administrations' exclusively any desire for reimbursing the obligation is allowing expansion to reduce its cost. At the point when expansion gets off the ground in a nation, the money debilitates because it degrades against elective monetary standards. Nonetheless, when at least two monetary forms degrade at a consistent time their trade rates won't enrol a ton of change, but rather the looking for the energy of those monetary standards diminishes. This can be one motivation behind why we tend to anticipate that Gold costs will even now rise. As Europe, Japan and consequently the US take measures, for example, QE, to support their financial development and fight off collapse, they chance corrupting their monetary standards, and hence it's not stunning that Gold expenses are ascending over these monetary standards. Because of focused downgrading is affecting a few of the fiscal measures that structure the dollar record (which incorporates the euro, the yen, the pound, the Swiss franc and in this manner the Swedish krona) the degree of shortcoming inside the dollar won't uncovering inside the list. In any case, a look at the dollar versus the Swiss franc plainly demonstrates the downtrend inside the dollar proceeds with, see graph inverse. Amid the sovereign obligation frightens in Europe in the underlying 0.5 2010, the backward connection between the dollar and Gold has been sporadic with each ordinarily ascending while, features each is viewed as places of refuge. Notwithstanding, more as of late the dollar has been falling, and Gold has been developing.

Flattening - Inflation - At this time, the possibilities of, emptying have all the earmarks of being a considerably greater reason for worrying that expansion, however, the swelling/flattening hazard has at present turned into a considerable measure of a topographical issue. Asia and quickly creating economies confront increment, though established economies are stressed concerning emptying, and with loan costs as of now as low as they will be, governments are utilizing QE in a trial to stay away from collapse. As QE degrades cash, we feel Gold can remain popular even all through a measure of destruction. One contention against powerful Gold expenses amid times of collapse is that flattening is most likely going to analyse a significant action of interest for US Treasuries and in a flip, that is conceivable to support the dollar. Once practical financial development is seen again, we anticipate that expansion will require hold inside the West, either as governments allow it to, in an undertaking to lessen the value of their obligation mountains, or because of they wind up being moderate to fix money related strategy. This may happen if development returns though joblessness stays high, or the lodging market stays delicate. In this manner, regardless of whether the swelling is probably not going to be an issue inside the West in the medium term, it's a broadened term risk, especially given all the QE.

Stagflation– Given there's a level of obscure results inside the measures national banks are applying in their push to provoke development and stay away from flattening; there's a hazard that they may make the conditions for stagflation. In reality, however official expansion inside the West is low, resource costs are as of now rising sharply and that they don't appear to do along these lines on the back of a huge get sought after. Along these lines, it may seem that one in each one of the ramifications of QE is that liquidity is drawing into value and ware showcases and is pursuing costs higher. Accordingly, we tend to are ending up high prices. However, almost no financial development and as development stays stifled joblessness stays high. Amid this situation, governments are conceivable to abstain from bringing loan costs and up in a flip that is conceivable to guide to swelling.

De-supporting– At the start of the commercial bull centre for Gold, that matched with the begin of de-supporting, the whole fence book remained at three, 107 tons (99.9Moz). At the tip Q2'10, the fence book remained at 195 tons (6.75Moz). The 'de-supporting period' is presently coming back to a point by point thus one in each of the relentless drivers of the positively trending market is dwindling. At a show, the point towards supporting has not changed, and new fences exclusively appear to be put on when investors/agents request it for fresh out of the plastic new comes. Notwithstanding, at some stage, Gold's buyer market can complete and regardless of whether the present wants of investors of digging organizations are for no, or confined supporting. That point is most likely going to fluctuate when the prospect for financial recuperation enhances, the prerequisite for places of refuge subsides, and long liquidation develops. For the moment, the disposition among makers is, inside the more substantial part, still bullish for the Gold esteem.

National Bank Official Sales– For quite a while national banks are web dealers of Gold, be that as it may, that may as of now be near change. Since the underlying year of the third Central Bank Gold Agreement (CBGA-III), which licenses for offers of fourhundred tons of Gold consistently, includes a complete, it seems like EU national banks have detailed proposals of however three tons; the IMF has sold 222 tons to domestic banks (India two hundred tons, Mauritius two tons, Sri Lanka ten tons and Bangladesh ten tons) and eighty-eight.3 tons on the open the market, thusly aggregately official deals appear to be so starting at somewhere in the range of 333 tons. Outside their acknowledgment of IMF deals, European National Banks would seem to claim had a noteworthy alteration of heart as their contracts are insignificant though underneath CBGA-II yearly deals found the middle value of 377 tons. Elective nations are adding to their Gold stores; amongst January, and along these lines, the complete of April IMF data demonstrates official property expanded forty-three tons, with Russia and Venezuela the two boss benefactors. Elective reports additionally prescribe that Russia has kept on making up its Gold stores and at the tip of July supposedly held somewhere in the range of 726 tons, up 13.6 % up to now this year. With confined IMF deals one year from now, (despite everything they have expected ninety-two.7 tons to offer) and with European national banks perhaps ceasing from the offering, we won't be stunned to inspect national banks progress toward becoming web benefactors in 2011. As of the tip of July 2010, federal banks still held thirty,520 tons of Gold – this can be esteemed recalling once we stress concerning sovereign obligation as though things became essential then national banks may flip to their Gold stores to safeguard themselves out. Note how the Bank of International Settlements, BIS, finished a 346-ton Gold swap in July with various business banks, whereby it loaned them money and took Gold as a guarantee.

National Bank enhancement: Nations have just begun to find a way to differentiate their stores. Customarily and for quite a while future, no questions that S dollar is probably going to stay as world's save. China, for instance, has cut efficiently its dollar save holding and has begun to purchase Japanese securities. China's held 843.7 billion US obligations lessened from 938 Billion dollars as on September 2009. In the central portion of 2010 china bought 20 billion worth Japanese bonds. China is further considering purchasing obligation from other Asian exchanging areas. In spite of the fact that China has illuminated that they are not intrigued by buying Gold saves as the market is too little, however, they could purchase an extent of nation's mine yield. Despite the fact that China isn't excessively bullish on Gold stores, other Asian districts are. The pattern will proceed and perhaps spread to oil makers too. China, Japan, and Saudi Arabia just have 2% to 3% of their stores in Gold contrasted with 62% in the European districts.

Oil: In Bull Run, Oil and gold costs are associated. Gold costs, then again, have kept on rising. This powerless relationship demonstrates that oil costs battle in light of monetary battle, though Gold expenses stay dynamic as an indication of reckoning of more money related distress. On the off chance that Oil costs see a development pair with financial development, considered as a notice to Gold value bull run. This last phase of Gold Value Bull Run can at present end up being intense as an arrival to development may be inflationary.

Gems request: Gems utilization represented the central part of the Gold market, on a healthy 78% between 1993 to the year 2000.Then out of 2001 Gold's Bull Run began. In Mid 2000's it started to go down to around 62%. Since 2009, gems utilization has gone down to under half of the Total Demand for Gold. High Gold costs are the purpose behind this decrease in gems utilization. Also, financial issues have additionally driven the usage down. This is an overall example with China as a particular case. Worldwide gems request fell 20% year on year to around 1,760 tons in the year 2009. It is required to drop a further 15% this year to 1,500 tons. China, then again, saw request achieve 340 tons, a 7.6 % rise. The requirement for gems is just anticipated that would go additionally down. Costs will turn out to be more unpredictable in coming years which will merely diminish the interest for silver.

Speculation request: Trade Traded Funds are prevalent Investment implies. This utilizes as a part of venture hovers like, with retail Investors, annuity stores, flexible investments, and sovereign riches subsidizes as well. The general pattern in the measure of Gold help in ETF has been going upwards, with few examples of critical recoveries.

The money related emergency of 2008 and sovereign obligation crisis this year both saw a brisk increment in the extent of ETFs. A measure of Gold held topped in mid-July 2008 at 2095 tons, and recoveries in rally values as of late observed carrying of 2046 tons of Gold. The dread of twofold plunge retreat took after this and afterward by the debilitating of dollar esteem. This made the holding come back to another high of 2106 tones.

Speculators don't keep their venture to ETF just. However, they are keen on broad measures of Gold coins and bars. Retail Investment request in Europe and North America in the year 2008 hopped to initial 327 tons and after that to another high of 414 tons in 2009. The average level of purchasing in 2006 and 2007 was 50 tons.

In Q1 2010, American Gold Eagle Coins sold around 82875 ounces. They bounced to 190,000 ounces by May and found the middle value to 164500 ounces more than three months of May, June, and July. They at that point dropped to 41500 ounces in August of that year.

1.3 Scope of the paper

The goal of the paper is to build up a model at anticipating the costs of Indian Gold. For this two models are recognized. The approach utilized is as per the following:

The Top 10 nations from which India imports gold and their money's trade rates are relapsed with the gold cost to distinguish the financial standards which significantly affect the gold value. The nations are Britain, China, Switzerland, UAE, USA, Hong Kong, Germany, Netherlands, South Africa and Australia. The monetary standards viewed as huge at 1%, 5% and 10% noteworthy levels taken to the following stage.

As a feature of the second relapse organizes, the monetary forms are relapsed with different factors oil costs, silver cost and Nifty (shutting cost). All the arrangement tried for measurable issues like stationarity, heteroscedasticity, multicollinearity, autocorrelation, and Causality.

In the later stage, ARIMA demonstrating is done to enhance the outcomes further. The Final ARIMA display got chose by the model which gives the highest R2 esteem and slightest MAPE (Mean Average Percentage Error).

2. RESEARCH DESIGN

The goal of the exposition is to discover the factors influencing the costs of Indian gold in the short run and the long haul. For this reason, the needy variable is Price of Gold in India in INR. The cost of the gold is from World Gold Council is the cost of 10 gms gold in INR.

Two models were produced in the thesis for variable ID and value forecast.

2.1 Multiple Variable Regressions

It begins with an estimation of factors which are accepted to affect the gold costs. The measurable tests are performed on these factors to guarantee that outcomes are non-one-sided and free from any mistake. A portion of the factors consolidated in the model before get expelled in light of unimportant impacts. At last, the model is finished and can use for forecast.

2.1.1 Variables Identification

The free factors considered in the paper are of two sorts: monetary and non-financial.

1. Money Exchange Rate: The main 10 nations from which India imports gold is broke down, and their trade rates concerning INR are considered. These trade rates affect the gold cost in India on the grounds that if the local money acknowledges, at that point gold imports wind up noticeably less expensive and gold costs will fall. Likewise, there will be an expansion in rivalry among the gold-creating countries to trade gold at a lower cost.

The nations from which India imports gold are (2010-2011 million USD):

Table 1: Gold Sourcing Countries, India (2009, in tonnes)

SWITZERLAND	22,572.04
U ARAB EMTS	7,508.28
SOUTH AFRICA	4,328.65
AUSTRALIA	3,027.45
U S A	1,070.71
HONG KONG	402.54
U K	386.17
GERMANY	180.12
CHINA P RP	147.58
NETHERLAND	68.24

Likewise, the cost of gold firmly connected to the condition of the American economy than to overall monetary conditions (Koutsoyiannis 1983). Henceforth, US dollars' swapping scale is of prime significance. The trade rates are taken in backhanded statements.

2. Stock Performance: Researchers have contemplated how gold costs have varied with the adjustment in execution of stocks. Since gold is frequently used to broaden the portfolio and normally has better than expected market restores, its expenses are firmly identified with the offers. To represent this, Nifty is taken.

3. Oil Prices: Change in gold cost has coordinate effect on Inflation. Since gold is accepted to be an inflationary fence in the short run, the interest for gold increments when swelling increment and this prompts the ascent in gold cost. The cost of raw petroleum per barrel is figured in for the examination. The units are INR/Barrel.

4. Silver Price: Since the products" costs incline together, thus silver is taken.

2.1.2 Model

The cost is gold is considered as a component of the money trade rates of nations from which India imports gold, Oil costs (INR/barrel), Stock performance(Nifty), Silver price(INR/KG). The econometric model concentrated in this exposition is:

Gold Price (G.P.) = f {Foreign Exchange Rate (FE – Aus Dollar, USA Dollar, Swiss franc, German Mark, UK pound, Dutch guilder, UAE Dirham, Yuan, HK dollars), Stock Market Performance (clever), Oil Prices(oil value), Silver Price (silverprice}

The genuine model is as per the following:

(G.P.) = a + b1 (franc) + b2(Guilder) + b3 (USD) + b4 (AUSD)+ b5 (China Yuan) + b6 (HK Dollars) + b7 (UAE Dirham) + b8 (Euro) + b9 (Oil Prices) + b10(silver costs) + b11(pound) + b12(mark) + b13 (clever)

2.1.3 Data Sources

Variable	Source	Frequency	Hyperlink
Swiss Franc	Oanda website*	weekly	www.oanda.com/currency/historical-rates/
Aus Dollars	Oanda website*	weekly	www.oanda.com/currency/historical-rates/
US Dollars	Oanda website*	weekly	www.oanda.com/currency/historical-rates/
Chinese Yuan	Oanda website*	weekly	www.oanda.com/currency/historical-rates/
Euro	Oanda website*	weekly	www.oanda.com/currency/historical-rates/
UAE Dirham	Oanda website*	weekly	www.oanda.com/currency/historical-rates/
HK dollars	Oanda website*	weekly	www.oanda.com/currency/historical-rates/
US Dollar	ECB	Daily	http://www.ecb.int/stats/exchange/eurofxref/html/index.en.html
Oil Prices	Per Barrel in INR	Daily	http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=RBRTE&f=D
Stock Performance	Nifty	Daily	http://www.nseindia.com/content/indices/ind_histvalues.htm
Gold Price	World gold council	Daily	World Gold council Gold prices
Silver Price	NCDEX historical spot rates	Daily	http://www.ncdex.com/MarketData/SpotPrice.aspx

Table 2: Data Set Sources

* Historical data, Average monthly BID rates @ +/- 0%

2.1.4 Time Selection

The relapse is keep running in two phases:

1. Cash relapse: Weekly (5 days) information is gathered from ten monetary standards, for most recent five years.

2. Last Regression: The monetary standards which are critical in relapse organize 1, are relapsed with different factors in stage 2. For this day by day five-day information is gathered for a five-year time frame, i.e., Jan 2013 till Dec 2015.

2.1.5 Steps Followed

1. Stationary Test: Check both the length of reliant and autonomous factors for stationarity. For this reason, ADF Test (Augmented Dickey-Fuller) is performed. For an arrangement to be stationary, its T-measurement esteem ought to be higher than costs at the advantages at other noteworthiness levels. Likewise, Durbin-Watson detail ought to be high.

2. Causality Test: In monetary information, the relationship might be the two headings, that is reliant and free factors influences each other, and all things considered, we ought not to utilize relapse display but rather vector models. We will utilize Granger loss test to test for same.

3. Run relapse for cash trade rates (arrange 1): These aides in recognizing the monetary standards which substantially affect the Indian gold cost. The monetary standards whose' coefficients are higher than 0.05 are thought to be critical and are taken to the following level of relapse where they are relapsed with different factors like oil value, financing costs, swelling rates.

4. Distinguish monetary standards which significantly affect gold costs ($p<.05$ – for 5% essentialness level and$p<.1$ for 10% noteworthiness level)

5. Run Final Regression: After distinguishing the monetary standards which significantly affect Indian gold costs, they are relapsed with other free factors recognized at first.

6. Factual Problems Checking: The model reviews for three scientific issues:

a. Multicollinearity: The free factors ought not have a high connection among them and ought to be exceptional to the degree that every one can account as discrete thus we will check for the relationship among the autonomous factors. To test the issue of multicollinearity, the most straightforward approach to use in this examination is checking "Basic Correlation Coefficients." In measurements, if the free factors have the connection esteem among them lower than 0.8, it is considered as no Multicollinearity issue.

b. Heteroscedasticity: Setting theory can right off the bat check the issue of Heteroscedasticity;

Ho: Homoscedasticity H1: Heteroscedasticity

The preface tests at 95% fulfilled level. The esteem which is utilized to be a reference for the investigation is Obs*R-squared. This test is easily done White Heteroscedasticity Test work.

The issue ought to be reduced by "White Heteroscedasticity-Corrected Standard Mistakes" gave in E-Views. The strategy will change the estimation of t-Statistic and P

esteem for re-choosing whether which variable(s) ought to be removed from the model to reduce the issue of Heteroscedasticity by not changing the estimation of catch and co-productive. This technique is the exit from alleviating the issue which may not dispose of the issue. All things considered, this should be possible simply in time restrain limitation and when no factors removed from the model.

c. Autocorrelation: There are a few techniques for autocorrelation conclusion. Be that as it may, the most clear and understood way is Durbin Watson Statistical esteem estimation utilized as a part of this exploration. The Durbin Watson esteem ought to satisfy the accompanying condition:

4-du > Durbin Watson Value > du

The technique to tackle the issue in this investigation is "The Cochrane-Orcutt Iterative Method." The model's coefficient and every single factual esteem will be recalculated over and over for finding the most ideal ρ that mirrors No Autocorrelation issue.

After this, we began making our model by taking dependant and all the autonomous terms and alter the model for AR and MA conditions to get the best model. The models can be checked and assessed by utilizing F-insights, AIC and SIC and balanced R2 esteems. The F-insights ought to be sufficiently noteworthy to dismiss the invalid theory that there is no model conceivable. The measure of AIC (Akaike Information Criterion) and SC (Schwarz Criterion) ought to be least potential and estimation of balanced R2 ought to be greatest conceivable

Investigation and Findings

3. CURRENCY REGRESSION

3.1 Statistical Tests

3.1.1 Stationarity Test

Using ADF test, all the series are made stationary. The ADF results for all the series attached in the Appendix. Below is a comprehensive table on the results of ADF test for dependent and independent variables.

Ho: The variable has a unit root.

All the series will be stationary if their returns are taken.

3.1.2 Causality Tests

As seen below, we found little evidence to reject Null hypothesis that our dependant Variable (Gold Price) Granger causes independent variables. Thus, we can use regression model.

Table 3: Currency Granger Causality Tests

Pairwise Granger Causality Tests
Date: 03/15/16 Time: 22:17
Sample: 1/07/2013 12/25/2015
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
DIRHAM does not Granger Cause AUD	257	0.02707	0.9733
AUD does not Granger Cause DIRHAM		1.38879	0.2513
FRANC does not Granger Cause AUD	257	3.36244	0.0362
AUD does not Granger Cause FRANC		1.38341	0.2526
GUILDER does not Granger Cause AUD	257	3.36206	0.0362
AUD does not Granger Cause GUILDER		1.38413	0.2524
HKD does not Granger Cause AUD	257	0.04256	0.9583
AUD does not Granger Cause HKD		1.49350	0.2266
MARK does not Granger Cause AUD	257	3.36228	0.0362
AUD does not Granger Cause MARK		1.38454	0.2523
POUNDS does not Granger Cause AUD	257	1.34729	0.2618
AUD does not Granger Cause POUNDS		1.15220	0.3176
RAND does not Granger Cause AUD	257	0.00748	0.9925
AUD does not Granger Cause RAND		1.95503	0.1437
USD does not Granger Cause AUD	257	0.02833	0.9721
AUD does not Granger Cause USD		1.36245	0.2579
YUAN does not Granger Cause AUD	257	0.02460	0.9757
AUD does not Granger Cause YUAN		0.93440	0.3942
FRANC does not Granger Cause DIRHAM	257	1.28836	0.2775
DIRHAM does not Granger Cause FRANC		0.34193	0.7107
GUILDER does not Granger Cause DIRHAM	257	1.28846	0.2775
DIRHAM does not Granger Cause GUILDER		0.34217	0.7106

HKD does not Granger Cause DIRHAM	257	0.67114	0.5120
DIRHAM does not Granger Cause HKD		0.64270	0.5267
MARK does not Granger Cause DIRHAM	257	1.28822	0.2776
DIRHAM does not Granger Cause MARK		0.34204	0.7106
POUNDS does not Granger Cause DIRHAM	257	0.15516	0.8564
DIRHAM does not Granger Cause POUNDS		1.95636	0.1435
RAND does not Granger Cause DIRHAM	257	5.05276	0.0071
DIRHAM does not Granger Cause RAND		0.74400	0.4763
USD does not Granger Cause DIRHAM	257	0.33753	0.7139
DIRHAM does not Granger Cause USD		0.21097	0.8099
YUAN does not Granger Cause DIRHAM	257	0.70961	0.4928
DIRHAM does not Granger Cause YUAN		0.69009	0.5025
GUILDER does not Granger Cause FRANC	257	0.50156	0.6062
FRANC does not Granger Cause GUILDER		0.50714	0.6028
HKD does not Granger Cause FRANC	257	0.31983	0.7266
FRANC does not Granger Cause HKD		1.31825	0.2694
MARK does not Granger Cause FRANC	257	0.12954	0.8786
FRANC does not Granger Cause MARK		0.13221	0.8762
POUNDS does not Granger Cause FRANC	257	0.28891	0.7493
FRANC does not Granger Cause POUNDS		0.40254	0.6690
RAND does not Granger Cause FRANC	257	4.02753	0.0190
FRANC does not Granger Cause RAND		0.26417	0.7681
USD does not Granger Cause FRANC	257	0.34078	0.7115
FRANC does not Granger Cause USD		1.30074	0.2742
YUAN does not Granger Cause FRANC	257	0.52904	0.5898
FRANC does not Granger Cause YUAN		1.40584	0.2471
HKD does not Granger Cause GUILDER	257	0.32006	0.7264
GUILDER does not Granger Cause HKD		1.31838	0.2694
MARK does not Granger Cause GUILDER	257	0.69358	0.5007
GUILDER does not Granger Cause MARK		0.69063	0.5022
POUNDS does not Granger Cause GUILDER	257	0.28815	0.7499
GUILDER does not Granger Cause POUNDS		0.40181	0.6695

RAND does not Granger Cause GUILDER	257	4.02697	0.0190
GUILDER does not Granger Cause RAND		0.26398	0.7682
USD does not Granger Cause GUILDER	257	0.34102	0.7114
GUILDER does not Granger Cause USD		1.30086	0.2741
YUAN does not Granger Cause GUILDER	257	0.52937	0.5896
GUILDER does not Granger Cause YUAN		1.40615	0.2470
MARK does not Granger Cause HKD	257	1.31813	0.2695
HKD does not Granger Cause MARK		0.31996	0.7265
POUNDS does not Granger Cause HKD	257	0.11965	0.8873
HKD does not Granger Cause POUNDS		2.19385	0.1136
RAND does not Granger Cause HKD	257	5.13128	0.0065
HKD does not Granger Cause RAND		0.73550	0.4803
USD does not Granger Cause HKD	257	0.45828	0.6329
HKD does not Granger Cause USD		0.46443	0.6290
YUAN does not Granger Cause HKD	257	0.29413	0.7454
HKD does not Granger Cause YUAN		0.25148	0.7778
POUNDS does not Granger Cause MARK	257	0.28833	0.7498
MARK does not Granger Cause POUNDS		0.40206	0.6694
RAND does not Granger Cause MARK	257	4.02746	0.0190
MARK does not Granger Cause RAND		0.26395	0.7682
USD does not Granger Cause MARK	257	0.34090	0.7115
MARK does not Granger Cause USD		1.30061	0.2742
YUAN does not Granger Cause MARK	257	0.52923	0.5897
MARK does not Granger Cause YUAN		1.40591	0.2471
RAND does not Granger Cause POUNDS	257	3.07745	0.0478
POUNDS does not Granger Cause RAND		1.45123	0.2362
USD does not Granger Cause POUNDS	257	1.98222	0.1399
POUNDS does not Granger Cause USD		0.16518	0.8478
YUAN does not Granger Cause POUNDS	257	2.25290	0.1072
POUNDS does not Granger Cause YUAN		0.26936	0.7641
USD does not Granger Cause RAND	257	0.72964	0.4831
RAND does not Granger Cause USD		5.12742	0.0066

YUAN does not Granger Cause RAND	257	1.01415	0.3642
RAND does not Granger Cause YUAN		5.50137	0.0046
YUAN does not Granger Cause USD	257	0.62719	0.5349
USD does not Granger Cause YUAN		0.56920	0.5667

The hypotheses rejected are:

FRANC does not Granger Cause AUD	257	3.36244	0.0362
GUILDER does not Granger Cause AUD	257	3.36206	0.0362
MARK does not Granger Cause AUD	257	3.36228	0.0362
RAND does not Granger Cause DIRHAM	257	5.05276	0.0071
RAND does not Granger Cause FRANC	257	4.02753	0.0190
RAND does not Granger Cause GUILDER	257	4.02697	0.0190
RAND does not Granger Cause HKD	257	5.13128	0.0065
RAND does not Granger Cause MARK	257	4.02746	0.0190
RAND does not Granger Cause POUNDS	257	3.07745	0.0478
RAND does not Granger Cause USD		5.12742	0.0066
RAND does not Granger Cause YUAN		5.50137	0.0046

3.1.3 Autocorrelation

Table 4: Autocorrelation between currencies

	AUD	DIRHAM	FRANC	GUILDER	HKD	MARK	POUNDS	RAND	USD	YUAN
AUD	1.000000	-0.068906	0.506001	0.506004	-0.055282	0.506005	0.426854	0.528752	-0.070087	-0.049159
DIRHAM	-0.068906	1.000000	0.368478	0.368497	0.998057	0.368491	0.435364	-0.089658	0.999784	0.985936
FRANC	0.506001	0.368478	1.000000	1.000000	0.379186	1.000000	0.627676	0.315852	0.367251	0.410154
GUILDER	0.506004	0.368497	1.000000	1.000000	0.379205	1.000000	0.627667	0.315838	0.367270	0.410174
HKD	-0.055282	0.998057	0.379186	0.379205	1.000000	0.379198	0.441815	-0.082843	0.998202	0.984846
MARK	0.506005	0.368491	1.000000	1.000000	0.379198	1.000000	0.627671	0.315832	0.367264	0.410168
POUNDS	0.426854	0.435364	0.627676	0.627667	0.441815	0.627671	1.000000	0.227492	0.433740	0.456658
RAND	0.528752	-0.089658	0.315852	0.315838	-0.082843	0.315832	0.227492	1.000000	-0.089609	-0.081988
USD	-0.070087	0.999784	0.367251	0.367270	0.998202	0.367264	0.433740	-0.089609	1.000000	0.985776
YUAN	-0.049159	0.985936	0.410154	0.410174	0.984846	0.410168	0.456658	-0.081988	0.985776	1.000000

The currencies which are highly correlated are:

1. HKD, dirham, Yuan, USD
2. Franc, Guilder, Mark

The currencies which can be taken into account are (different sets can be regressed):

1. Franc/ Guilder/ Mark – If any of these are taken then AUD need not be taken

2. HKD/ Dirham/ Yuan/ USD
3. Pound

Since rand causes all the currencies, hence Rand is not taken (Ref: Granger Causality tests)

3.2 Currency Regression Model

All the seven currencies are taken to be in the regression analysis to identify the currencies which have a really significant impact on the Indian Gold price.

Table 5: Currency Regression Analysis

Dependent Variable: GOLDPRICE
Method: Least Squares
Date: 03/16/16 Time: 13:33
Sample (adjusted): 1/14/2013 12/25/2015
Included observations: 259 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.457549	0.188663	2.425211	0.0160
POUNDS	0.011210	0.210048	0.053371	0.9575
FRANC	0.488738	0.201142	2.429819	0.0158
USD	-0.075914	0.200924	-0.377824	0.7059

R-squared	0.035499	Mean dependent var	0.490248
Adjusted R-squared	0.024152	S.D. dependent var	3.053138
S.E. of regression	3.016043	Akaike info criterion	5.061092
Sum squared resid	2319.611	Schwarz criterion	5.116024
Log likelihood	-651.4114	Hannan-Quinn criter.	5.083178
F-statistic	3.128467	Durbin-Watson stat	2.259242
Prob(F-statistic)	0.026327		

This shows that mark/ franc/ guilder significantly affect the gold price at 0.05 critical value.
They have a positive correlation with the price of gold.

4. FINAL REGRESSION

4.1 Statistical Problems Checking

4.1.1 Causality Tests

As seen below, we found little evidence to reject Null hypothesis that our dependant

Variable (Gold Price) Granger causes independent variables. Thus, we can use regression model.

Table 6: Granger Causality Tests

Pairwise Granger Causality Tests
Date: 03/16/16 Time: 14:15
Sample: 1/01/2013 12/30/2015
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
SILVERRET does not Granger Cause OILRET	1302	0.91812	0.3995
OILRET does not Granger Cause SILVERRET		2.19921	0.1113
NIFTYRET does not Granger Cause OILRET	1302	0.61278	0.5420
OILRET does not Granger Cause NIFTYRET		0.42174	0.6560
MARKRET does not Granger Cause OILRET	1302	0.76643	0.4649
OILRET does not Granger Cause MARKRET		0.59652	0.5509
NIFTYRET does not Granger Cause SILVERRET	1302	0.14405	0.8659
SILVERRET does not Granger Cause NIFTYRET		0.57576	0.5624
MARKRET does not Granger Cause SILVERRET	1302	1.68874	0.1852
SILVERRET does not Granger Cause MARKRET		0.44078	0.6436
MARKRET does not Granger Cause NIFTYRET	1302	1.57934	0.2065
NIFTYRET does not Granger Cause MARKRET		0.51030	0.6004

Since for all Hypothesis, $p>.05$, hence $H_o$is accepted.

4.1.2 Multicollinearity

To check the problem if multicollinearity, simple correlation coefficients are checked. If the independent variables have correlation of less than 0.8, then there is no problem of multicollinearity.

The table below shows the correlation between various independent variables taken in the analysis.

Table 7: Correlation Matrix

	MARKRET	NIFTYRET	OILRET	SILVERRET
MARKRET	1.000000	0.019572	0.044109	-0.003998
NIFTYRET	0.019572	1.000000	0.047073	-0.003732
OILRET	0.044109	0.047073	1.000000	-0.000820
SILVERRET	-0.003998	-0.003732	-0.000820	1.000000

None of the factors are correlated.

4.1.3 Autocorrelation

The simplest and well-known method is Durbin Watson Statistical value measurement which is used in this study. Durbin Watson Statistical value for the model equals to 2.116918. Durbin Watson critical value (du) is 1.841.

$$4- 1.841 > 2.116918 > 1.841 = 2.159>2.116918>1.841$$

This shows that there is no autocorrelation problem.

Table 8: Autocorrelation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.507932	Prob. F(2,1295)	0.0818
Obs*R-squared	5.023519	Prob. Chi-Square(2)	0.0811

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 03/16/16 Time: 14:36
Sample: 1/04/2013 12/30/2015
Included observations: 1302
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000586	0.036592	-0.016004	0.9872
MARKRET	0.004082	0.030558	0.133587	0.8937
NIFTYRET(-2)	0.000141	0.001496	0.094211	0.9250
OILRET	0.002613	0.015118	0.172853	0.8628
SILVERRET	0.001277	0.019402	0.065802	0.9475
RESID(-1)	-0.061251	0.027947	-2.191689	0.0286
RESID(-2)	-0.016646	0.027964	-0.595272	0.5518

R-squared	0.003858	Mean dependent var	3.93E-17
Adjusted R-squared	-0.000757	S.D. dependent var	1.316133
S.E. of regression	1.316631	Akaike info criterion	3.393391
Sum squared resid	2244.905	Schwarz criterion	3.421196
Log likelihood	-2202.098	Hannan-Quinn criter.	3.403823
F-statistic	0.835977	Durbin-Watson stat	2.000074
Prob(F-statistic)	0.542032		

Since the probability is greater than .05 for obs*R-sqaured, this implies that there is no autocorrelation between the variables.

4.2 Regression

The results of the regression are as follows:

Table 9: Final Regression

Dependent Variable: GOLDRET
Method: Least Squares
Date: 03/17/16 Time: 16:18
Sample (adjusted): 1/02/2013 12/30/2015
Included observations: 1304 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.076042	0.036559	2.079975	0.0377
NIFTYRET	0.002506	0.001495	1.676191	0.0939
MARKRET	0.157486	0.030424	5.176333	0.0000
OILRET	0.056455	0.014979	3.768883	0.0002
SILVERRET	0.010616	0.019338	0.549003	0.5831

R-squared	0.034823	Mean dependent var	0.090805
Adjusted R-squared	0.031851	S.D. dependent var	1.337932
S.E. of regression	1.316453	Akaike info criterion	3.391586
Sum squared resid	2251.230	Schwarz criterion	3.411422
Log likelihood	-2206.314	Hannan-Quinn criter.	3.399027
F-statistic	11.71672	Durbin-Watson stat	2.116918
Prob(F-statistic)	0.000000		

The significant variables at different levels of significance are:

At 0% significance level:
1. Mark/ Franc/ Guilder
2. Oil Prices

At 5% significance level:
1. Mark/ Franc/ Guilder
2. Oil Prices

At 10% significance level:
1. Mark/ Franc/ Guilder
2. Oil Prices
3. Nifty

For 10% significance level the equation becomes:

GOLDRET = 0.0760416946565 + 0.00250604184538*NIFTYRET + 0.157486411309*MARKRET + 0.0564545244806*OILRET

5. CONCLUSION

The Gold speculators can utilize Multivariate ARIMA (1,1,2) at foreseeing the costs of gold. Despite the fact that in the present extent of study, it is the best model, in any case, it has particular blunders. The elements influencing the gold costs are nifty, oil prices and Mark/Franc/Guilder.

They all have a positive relationship with the cost of gold. In this way, European countries are large gold trading countries, any gratefulness in their financial standards will prompt increment in gold costs due to imports getting to be noticeably costlier when contrasted with the subcontinent.

Gold likewise has a positive association with the price of oil since it goes about as an inflation hedge. At the point when oil costs characteristic of inflation rise, interest for gold expands in this way pushing the expenses further high.

Nonetheless, political events additionally significantly affect the condition of economies on the planet, and since the impact of these events can't be measured, furthermore examine on coordinating these outcomes with the proposed model would enhance the anticipating capacities of the model.