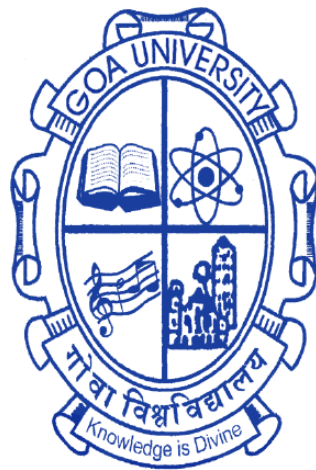


**MACROECONOMIC VARIABLES AND GOLD PRICES: A CASE
STUDY OF INDIA**

A thesis submitted in partial fulfilment for the degree of

Masters in Economics

in the name of Goa business school Goa University



BY

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MA Part II Economics

Goa University

Goa

May 2021

DECLARATION

I, Swara Vishant Naik hereby declare that this thesis represents work which has been carried out by me and that it has not been submitted, either in part or full, to any other University or Institution for the award of any research degree.

Swara Vishant Naik

Place: Taleigao Plateau.

Date : 10-08-2021

CERTIFICATE

I hereby certify that the above Declaration of the candidate, Swara Vishant Naik is true and the work was carried out under my/our supervision.

Dr P.K. Sudarsan
Professor in Economics
Goa Business School

ACKNOWLEDGEMENT

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CHAPTER I

INTRODUCTION

1.1 Background

Gold has backbone of all economies since its inception. It has been the best investment for common people and currently it is also used by investors as an instrument to hedge their portfolio investment. It has long been considered one of the most precious metals, and its value has been used as the standard for many currencies. It provides a strong and better hedge against declining currency as compared to any other commodity. Gold maintains its value in terms of real purchasing power. If the purchasing power of the currency falls, inflation rate goes up and the price of gold rises. Gold has to manage its float with respect to deficit and other imports of related commodities from time to time. Gold is partly used as domestic consumption and partly in disposing the deficit of payments. The movement of gold price is highly sensitive to the changes in fundamentals of any economy and expectations about future prospects. Gold consumption observed a sharp acceleration during the 1990s amidst liberalization of gold import policy, strong economic growth and favourable movements in gold prices. Monetary and Non-Monetary demand for gold is steeply rising and it is now being demanded by individual buyer, institutional buyer as well as the Countries too such that there has been drastic increase in the prices of gold since 2001 and gold prices have been increased by 900% during last 10 years. gold price is a complex macroeconomic variable. Demand for gold is driven by various motives that are sensitive to macroeconomic conditions in different parts of the world which is difficult to anticipate, predict and explain but it is observed that gold prices are often influenced by common macroeconomic variables like, GDP, Growth Rate, Exchange Rate, Interest Rate, Inflation, Sensex, Index, Forex Reserves and fiscal deficit. As gold is one of prime financial assets which can be used as hedge against inflation, the close relationship between macroeconomic variables and gold prices are to be what we aim to observe and analyse in this paper

In India, gold has immense value to the society in terms of jewellery making for ornamentation as well as a major vehicle of wealth accumulation asset. Traditionally gold has been a safe

investment option in India, but its role has changed with the time and it is now being traded and forecasted as a commodity. Nowadays the meaning of gold has changed and gold has become a best mode of investment, which works as a safe mode of investment in the fluctuate market. The price of gold increases and notice many drastic changes which effects on the whole economy. The impact of the rise in international gold prices is reflected in its domestic prices as well. Despite the sharp recent price rise, in India, demand for gold has sustained, not only as a component of safe savings but also due to its social and cultural importance therefore India is the largest consumer of gold and almost all of India's gold demand is met by imports. Reason for this sustained demand for gold are

1. In India gold is treated as a symbol of goddess and hence they gift to the daughters, close friends, son in-laws etc., in the form of gold during festivals, marriages etc.
2. India is predominantly dominated by unorganized or informal sector and population living in rural area are away from banking facilities hence they buy gold which creates the demand for gold.
3. It is considered as the best hedge against Inflation
4. In India middle class is rising which led to an increase in demand of gold.
5. With the exitance of parallel economy, most of the black money is stored in the form of gold.
6. whenever there is a geo political trouble, investors around the world rush to prevent attrition to their investment and gold attracts one and all.
7. The unstable international scenario with US is still not stabilizing, China not being as strong as it was a year ago and India also reflecting the unrest. Therefore, creating a situation for gold acting as a safe haven.

Though Government of India increased the exercise duty on the imports of the gold, the demand for gold in India has not declined. Hence the high demand for gold contributing to weakening the rupee making the imports become costlier there by increasing the burden of subsidy on the government leading to rise in fiscals deficit, trade deficits etc. High fiscal deficit leads to inflation which may lead to increase in interest rates. Due to high interest rates and inflation stock market will take huge hit further contributing the demand for gold to hedge against inflation. Having said that there are more reasons that can also affect gold prices other than government intervention such as with dollar losing its value, Reserve bank of India and central banks of most of the developed countries started to increase their share of gold in the storage to prevent excessive. From the time global financial crisis got off, there seems to be a noticeable

hike in gold prices as there has been increase in the demand of gold from central banks all over. It is also observed that the amount of gold mining occurring has gone down by nearly 40% while monetary and non-monetary demand has increased further pushing the gold price upward. Now gold being a natural mineral and not renewable, the amount of gold mined each year will decrease but the amount of demand for precious metals will keep on increasing every year. This scarcity in the long term lead to gold prices will further rise.

1.2 Objectives

1. To examine the trends in India's Gold Imports, Govt policy and the impact of Covid-19

Given the global pandemic of year 2020 gold prices have shown some fluctuations hence the study will attempt to understand the causes of these movements with respect to gold imports, government policy implications and how this has translated into the world with an ongoing pandemic.

2. To study the effect these macro-economic variables have on gold price.

Multiple regression analysis will be conducted in this study to test how strongly the selected macroeconomics variables (independent) affect gold prices (dependent) and India. This is expected to help us give an insight on inner workings of gold price fluctuations and formulate an explanation to justify these rapid changes in gold prices.

3. To study causality between all of the variables.

Granger causality test will be conducted by using VAR model and AIC criterion to find optimum lag length. The test is expected to give us a deeper understanding of how one variable can cause another one to happen.

1.3 Data Sources

For this paper, secondary data was used which was collected from the Reserve Bank of India website under subsection of publications and annual releases the data was clearly stated under handbook of statistics on Indian economy. Some other figures were collected from subsection statistics under database on Indian economy. All of the data for variables both independent and dependent was collected from RBI database alone. Units of the variables in which the data is collected is as follows. Gold reserves in crores of rupees, foreign exchange reserves in crore of rupees, bank rate in percentage, exchange rate in INR for USD, inflation rate in percentage and finally gold price in rupees per 10 gm. For the theoretical aspect of the study a lot of journal articles were referred to which are describes clearly under review of literature in chapter three of this study.

1.4 Methodology

The model for this study has been tested for the period of 2011 till 2020 to capture the effect of pandemic of Covid-19 on gold prices. The data for the study is collected on monthly basis. Subject to this study gold prices are defined as a function of Gold reserves with government, Foreign exchange reserves with government, interest rate, inflation rate and exchange rate (INR for USD). The entire analysis was conducted in the free software GRET

First Unit Root Test was applied to check the data stationarity which is conducted in all three forms to test to allow for various possibilities. These three models are one with no constant and on trend, second is with constant but no trend and final one with both constant and time trend. In all three cases first we take the first difference of the variable and regress it against only the lag of the variable in first model, against lag and constant in second model and against constant, lag and time trend in third mode. The t value of each variables are then compared to Dicky and Fuller table to test the hypothesis.

After that, to study the impact of macroeconomic variables on gold price Regression Analysis with a Log- Log functional form is conducted. Log-Log is one of the commonly used functional form of multiple regression analysis. This model is linear in parameters and linear in logarithmic of the independent variables. Here β values measure elasticity of dependent

variable with respect to independent variable i.e. one percent change in independent variable induce a β percent change in dependent variable.

Later Granger Casualty Test is applied to analyse the cause effect relationship between the variables to really understand the pattern in how the data moves. Regression analysis deals with dependence of one variable on other variable while the causality helps us understand one variable causes another. The test was conducted using the Vector autoregression (VAR) model wherein Akaike's AIC criterion was used to find the optimum lag length. Here the p values of each pair of variables was views to test whether to reject or not reject the null hypothesis at 5% level of significance. The test was successfully done using the R studio software.

1.5 Significance of study

The scope of this study is only confined to the chosen macroeconomic variables which are Foreign exchange reserves, Gold reserves, Bank rate, Exchange rate and inflation. Hence the study is limited to the knowledge possessed by the researcher so other scholars with greater knowledge on the subject can always take the research forward, shape it their way and make it their own to yield better results.

The study period have its own contemporary economic, political, and social situation and environment. For instance, this study is conducted during the period global pandemic of covid-19 occurred all over the globe hence the results may be skewed towards its effects. A similar study conducted after the year 2020 will capture the effects of world's response to economy post pandemic.

This study is expected to give a better insight on behaviour of gold prices, why they fluctuate and what role do these selected macroeconomics variables, Foreign exchange reserves, Gold reserves, Interest rate, Exchange rate and Inflation have to play in these fluctuations. The study also tries to focus on especially how closely USD and gold is related and how that can reflect in our investment behaviour.

This study was also able to comprehend the effect of covid-19 pandemic on the economy of India, what kind of behaviour it stimulated in general public and how that was reflected in the

movement of the chosen variables. Study was also useful to point out the similarities in the behaviour of India and China regarding their gold purchasing habit.

In conclusion, this study leaves scope to further examine the significance of gold as an investment and not just an ornament or hedge against inflation or fluctuating USD rate during an onset of recession.

CHAPTER II

ECONOMICS OF GOLD IN INDIA

2.1 Evolution of gold policies

Gold being one of the crucial element of wealth accumulation the policies associated with have changed drastically over the period of time. From 1947 till 1962 India experienced a restriction phase where policies were aiming to reduce the gold smuggling that happened at that time on a high scale due to the tension of partition. Foreign exchange regulation act (1947) at that time helped to regulate payments and dealings in foreign exchange then along with import and export of bullions. Around 1956 India moved to a minimum reserve system for issuing currency where RBI was required to maintain gold and foreign exchange reserve of Rs. 200 crore. Then in 1962 the international border disputes drained India's foreign reserves hence India's first gold bond scheme was introduced. In the same year government reduced its restrictions on production and transaction of gold through but this excessive gold import led to devaluation of Indian rupee hence the gold control act was introduced to limit personal possession of gold by imposing restrictions such as manufacturing of gold jewellery above 14 karat purity was prohibited and a limit was put for individuals holding gold jewellery. Around 1975 voluntary disclosure of Income and wealth (amendment) ordinance was introduced wherein people were encouraged to disclose their undeclared wealth. This was done to reduce gold smuggling and control budget shortage in the country. Then came the liberalization phase in 1990 where the gold control act was revoked leading to free import of gold. Also the non-resident Indian scheme and special import licence scheme were introduced in year 1992 and 1994 respectively that allowed more NRIs to carry more gold into India. As a result of these amendments by 1997 several banks were authorized to import gold into the country. In 1999, government mobilized idle gold through the gold deposit scheme that provided opportunity for gold holders to earn interest on the income. Accessing gold became even more convenient since 2002 as banks permitted to sell gold coins and by 2008 one could walk up to even a local post office and buy gold. Then around the same time gold financial crisis struck that peaked the gold demand hence tripled. With rising global uncertainties and domestic governance issues, India's demand for gold had skyrocketed up to 1001.7 tonnes in 2010 hence by 2012-13 import duty was pushed from 2% to 10% also a ban was imposed on import of gold coins and its sale

through banks or post office. Then the introduction of 80:20 rule enforced export obligation wherein at least 20% of gold imports had to be exported before bringing in new consignments and import of the next lot was allowed only upon fulfilment of the previous export consignment. Finally from 2014 – 2018 government has been promoting transparency in all economic aspects. In 2014 the 80:20 rule was abolished and ban on import of gold was lifted, in 2015 the gold monetization scheme was relaunched from 1999, sovereign gold bonds were introduced and India's first national gold coin i.e. the Indian gold coin (IGC) was launched. By 2016 the government mandated disclosure of PAN for all purchases above 2 lakh. An excise duty of 1% was levied on jewellers with a turnover of over Rs. 12 crore and 1% excise duty on branded gold coins with purity of 99.5% was abolished. Finally as of 2018 Union Budget, the government formulated a comprehensive gold policy to develop gold as an asset class. The government also established a system of consumer friendly and trade efficient system of regulated gold exchange in the country. Gold monetization scheme was revamped to enable people to open a hassle free gold deposits.

2.2 Import of Gold in India

Now amidst the COVID-19 pandemic crisis, gold has shown some significant change hinting the situation of the economy. Indian households sit on the world's biggest private stock of gold at 25,000 tonnes, which is worth around Rs 110 lakh crore. Amid the crash in gold imports, with the yellow metal rallying and the covid-19 blues ailing the economy, the government is keen on tapping gold's idle value lying with India. Gold imports have plunged to \$79.14 million during the first two months of 2020-21 on a major fall in demand amid the covid-19 pandemic, according to data from the commerce ministry. With domestic bullion prices hitting a record high, India's gold demand in 2020 is expected to fall to the lowest level in 26 years, according to the World Gold Council. The Indian government's sustained campaign for improving overall tax was reflected again in the 2021-22 Union Budget, with a few material announcements that impact gold. Key highlights from the Union Budget announcement on 1 February were:

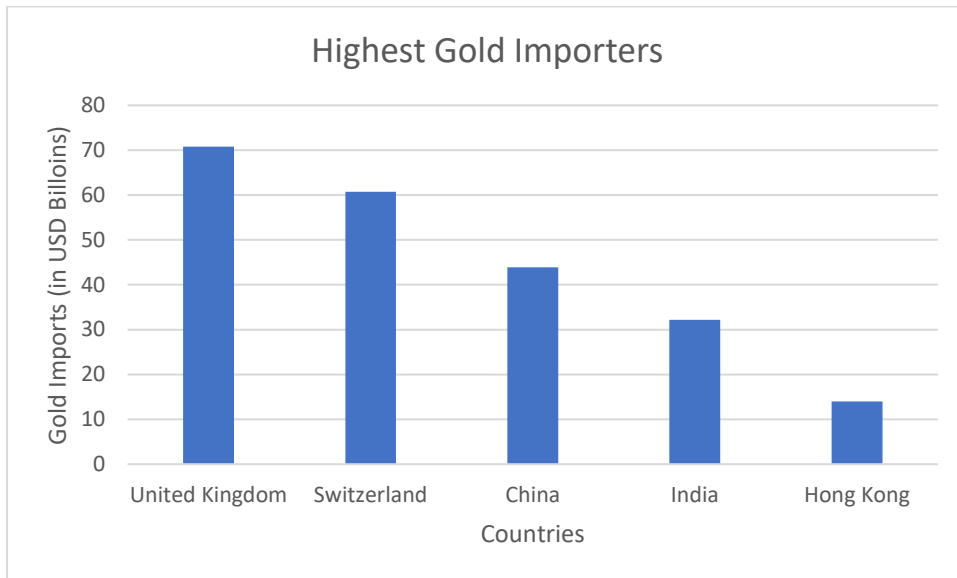
1. a reduction in gold import duty
2. the authorisation of the Securities and Exchange Board of India (SEBI) as regulator for domestic gold spot exchanges
3. the establishment of welfare schemes for rural areas designed to boost incomes.

4. In the Union Budget of 2018-19 the government had indicated its intention to establish a system of regulated gold exchanges, and the current budget authorised SEBI as the regulator. It also expanded the responsibilities of the Warehousing Development and Regulatory Authority to include a commodity market eco-system, embracing vaulting, assaying and logistics, as well as warehousing.
5. The current budget lowered custom duty on gold bars and gold doré in light of the significant increase in the gold price since the duty was last raised (from 10% to 12.5%). The various changes to the components of import duty and rates are as follows:
 - a) Basic Customs Duty (BCD) on gold bars and gold doré is reduced to 7.5% and 6.9% from the previous level of 12.5% and 11.85%, respectively
 - b) To improve agricultural infrastructure, an additional Agriculture and Infrastructure Cess (AIDC) is levied on several items, including gold bars and gold doré, at a rate of 2.5%.
 - c) The Social Welfare Surcharge (SWS) is imposed on BCD at 10% for gold bars and gold doré but will not be applied to AIDC.

The lower import duty is expected to enhance consumer demand and discourage unofficial imports. Oversight by SEBI may spur infrastructure development and likely lead to higher trading and more effective gold price discovery and the rural welfare schemes may indirectly support gold demand through income growth. It is believed that this, combined with better gold policies, could bode well for India's gold industry in 2021 and beyond. We can afford to believe that the policy announcements made in the 2021-22 Union Budget should be positive for India's gold industry. A lower import duty may boost consumer demand and curb unofficial imports. Some policy areas could take longer to progress than others. The formation of the IBE at GIFT-IFSC city may happen more quickly as the relevant notifications and regulations are already published and the authority is working on the enactment of the operational framework of the exchange. The domestic gold exchange, however, may take longer, as SEBI chalks out future steps to work on the modalities of the exchange and the necessary regulatory framework. The Department of Consumer Affairs has announced that hallmarking will be mandatory for 14, 18 and 22 carat jewellery. This will protect consumers from under-carating and is expected to come into effect from 1 June 2021. The National Stock Exchange and the Bombay Stock Exchange have accepted 1kg bullion bars processed by Bureau of Indian Standards certified local refineries. This is an important step and will allow local banks and proposed spot gold exchanges to accept these locally processed bars to be accepted. I believe India's gold market

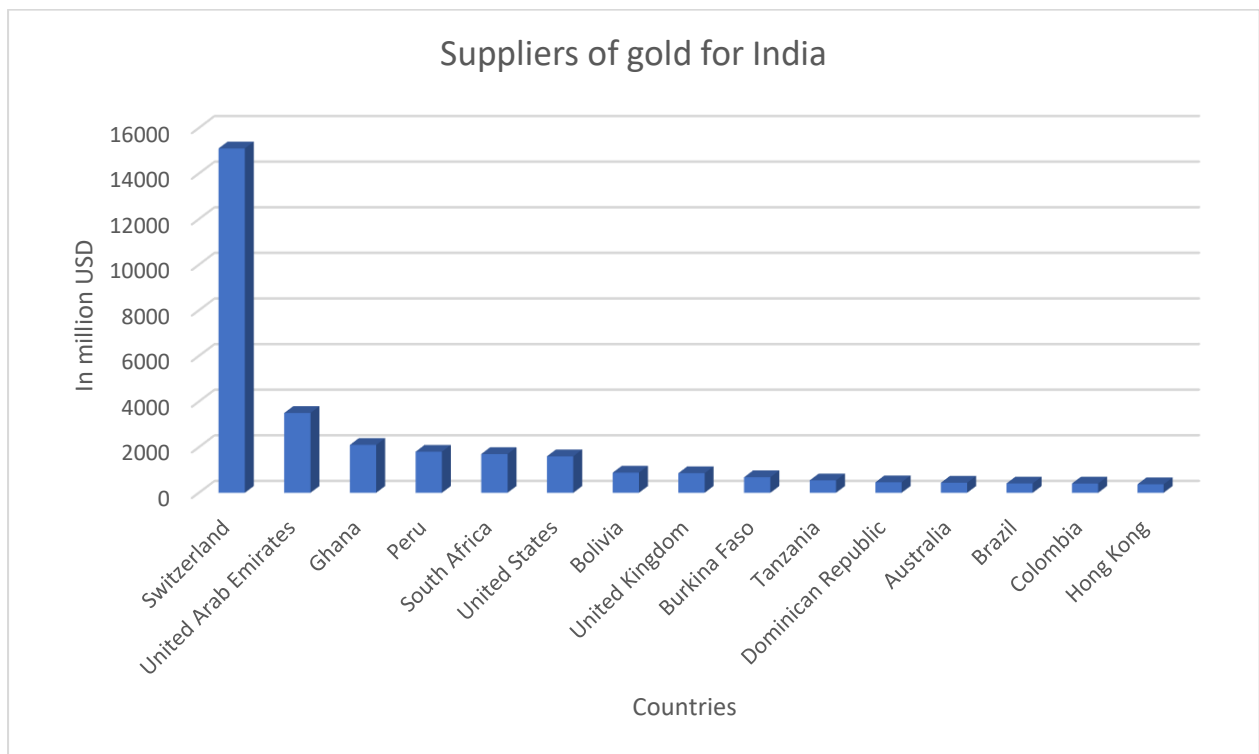
will not only benefit from these reforms but will also indirectly benefit from the various rural welfare schemes announced in the budget. With a revival in the economy and these positive budget announcements, Indian gold demand looks set to recover in 2021 from its 2020 lows. Below are the 5 countries that imported the highest dollar value worth of gold during 2019.

Graph 2.1: Top 5 countries that are highest importers of gold



As we may observe India comes within first five whose reasons are already discussed. India is seen to import 32.2 billion USD worth of gold and comes at the fourth position under top five. Past two years have shown some serious increase in gold prices and tighter government restrictions that followed. India's global purchases of imported gold totalled US\$32.2 billion in 2019. Below are the top 15 suppliers from which India imported the highest dollar value worth of gold during 2019.

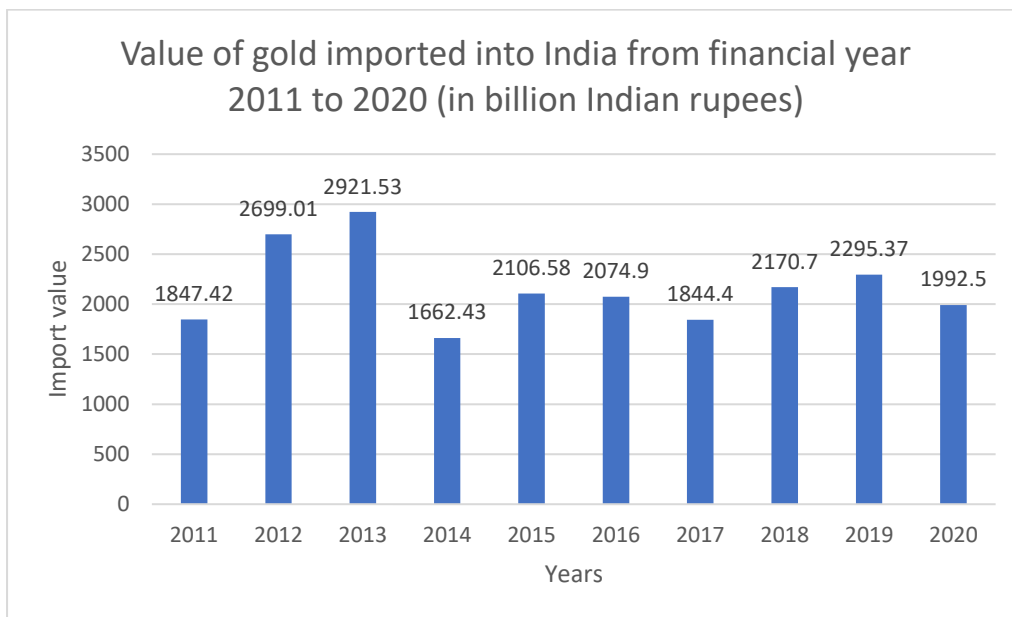
Graph 2.2: Countries that supply gold to India



The listed 15 countries shipped 96% of gold imported by India in 2019. Among the above countries, the fastest-growing suppliers of gold to India since 2015 were: Hong Kong (up 1,275%), Bolivia (up 371.3%), Peru (up 302.7%) and United Kingdom (up 200.4%). Countries that experienced declines in the value of their gold supplied to Indian importers included: Australia (down -55.4%), United States (down -35.7%), Ghana (down -31%) and Switzerland (down -19.6%). Overall, the value of India's imported gold declined by an average -8.2% from all supplying countries since 2015 when gold purchased cost \$35 billion.

Over the years policies regarding gold imports have constantly changed and yet the demand for gold has continued to grow. Despite all this we can observe gold imports took a serious toll in the global pandemic when gold prices sky rocketed as people started investing in it as safe heaven eventually the imports reduced.

Graph 2.3: India's gold import for past 10 years



As can be seen from the graph above, since accessing gold became easier around 2008 the demand for gold skyrocketed whose effect could be seen up until year 2013 when to curb the ever-growing demand for gold import duty was raised to 10% which was earlier at 2%, import of gold coins and sale through banks or post office was banned and finally 80:20 restrictions were imposed which shows the lowest point for gold import in these 10 years for India. But later in 2014 80:20 rule was abolished and government started to promote a more transparent approach to gold which resulted in a slow and steady rise in gold demand again. Finally in the amidst of COVID-19 pandemic gold import again saw a decrease mainly because due to lockdowns imposed in many countries gold mining came to a halt hence there was less gold available which shoot up the gold prices for that year.

2.3 India V/S China

Gold has been considered the sign for good luck and success in China for thousands of years. This was in large part down to the fact that gold and its colour represented the supremacy of emperors throughout China's history. Gold's significant traditional and emotional connection with Chinese people laid the foundation for China's emergence as the largest gold market in the world.

The gold jewellery and investment sectors are vital components of China's gold market, accounting for 62% and 24% respectively of Chinese gold demand in the past ten years. Over the past two decades, China has become the world's leading gold market. As both the largest gold consumer and producer in the world, China plays a key role in the global gold market. But to many, the ancient eastern country's gold market remains a mystery. This primer serves as an introduction to China's gold market. It provides an overview of China's jewellery and investment markets, key drivers of demand and the gold mining industry. China's jewellery market has witnessed stunning growth: from 1990 to 2019, jewellery demand averaged 17% annual growth. In 2019, China accounted for over 30% of global jewellery demand. China's bar and coin market has also experienced rapid expansion: demand grew to 211 tonnes in 2019 from just 12t in 2004. Meanwhile, the young Chinese gold ETF market is also expanding. China has been the world's largest gold producer since 2007, representing 11% of the world's total mined gold production in 2019. Currently, China's gold mining industry is transitioning from quantity-driven growth to quality-driven growth. Having developed for 17 years, gold trading volumes at Shanghai Gold Exchange (SGE) totalled 68,574t in 2019, making it the largest spot gold exchange in the world.

Chinese consumers' appetite for jewellery has been the largest in the world since 2012. Between 2010-2019, China's annual jewellery demand averaged 677t, accounting for a third of the world's total. Chinese jewellers continually widen their product ranges to meet ever changing consumer demand. Even though traditional mass-appeal 24K pieces still dominate China's jewellery market, innovative products such as hard-pure gold jewellery with more fashionable designs and lighter weights are increasingly popular among young Chinese consumers. Chinese jewellers are making efforts to strengthen young consumers' connection with gold. As our 2019 global consumer research results indicated, Chinese youngsters are less likely than older consumers to agree that gold can bring good luck. Nor do they believe wearing gold can help them stand out. But Chinese jewellers have made progress in overcoming this barrier by creating innovative products and embedding trendy fashion as well as cultural elements in these products.

Wealth expansion and gold's price performance are the two most fundamental drivers for China's jewellery demand. The logic of the former is straightforward: with more income, consumers tend to spend more on discretionary items, such as gold. Analysis of annual demand between 1990 to 2018 shows that there is a positive relationship between consumers' expenditure and China's jewellery demand, when the gold price increases, China's jewellery

demand in the same year decreases: a higher gold price deters consumers away while a lower one attracts sales and finally the gold price performance can also affect China's jewellery demand in the subsequent year. This suggests that the gold price trend draws jewellery consumers' attention. Chinese consumers' tradition of purchasing gold jewellery - especially 24K chunky pieces – for long term saving and investment purposes might be the key logic behind this. So if we isolate and analyse china's behaviour towards jewellery v/s coins and bars demand, according to a study conducted by world gold council changes in consumers' spending power and gold prices in both the current and previous period can all affect China's jewellery demand such that a one unit increase in consumers' expenditure leads to a 0.3 unit rise in China's jewellery demand. With higher spending power, Chinese consumers tend to buy more jewellery whereas one unit rise in consumers' expenditure results in 1.1 unit increase in China's bar and coin demand. Similarly, bar and coin demand in China also depends on consumers' purchasing power. This shows China treats gold more as an investment instead of an item of luxury or gift as India does.

Demand for gold in India is interwoven with culture, tradition, the desire for beauty and the desire for financial protection. In this chapter, we analyse the drivers of gold supply and demand in India and assess the genuine economic contribution that gold makes to the Indian economy. For many years the most avid purchaser of gold in the world, India remains one of the leading markets for gold globally today. Indian consumers buy gold as an investment and for adornment. Many perceive gold as a safe investment while some consider it primarily an adornment but in general a large majority of Indian population believe that gold is both. Consumers in India view gold as a protection against uncertainty. That being said people do buy gold if the stock market was booming or if it was falling depending on their strategy but they do buy gold in volatile market conditions. Gold is part of an Indian households' regular expenditure. The purchase of jewellery and coins comprises 8 per cent of daily consumption, only marginally behind medical expenses and education. Hence we observe that gold demand is not dependent on price fluctuations. People would normally buy gold if the economy was growing and would sell if the economy was in recession. The major reasons behind this spending habit on gold are Combining Security and adornment, Protection Against Volatility, Part of family budget, a trusted asset and finally it is easy to understand.

Indian families cherish gold. Much of this gold remains at home. An estimated 22,000 tonnes of gold are currently held in Indian households, worth more than \$1 trillion. If a small percentage of this gold were monetised, the economic and fiscal impact would be considerable.

Monetising gold involves mobilising the gold that lies within Indian households so it can play a dynamic role in the domestic economy. The most straightforward way in which this can be achieved is by encouraging consumers to swap some of their gold assets for gold-related investment products. This essentially will involve transferring household gold into the financial system. Once there, this gold can be recycled, thereby reducing imports of gold into India while continuing to satisfy demand. As imports reduce, the current account deficit would decrease, employment would rise across the financial services and jewellery industries and economic growth would be boosted.

Coming back to China, 2020 was a bumpy year for China’s economy due to the COVID-19 pandemic but China’s economy is expected to remain stable in 2021. At the annual Central Economic Work Conference in late December, Chinese policy makers stated that fiscal and monetary policies will remain reasonably supportive in order to secure the economic recovery. And domestic consumption stimulation was positioned as a key task for the coming years, potentially boosting China’s retail gold demand.

Table 2.1: Comparative chart between India and China gold demand

India	China
India is among top five gold importing countries.	China is world’s leading gold market both as the largest gold consumer and producer in the world.
India is at 4th position for gold imports.	China is at 3rd position for gold imports.
Indian jewellery demand fell 74% in year 2020.	China's jewellery demand was down 33% in year 2020.
In India, gold is purchased as a symbol of wealth.	In China, gold is believed to bring good luck.
India treats gold as a hedge against Inflation .	China treats gold more as an investment by buying it in the form of 24K chunky pieces.

2.4 Covid Impact

The Covid-19 pandemic has affected the level of central banks' total international reserves. Deployed to maintain currency stability and financial system liquidity, they may well have been put to good use in recent months. This year's Central Bank Gold Reserves survey highlighted several notable shifts in central bank attitudes towards gold. Increased interest in gold's "performance during times of crisis" suggests that the fast-changing financial and economic landscape has sparked a significant transformation in investment attitudes. At the same time, factors that were relevant before the Covid-19 outbreak, such as negative interest rates, increased political risk, concerns about fiscal sustainability and changes to the geopolitical order continues to inform central banks' view of gold. In the near future, profound uncertainty about the impact of the coronavirus pandemic may accelerate some of these factors and in turn prompt central banks to look more closely at gold. The markedly higher proportion of respondents who are planning to add gold to their reserves this year may also reflect concerns about the unpredictable impact of the pandemic. Ultimately, the combination of recent market developments and persistent long-term trends has strengthened central banks' interest in gold, pointing to continued purchases from the official sector.

Central bank reserves are typically constructed according to three guiding principles: safety, liquidity and return. The Covid-19 pandemic has reinforced the significance of these principles and, by extension, the importance of smart and sustainable reserve management. But, in order to deliver effectively against this mandate, central bank reserve managers need to understand how different assets perform during stress periods. Only in this way, can they develop portfolios that are robust and resilient in the face of market stress, while aligning with the three core principles of reserve management. Traditionally, assets such as US Treasuries and G-10 sovereign bonds comprise the bulk of central bank reserve portfolios. But gold is widely held too, with one of the main reasons being that it tends to outperform other assets during periods of market stress. Gold has generated strong returns this year, increasing in value by 10.91% from 1 January to 17 April. Some central banks have already put their gold into action: the Banco Central del Ecuador, for example, swapped US\$300 million of its gold holdings to raise liquidity in March. However, while nearly every central bank holds some gold, the majority maintain a relatively low allocation, particularly those from emerging economies. Recent market behaviour prompts a re-examination of gold's role compared to other traditional reserve assets. Risk assets have moved rapidly out of favour in recently as the Covid-19 pandemic has

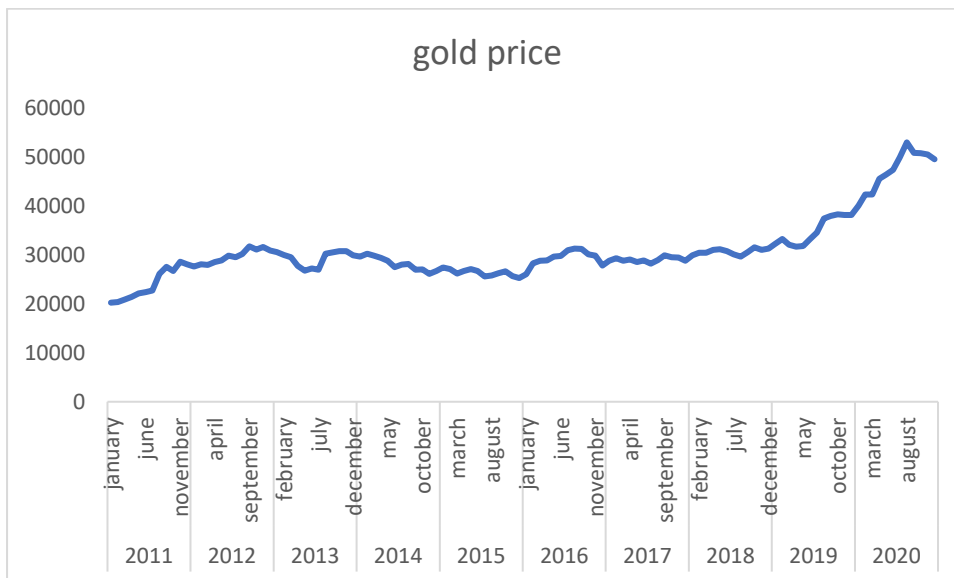
prompted a widespread reassessment of global economic prospects, investors have rotated into safe-haven assets, including gold. Gold has been one of the best performing safe-haven assets this year. Between 1 January and 17 April 2020, gold outperformed US treasury bonds and bills, USD-denominated investment grade agency and corporate debt, and Eurozone sovereign bonds but there have been times when the gold price fell in recent months, especially during heavy risk-off sessions. This has prompted concerns about gold's haven status. Such behaviour may seem counterintuitive but it is not without precedent. During the darkest days of the 2008 financial crisis, gold also declined alongside risk assets on sharp sell-off days. The key to this phenomenon lies in gold's liquidity. As investors faced margin calls and needed urgently to raise cash for redemptions, liquid assets such as gold were first in line to be sold. US Treasuries also fell victim to this trend, selling off alongside equities and gold on some of the sharpest risk-off days. Ultimately, however, gold was one of the few asset classes to deliver positive results that year. Gold generated an annual return of 4.3% in 2008 to end the year at US\$869.75 per ounce. This outperformance underlines gold's long history of resilience in times of turmoil. During the past three decades, gold has outperformed risk assets in nearly every single major market downturn. And that outperformance has continued during the Covid-19 pandemic, reinforcing gold's role as a counter-cyclical asset during periods of market stress.

The economic, social, and financial fallout from the Covid-19 pandemic will almost certainly continue for a prolonged period. It is impossible to predict the exact course that financial markets will take as the pandemic continues, but gold has certainly reacted in a predictable way to date – preserving value and providing financial safety as risk assets sell off. During this crisis period, a typical central bank total reserve portfolio would have performed better with higher allocations to gold than a portfolio without gold, preserving more financial firepower to support currency stability and market liquidity. Central bank reserve managers are already aware of gold's strategic value and resilience. Its performance in recent times highlights the benefits of these attributes. Looking ahead, the financial turmoil unleashed by Covid-19 is yet another test of reserve managers' ability to strike the right balance between safety, liquidity, and return in their portfolios. Now, as in previous crises, gold remains an indispensable central bank reserve asset. The COVID-19 pandemic raised uncertainty by compounding existing risks and creating new ones. But by the end of last Year 2020, investors were optimistic that the worst was over. Looking ahead, one can believe that investors will likely see the low interest rate environment as an opportunity to add risk assets in the hope that economic recovery is on the immediate horizon. That being said, investors will likely also be navigating potential portfolio risks

including budget deficits, inflationary pressures and market corrections amid already high equity valuations. In this context, it is believed that gold investment will remain well supported while gold consumption should benefit from the nascent economic recovery, especially in emerging markets.

2.5 Price behaviour in gold

Graph 2.4: Gold price behaviour for past 10 years



Gold prices have shown a very stable behaviour unless there is an economic recession or some drastic change in policies have occurred that severely impacted the gold demand. The beginning of the year 2020 was, as usual, positive for the gold prices. However it shot up in February amid mounting worries about the COVID-19 pandemic. This steep rise in gold in the year 2020 was due to the fact that gold proved to be one of the biggest beneficiary of the coronavirus crisis, confirming its role as a safe-haven asset and a hedge against inflation. There were few reasons for this behaviour in gold prices. First of all due to lockdowns imposed by most countries the mining activities came to a halt that further increased the price due to the constant demand but lack of supply. Secondly coronavirus recession was very deep, but also very short. The coronavirus crisis was more like a natural disaster rather than financial crisis or recession triggered by fundamental factors hence it was easy for economy to bounce back to certain extent post quarantine period which was why the gold prices deflate after a while. Moreover, in March 2020, the U.S. dollar appreciated significantly, which put downward pressure on the gold prices

Speaking of gold price behaviour in general, the price of gold is moved by a combination of supply, demand, and investor behaviour. Mostly it is viewed as a hedge against inflation because as paper money loses value as more is printed, while the supply of gold is relatively constant. In countries like India and China treat gold as a store of value i.e. people here buy it don't regularly trade it. Instead, jewellery demand tends to rise and fall with the price of gold. When prices are high, the demand for jewellery falls relative to investor demand. Hence also the gold prices are seen to have a rising trend during the times of Chinese new year and Diwali. Hence if we view it closely the behaviour in general with the metal is it's probably a good idea to look at how well the economies of certain countries are doing since economic conditions worsen, the price will usually rise.

CHAPTER III

REVIEW OF LITERATURE

A study was conducted on cointegration relationships among crude oil price, domestic gold price and selected financial variables such as exchange rates and stock price indices in India. (Bhunja, 2013) This study is based on secondary data obtained from BSE and NSE database and the world gold council database for the period from January 2, 1991 to October 31, 2012. The study compiled daily data encompassing the closing stock price indices of both BSE (Sensex) and NSE (Nifty), the daily domestic gold price indices, daily crude oil indices (WCI) and exchange rates which were then fitted with the corresponding gold price, crude oil price and exchange rates with a total of 5400 observations. The study used econometric tools Augmented Dickey Fuller (ADF) both at levels and 1st differences was used to test whether the time series data was stationary (null) or non-stationary (alt) and Johansen's system co-integration test was used to test if there is co-integration relationship between variables(alt) or not (null). The principal results of the study showed that the selected time series exhibited non-stationary and hence provided indication of long-term cointegration relationship while the multivariate cointegration test results indicated that long-term cointegration stable relationships were present under the study period i.e. selected variables were closely interlinked.

Another study conducted on evolution of gold process in India and it's determinants wherein the influence of oil prices, exchange rate, trade deficit, and fiscal deficit were assessed on the prices of gold in India. (Seshaiah, et al., 2017) The study was based on acquired monthly data on gold prices, crude oil prices, exchange rate, trade deficit and fiscal deficit over the period 1994:01 to 2014:12. The study first conducted unit root test by applying Ng and Perron test and Kwiatkowski–Phillips–Schmidt–Shin stationary test. Further for the cointegration analysis they adopted Johansen and Juselius method which employs a VAR system to test for numbers of cointegration vectors. Results of the study indicated the growth in the prices of gold almost two times greater than the growth in crude oil price and exchange rate and based on VEC Granger Causality/Block Erogeneity, Wald Tests no influence of trade deficit, exchange rate, fiscal deficit and the crude oil prices on the prices of gold. Exchange rate, trade deficit, fiscal deficit was influenced by all the variables under consideration. The variation in gold prices explained by gold itself by 93.4% where as the other variables influence on the variation of

gold prices under consideration is negligible. Gold prices and trade deficit contributes 9.43% and 7.92% respectively in the variance of crude oil prices, whereas the gold prices and trade deficit contributes 9.73% and 12.22% in the variance of the prices of exchange rate. The variance in the trade deficit was explained by variance in gold price is as high as 11.31% compared all the other variables under consideration.

This study investigates the causal relationship between stock market indices and gold price in India (Patel, 2013). The study used monthly time series data for gold prices was collect from RBI and three stock market indices, i.e. Sensex, BSE 100 and S&P CNX Nifty, were used from January 1991 to December 2011 which yielded a total of 252 observations. Augmented Dickey-Fuller unit root test, Johansen cointegration test and Granger causality test in Error Correction Model framework were used to draw results where ADF test concluded that all variables were stationary. Second, Johansen's cointegration test inferred that there exists a long- run equilibrium relationship between all stock market indices and gold prices. Third, Granger causality test in the VECM suggested the evidence of causality running from gold price to Nifty. Thus it was concluded that gold price contains some significant information to forecast Nifty return.

This study critically analysed various factors contributing towards the continuously escalating prices of gold in India and how factors like international business environment, political environment, market conditions, its induction in commodity market, buying behaviour of consumers, and inflation have affected prices of gold during last decade (Baber, et al., 2013) . The major objectives of the study were to study present situation of gold and its price in Indian economy, to study the factors contributing towards the increase in the gold prices in India and to study the impact of increasing gold prices on Indian economy. The study was majorly based on secondary data collected from the database on Indian economy maintained by Reserve Bank of India. The study analysed the yearly domestic gold prices calculated by taking an average of gold price of every month in an year. The study used Karl Pearson's correlation coefficient but the time series was calculated and its significance was tested by the Hotelling's Squared T-test. Rest all statistical calculations were performed with the help of IBM SPSS 20.0 version. Finally their test results, revealed that there are positive correlations between gold prices with all other major factors i.e. gold prices, inflation rate and dollar price.

A group of three scholars conducted a relationship analysis on the causal effects of macroeconomic variables on gold prices to examine whether gold price contain any additional

significant information about macroeconomic trends (Bapnn, et al., 2012). The objective of the study was to study the impact of macroeconomic variables on gold prices and to study the cause and effect relationship between macroeconomic variables and gold prices. The study undertook the secondary data for analysis wherein quarterly values of growth rate, exchange rate, interest rate, inflation rate, NSE Index, BSE Sensex, foreign reserves, fiscal deficit, and gross domestic product were taken from BSE, NSE and RBI websites for 10 years from 2002 to 2011. The study being empirical in nature used unit root test to check the data stationarity. Further, to study the impact of macroeconomic variables on gold price, regression analysis and granger casualty test were applied. The study ended with certain conclusions that exchange rate, fiscal deficit, forex reserve inflation rate independently affect gold prices at large but, growth rate, GDP, BSE Sensex and NSE Index are have a very low impact on gold prices independently and collectively all these variables determines gold prices. It was also observed that Gold does not cause and effect exchange rate, BSE Sensex, NSE Index, forex reserves and fiscal deficit but gold does affect interest rate and inflation and vice versa. There exists a bidirectional relationship with growth rate and GDP in terms of gold pricing.

This was an investigative study conducted on the impact of gold price and exchange rates on Sensex in India for the period from January 2, 1991 to October 31, 2013 (Amalendu & Sanjib, 2014). The study was based enormously on secondary data acquired from RBI database, BSE database and World Gold Council database from where daily data encircling the closing stock price indices of BSE (SENSEX), the daily Indian gold price and exchange rates between dollar and rupee was processed which resulted in 5463 observations. The study used econometric tools include Augmented Dickey Fuller (ADF) , PP, Johansen's system co-integration test and Granger causality test to analyse the data. The study tested three hypothesis which were if gold price, exchange rates and Sensex were non-stationary or not, If gold price, exchange rates and Sensex are associated in the long period or not and if gold price, exchange rates and Sensex are related pairwise or not whose results concluded that Sensex is influenced by gold price and exchange rates and also proved that there exists a bidirectional causal connection between gold price and exchange rates in the study period.

This study evaluated the impact of macro-economic variables on stock prices in India (Sharma & Mahendru, 2009). Objectives of this study were to explore major macro-economic variables, to study their effect on stock prices and see if there is any correlation between these macro-economic variables. The study focused on four major economic variables i.e. gold price, foreign exchange reserves, exchange rate and inflation. The study was conducted over the

period of one year from January 2008 to January 2009. the data on stock was collected from BSE Sensex and the money control while the data on macro-economic variables was collected from federal reserve statistical release, Reserve bank of India and NASDAQ. Statistical technique was used to develop a mathematical relationship between a single dependent variable and two or more independent variables i.e. a multiple regression model was employed to test for effects of macroeconomic factors on stock price. Empirical results revealed 88.9% correlation of exchange rate with stock price and 90.2% of gold price with stock price. So it was concluded that gold price has a significant effect on stock prices but inflation and foreign exchange reserve not so much.

This study explored trends in gold prices and it's demand, volatility in gold prices and causes of the mounting prices of gold in the Indian economy (Singh, 2013). The study was based on secondary source of data that was derived from RBI and other articles that were referred. First the trends in gold were compiled in a tabular form. Then the key reasons affecting the gold price were stated such as international scenario, fluctuations in currency, gold mining, unfavourable financial markets performance, taxes, Diwali effect etc. Later the volatility of gold was analysed followed by a comparison between trends and patterns between India and China. It was concluded that average annual growth of gold was 12.27percent which indicates that investment in gold is an effective investment while also giving the reason of high impact risk of a full-blown Euro crisis being a catalyst for the gold price to break higher. Consumer confidence in India has been knocked by the persistence of high domestic inflation rate of 9.5 percent which adversely affected jewellery demand through its impact on both disposable income levels and general consumer sentiment.

This study attempted to examine the co-movements of several macro-variables i.e. gold price, stock price, real exchange rate for dollar and the oil price of crude oil over a period of twenty years (Samanta & Zadeh, 2012). These long-term co movements were examined by tracking the cointegration, common trend factor and the spillover index of these variables. The data was collected from secondary source for daily price of NYMEX crude oil futures, and the US Dollar Index (DXY), price of gold and DJ index. The data was obtained from a Bloomberg terminal using daily closing prices from January 1989 through September 2009 with more than 5200 observations. The study examined examines the existence of co-integration, common trend, Granger causality and volatility spill over for these macro variables from which it was mainly observed that stock price and gold price are more likely to move on their own while oil price and exchange rates likely to be influenced by other variables.

This study analysed the behaviour of gold related equity securities like common stock gold price. (diBartolomeo, 1993) This was done as they observed gold price is the single most influential force in determining the behaviour of gold mining shares, gold stocks but is not nearly as sensitive to gold prices so to examine this further. The first test conducted was to calculate a "gold beta" which measured the sensitivity of returns on gold stocks to changes in the price of gold. Ordinary least squares regressions were performed using monthly percentage changes in gold prices as the independent variable and percentage total returns to an index of precious metals mutual funds as a proxy for gold mining stock prices. Then a multiple regression was performed using the gold fund index returns as the dependent variable and four independent variables which were % monthly change in gold bullion price, % S&P 500 stock index total return, % total return to the 80/20 Treasury security index described above, and % total return to the Merrill Lynch High Yield Bond Index. The study was concluded with a remark that much of the relative performance of gold mining related equities as compared to bullion can be explained as the impact of investor confidence on investor decisions.

The paper investigates nature of the causal relationship between BSE Sensitive Index and the five macroeconomic variables, viz., money supply, index of industrial production, national income, interest rate and rate of inflation (Bhattacharya & Mukherjee, 2002). The study was conducted using monthly data for the period 1992-93 to 2000-01 in India by applying the techniques of unit-root tests, cointegration and the long-run Granger non-causality test. The study first conducted the augmented Dickey-Fuller (ADF) unit root test then Hsiao's optimum lag length and finally Toda and Yamamoto version of Granger Causality test. Major findings of this study were that there is no causal linkage between stock prices and money supply, stock prices and national income and stock prices and interest rate; index of industrial production lead the stock price; and there exists a two – way causation between stock price and rate of inflation.

Then there was a paper written on Globalisation and Its Impact on Indian Economy (Khan, 2015). The paper seeks to analyse the implications of globalisation to the Indian economy in the post-cold war era. It first discusses the concept of globalisation and its chief features. It also examines the performance of the Indian economy since the arrival of globalisation in India. It also highlights the measures taken by the government to improve the economy of our country. The paper first defines globalisation talking about how the concept emerged post world war 2. Then gives various definitions available for globalisation particularly in context of India. Then the paper talks about India's economy after the dawn of globalisation and about how reducing

tariff and non-tariff barriers and relaxation of FDI rules boosted Indian economy. Later under the subtopic of “Consequences of Globalisation to Indian Economy” the paper talks about challenges that came with globalisations mass produced products and how it ruined certain local businesses making areas lose its uniqueness specifically due to its abuse of human, community and environmental resources. Later the paper talks about trade flow and how post globalisation India’s total merchandise trade has increased drastically through major export of petroleum products, gems and jewellery, pharma products, transport equipment, machinery and instruments and readymade garments. The paper then specifies on dual investment flow i.e. foreign direct investment and foreign portfolio investment in detail. The paper then shifts its focus on Indian economy post global financial crisis of 2008 about how the growth rate fell from 9.3 to 7.8 in a year. Finally the paper talks about measures taken to improve Indian economy.

A specialist in macroeconomic policy wrote about The depreciation in US dollar wherein he feels dollar’s decline is a symptom of broader economic problems, such as a weak economic recovery, rising public debt, and a diminished standing in the global economy . (Elwell, 2012) This paper starts with a brief introduction about movement in dollar from 2002 up to 2012. Then it talks about economic forces that have been affect the dollar since Bretton wood. Then it talks about determinants of the size and direction of cross-border asset flows which include interest rate differentials between the united states and other economies, investors’ expectations about the future path of the dollar, investors diversifying their portfolio of assets and other factors that influence the international demand for dollar assets such as the size and liquidity of U.S. asset markets, U.S. asset markets often being seen as “Safe Havens” and the dollar is the principal global “Reserve Currency”. Then the paper investigates possible effects of dollar depreciation such as a smaller trade deficit, decrease in U.S. international purchasing power, reduction in U.S. net external debt, increase in world commodity prices (in Dollars) with also a possibility that U.S. interest rates could increase, dollar’s reserve currency role could be reduced and finally risk of a dollar crisis could be increased. Then the focus is shifted on policies that could influence the dollar like monetary policy, fiscal policy, federal debt, lower foreign trade barriers and support for development of new products. Finally the paper end on a concluding note saying orderly depreciation of the dollar can be, on balance, a beneficial attribute of policy adjustments and economic changes that would ultimately improve economic conditions in the United States and abroad.

This paper from working series of RBI that talks about Gold Prices and Financial Stability in India (Mohan, et al., 2012). Since there has been an almost sustained rise in the international gold prices since 2002, with just one deep correction in 2008, gold is an integral part of savings of a large number of investors, this has raised apprehensions whether any correction in gold prices will have destabilising implications on the financial markets. Therefore, the paper makes an attempt to analyse the implications of the correction in gold prices on financial stability in India. The paper covers empirical analysis on the inter-linkages between domestic and international gold prices and then it examines the nature of changes in the factors affecting international gold prices during the last two decades. While validating empirically the existence of complete inter-linkages between domestic and international gold prices, the paper goes on to conclude that there has been a structural shift in the factors affecting international gold prices in 2003. Short-run volatility in international gold prices used to be traditional factors such as international commodity prices, US dollar exchange rate and equity prices. However, since 2003, the same is largely due to the volatility in the US dollar exchange rate and mildly due to volatility in equity prices. In conclusion, the findings of the paper show that domestic and international gold prices are closely interlinked. Based on empirical evidences, the paper also concludes that implications of correction in gold prices on the Indian financial markets are likely to be muted. What makes it a working paper is that it ends on an open note saying that the measure of financial stability used in this study is based on the financial market indicators alone and hence there is a need to widen this definition including macro and other market indicators relevant to the financial stability in order to arrive at more robust empirical analysis which could be a possible area for future research.

This paper conducted a research testing the argument that the fundamental reason for lack of correlation between returns on gold and those on financial assets such as equities is that returns on gold are not correlated to economic activity whereas returns on mainstream financial assets are (Lawrence, 2003). The time series used in this study consisted of quarterly data from January 1975 to December 2001. The analysis was conducted using real data, obtained by deflating nominal series using the percentage (logarithmic) change in United States producer price index as a proxy for inflation, with the exception of the US GDP growth rate, which was based on constant GDP at 1990 prices. All time-series were tested for unit roots using Dickey Fuller tests and Engle Granger approach was used to test for cointegration of the variables. In conclusion findings confirmed that gold appears to be independent of cycles in contrast to other commodities, making it worth considering as a good portfolio diversifier. There was no

statistically significant correlation between returns on gold and changes in macroeconomic variables such as GDP, inflation and interest rates, returns on financial assets such as the Dow Jones Industrial Average Index, Standard & Poor's 500 index and 10-year US government bonds were seen to be correlated with changes in macroeconomic variables, Changes in macroeconomic variables were seen to have a much stronger impact on other commodities (such as aluminium, oil and zinc) than they do on gold and finally returns on gold seemed to be less correlated with returns on equity and bond indices than are returns on other commodities.

Another study attempts explaining the importance of gold through a study of gold price determination (Vuyyuri, et al., 2003). The study tries to make an attempt at explaining the importance of gold through a study of gold price determination. In this study price of gold is defined as a function of Expected Inflation, Interest rate, import demand for gold, Exchange Rate of US Dollar with Indian Rupee, Stock Market Performance, qualitative variables such as removal of import restrictions on gold, FERA, FEMA, liberalization etc. The model has been tested for the period of 1978-79 and 1999-2000. The qualitative variable has been captured through a dummy variable. The dummy variable is supposed to take the value of 1 for years when significant events affecting the gold prices have taken place and 0 for other years of the study. The results conclude that the movement of the gold prices is affected to a large extent by lagged prices of gold as it is perceived to be an investment. Substitutes like silver also impacts the price of gold. The results also indicate that stocks do not seem to be perceived as an alternative to gold. The reason for holding gold is to a large extent a guided by individual sentiment. Besides, the equity culture in India is not as developed as in some other parts of the world. Gold has not lost its prime importance as an hedge against loss of wealth in times of crises.

This paper investigates the relationship between the value of the dollar and the prices of two commodities, gold and oil (Kim & Dilts, 2011). For this study, Granger causality was used on monthly data from January of 1970 through July of 2008. The empirical results showed that the hypothesis that there is no causal relation between the value of the dollar and the prices of gold and oil is not supported by the evidence. There are causal relations between each of the prices, and there is a negative relation between the value of the dollar and the price of each of the commodities, as predicted by standard economic theory. Also consistent with the predictions of classical economic theory is that there is a positive statistical association between

the prices of gold and oil. The implication is that gold and oil represent safe havens from fluctuations in the value of the dollar.

The study examines the general trend among the central banks' demand for gold during recent global financial crisis, whether India's purchase of gold was a reserve management strategy or otherwise and whether it affected the gold price (Karunakaran, 2011). In the course of analysis, several related issues such as optimum size of gold in the foreign reserves and rationale of central banks buying gold with special reference to the global crisis were also addressed. The paper explores gold reserves under different monetary regimes i.e. Gold Standard, Fixed and Floating Rate Exchange System. Then the paper examines central banks foreign exchange reserve management by analysing objectives of reserve management and importance of gold as part of reserves. Finally the paper talks about Global Financial Crisis and its effect on the demand for gold by the central banks. The paper ended on a concluding note stating gold as part of foreign exchange reserves continues to play a key role in the macroeconomic management devoid of its erstwhile purely monetary role.

Lastly this thesis paper examines several of the explanations commonly provided regarding gold and its price movements (Adibe & Fei, 2009). The data series for this study ranges from January 1956 to October 2008 and is available on the Commodity Research Board (CRB) website. The figures are in 2008 dollars. Their sample period is from January 1978 to December 2007 and used monthly data. The study conduct correlation between macroeconomic factors of interest. They perform impulse response functions, variance decomposition (VDC) and historical decomposition (HDC) of the real price of gold using a semistructural vector auto-regression (VAR) model. The hypothesis about most common opinions about gold price movements that we consider safe haven, inflation hedge, and dollar destruction hypotheses claims that gold returns will increase as fear increases. The inflation hedge hypothesis postulates the negative correlation between expected inflation and the return of gold. The study found a significant relationship between the price movement of gold, real interest rates and the exchange rate, suggesting a close relationship between gold and the value of U.S. dollar as the multiple linear regressions verify these findings. Finally the paper end on a concluding note saying The central message of the paper is that gold's relationships with fear and inflation are not what most people believe. We should not regard gold as a mysterious asset that is immune to fluctuations and behaves uniquely on the market. Rather, we should regard it as another currency, whose value is a reflection of the value of the U.S. dollar and U.S. monetary policy.

CHAPTER IV

IMPACT OF MACROECONOMIC VARIABLES ON GOLD PRICES

4.1 Introduction

The economic reform of Liberalization, Privatization and Globalization aimed at making the Indian economy as fastest growing economy and globally competitive. In India, series of reforms were undertaken with respect to industrial, trade as well as financial sector aimed at making the economy more efficient. This lead to growth in Indian economy increasing disposable income and simultaneously, demand for gold. While the demand for gold is to store it as wealth, central bank also keeps its gold reserves. Gold is often seen as an alternative to the stock market such that in times of economic recession, the value of shares tends to fall so investors may sell shares and buy gold. Thus, fear of recession tend to increase the value of gold as people move from more risky stock market to gold.

It can be estimated reliably that gold and macroeconomic variables are interdependent factors and complement each other. Gold maintains its value in terms of real purchasing power. If the purchasing power of the currency falls, consecutively, inflation rate goes up and the price of gold rises. When the dollar's exchange value falls, it takes more dollars to buy gold so the dollar gold price rises. On the contrary when the dollar's exchange value rises it takes smaller amount dollars to buy gold hence the dollar gold price falls. So when people hold gold it is either in form of jewellery or to hold as a hedge against inflation. Now we know that gold prices and dollar value id inversely related such that when dollar value gets weak gold price increases. Hence central banks usually keep some of their reserves in gold. If they decide to hold more reserves in gold, demand and price for gold rises. So, as an alternative to invest in a currency, investors may tend to buy gold. The level of US Government borrowing can have an impact on the price of gold. If markets feel the US debt is projected to get out of control, there is a greater chance that the dollar will devalue and dollar assets will fall. It means people may sell dollar assets. Now having said that most of the gold in India is imported hence exchange rate here plays a very important role.

1. Exchange Rate:- Exchange rate is a rate at which value of one currency is exchanged for another, in this case INR for USD. As we know USD is the most internationally accepted currency and hence more often then we see gold is used as a hedge against adverse exchange value of USD so much so that as the dollar's exchange value decreases, it takes more dollars to buy gold, which increases the value of gold.
2. Foreign Exchange Reserves:- These are foreign currencies held by domestic central bank primarily for balance of payment purposes. The value of a nation's currency is strongly tied to the value of its imports and exports hence the country that has access to gold reserves will observe an increase or decrease in it's currency strength with reference to fluctuation in gold prices. As we have already observed India is one of the biggest importer of gold. This is bound to have some effect on the country's foreign exchange reserves.
3. Gold Reserves:- Gold reserves are the stock of gold held by a government or central bank to back its promissory notes or currency or to settle its international debts. Gold reserves has a strong role to play in devaluation of currencies as when a country sells a chunk of its gold reserves its currency automatically tends to devalue hence countries mostly refrained from selling their gold reserves because of which their currencies stay stable, with some of currencies growing stronger on account of their gold reserves.
4. Interest Rate:- Interest rate is the rate charged by the commercial banks for lending funds to Investors. Higher interest rate will translate to lower borrowings by the general public . In order to curb liquidity, the central bank can resort to certain actions that will eventually result in raise in interest rate as the commercial banks will have less surplus amount available with them to lend so they will try to increase profits by higher interest rate. This gives us an idea about if the economy is in an expanding or contracting stage and what effect it can have on the gold purchasing behaviour of general public.
5. Inflation:- Inflation means rise in general price level. Reason for taking inflation as one of the macroeconomic variable that might define gold is because gold is commonly seen to be used as a hedge against inflation especially during an onset of recession and

given the fact that during the covid-19 pandemic period gold prices were seen to rise, these two might share a strong relationship.

4.2 Model

The study will focus on 5 macro- economic variables i.e. exchange rate(Dollar v/s INR), country's foreign exchange reserves, country's gold reserves, inflation and interest rates. The analysis will be conducted using monthly data from year 2011 to 2019. The data for this analysis was collected from RBI website. The gold reserves are calculated in crore of rupees, foreign exchange reserves in crore of rupees, bank rate in percentage, inflation in percentage, exchange rate in INR for USD and finally gold prices in rupees per 10 gm. All the analysis are conducted in the free software GRETL

The model formulated for the regression analysis to study the impact of macroeconomic variables on gold price Log- Log functional form is conducted.

$$\text{Ln (Gold price)} = \alpha + \beta_1 \text{Ln (Foreign exchange reserves)} + \beta_2 \text{Ln (Gold reserves)} + \beta_3 \text{Ln (Interest rate)} + \beta_4 \text{Ln (Exchange rate)} + \beta_5 \text{Ln (Inflation)} + U_1$$

4.2.1 Summary statistics

Summary statistics summarize and provide information about the sample data. It shows us where the mean lies and whether our data is skewed. This includes Measures of location which shows where our data is centered at or where a trend lies. It also includes Measures of spread which tells us how spread out or varied your data set is. The summary statistics of the chosen variables both dependent and independent is given below. This includes

Mean which shows us in average what is the foreign exchange reserves and gold reserves maintained by the country also average gold price, exchange rate, inflation and interest rate in the country. Standard error indicates that the sample that we chose has a fairly high or low distribution of the population mean. Median indicates the middle numbers of all the chosen variables based on the sample we used. Mode shows the number which appears most in the set hence it showed us the most prominent inflation rate and interest rate in these past 10 years while exchange rate changes more frequently so was unable to get a mode. Standard deviation

indicates whether the sample values that we used are spread far enough from the mean value or not. Kurtosis tells us about peakness or flatness of the variable. Any value smaller than 3 is concluded to be flat. Skewness tells us about which side the bell curve is bent i.e. left or right. Any skewness value smaller than zero is conclude to be left skewed such that right skewness is positive while left is negative. Range value indicates the difference between the highest and lowest value of the observation which is the maximum minus the minimum in the summary statistics that indicate the highest and lowest value respectively. Sum is the total of all the observations of each variable. Count shows the total number of observations which was 120 throughout. Finally the confidence level is a range of values that we can be 95% certain contains the true mean of the population and after fining its upper and lower limit we get the average number that lies between the two limits at 95% level of confidence.

Table 4.1: Summary statistics

Statistics	Foreign Exchange Reserves	Gold Reserves	Exchange rate	Interest Rate	Inflation	Gold prices
Mean	2146057.992	147026.3	62.9250908	0.0716542	0.062827	30836.68
Standard Error	59974.17737	3396.1545	0.74054303	0.0014034	0.002383	590.1765
Median	2189420	136860	64.4329	0.0675	0.0566	29548
Mode	2991738	139740	#N/A	0.09	0.0328	28069
Standard Deviation	656984.1963	37203.008	8.11224248	0.015374	0.026109	6465.059
Sample Variance	4.31628E+11	1.384E+09	65.808478	0.0002364	0.000682	41796994
Kurtosis	-0.463984764	4.0604526	-0.2525885	-0.9398	-1.2369	3.251768
Skewness	0.47188011	2.0478698	-0.664374	-0.042099	0.189414	1.77095
Range	2616326	181422	32.0715	0.06	0.097	32705
Minimum	1224883	100041	44.165	0.0425	0.0146	20212
Maximum	3841209	281463	76.2365	0.1025	0.1116	52917
Sum	257526959	17643156	7551.0109	8.5985	7.5392	3700402
Count	120	120	120	120	120	120
Confidence Level(95.0%)	118754.8612	6724.725	1.46634917	0.002779	0.004719	1168.608

4.2.2 Unit root test of stationarity

The Dickey-Fuller unit root was conducted first to check for the stationarity of the data that would be later regressed as it is considered as an appropriate tool to check the stationarity of time series data. In this test the time series is deemed nonstationary if the critical t-value is lower than the calculated t-value, subsequently null hypothesis is rejected and series is decided to be stationary. Therefore the hypothesis for this test became

H_0 : Series contain Unit root i.e. it is non- stationary

H_1 : Series does not contain Unit root i.e. it is stationary

The results of the test conducted can be seen in the table below

Table 4.2: Unit root results for random walk model without drift

Variables	T- value	P- value	Stationarity
Foreign Exchange Reserves	1.433	0.1545	Non- stationary
Gold Reserves	0.5152	0.6074	Non- stationary
Exchange Rate	2.118	0.0363 **	Non- stationary
Interest Rate	-0.5756	0.566	Non- stationary
Inflation	-1.189	0.2369	Non- stationary
Gold Prices	2.701	0.0079 ***	Non- stationary

Table 4.3: Unit root results for random walk model with drift

Variables	T- value	P- value	Stationarity
Foreign Exchange Reserves	-0.8371	0.4042	Non- stationary
Gold Reserves	-1.404	0.163	Non- stationary
Exchange Rate	-1.767	0.0799 *	Non- stationary
Interest Rate	-0.9348	0.3518	Non- stationary
Inflation	-1.698	0.0922 *	Non- stationary
Gold Prices	0.7753	0.4397	Non- stationary

Table 4.4: Unit root results for random walk model with drift

Variables	T- value	P- value		Stationarity
Foreign Exchange Reserves	-3.28	0.0014	***	stationary
Gold Reserves	-1.853	0.0664	*	non- stationary
Exchange Rate	-2.297	0.0234	**	stationary
Interest Rate	-2.497	0.0139	**	stationary
Inflation	-2.074	0.0403	**	stationary
Gold Prices	-0.1369	0.8913		non- stationary

Since gold reserves and gold prices were non stationary at the level, augmented dicky fuller test was conducted with 12 lags as this is a monthly data and at first difference these variables too proved to be stationary.

Table 4.5: Unit root with first difference

Variable	Calculated t-value	P value	Stationarity
Gold reserves	-1.975	0.0512 *	stationary
Gold prices	-2.039	0.0241 **	stationary

There are three different forms of unit root test i.e. first one being random walk model without drift where in the Y_t here is a stationary time series with zero mean. Here when we perform ordinary least square we take first difference of the selected variable as dependent variable and take one lag of the same variable as independent variable. After getting the results we compare the resulting t value to the Dickey and fuller table. If the calculated t- value is greater than critical t-value, we reject the null hypothesis, concluding that variable is stationary in nature. Second one is random walk with drift where Y_t is stationary with a non-zero mean. Here when we perform ordinary least square we take first difference of the selected variable as dependent variable as for independent variable we take one lag of the same variable as well as the constant. Finally for the unit root of a random walk model with drift and deterministic trend Y_t is stationary around a deterministic trend. Here when we perform ordinary least square we take first difference of the selected variable as dependent variable as for independent variable we take one lag of the same variable, constant and we add a time trend.

As we can see in the above table the critical t-value obtained from Dickey Fuller table for 119 observations at 5% level of significance was -1.95 and accordingly the above hypothesis were rejected or not rejected. The significance level of stationary variables is at the given P values. From a first glance we can observe that all variables were not stationary for random walk without and with drift but after adding a time trend, all variables except for gold reserves and gold prices turned out to be stationary. Therefore in process ahead we have resulted to the method of differencing to manipulate the data into being stationary wherein we subtract the value of one observation with the value of another observation x number of periods ago, where x is the time period lag.

4.2.3 Regression analysis

As we already saw our data at large suffers from a problem of non-stationarity i.e. here the mean and variance systematically vary over time. Non-stationary data, as a rule, are unpredictable and cannot be modelled or forecasted. The results obtained by using non-stationary time series may be spurious in that they may indicate a relationship between two variables where one does not exist. Therefore in this particular regression analysis we use the Log-Log functional form. This is because Logarithmic transformation is a convenient means of transforming a highly skewed variable into a more normalized dataset. Using the logarithm of one or more variables improves the fit of the model by transforming the distribution of the features to a more normally-shaped bell curve.

Now the way we interpret a regression model of a Log-Log functional form is very different from how we interpret a linear regression model. A regression model will have unit changes between the independent and dependent variables, where a single unit change in independent variable will coincide with a constant change in dependent variable. Taking the log of one or both variables will effectively change the case from a unit change to a percent change. Hence here one percent change in independent variable will induce a β percent change in dependent variable.

The Log-Log regression model for this dataset looked something like this

$$\ln Y_t = \alpha + \beta_1 \ln X_{1t} + \beta_2 \ln X_{2t} + \beta_3 \ln X_{3t} + \beta_4 \ln X_{4t} + \beta_5 \ln X_{5t} + U_t$$

Where,

Y_t = is the gold price

X_{1t} = is the foreign exchange reserves

X_{2t} = is the gold reserves

X_{3t} = is the interest rate

X_{4t} = is the exchange rate

X_{5t} = is the inflation

U_t = unobserved error term

The hypothesis for each independent variable of this model goes as follows

1. Foreign exchange reserves

$$H_0 : \beta_1 = 0$$

$$H_1 : \beta_1 < 0$$

2. Gold reserves

$$H_0 : \beta_2 = 0$$

$$H_1 : \beta_2 > 0$$

3. Interest rate

$$H_0 : \beta_3 = 0$$

$$H_1 : \beta_3 < 0$$

4. Exchange rate

$$H_0 : \beta_4 = 0$$

$$H_1 : \beta_4 > 0$$

5. Inflation

$$H_0 : \beta_5 = 0$$

$$H_1 : \beta_5 > 0$$

And the results for the above regression model after ordinary least square testing in the GRETL app are

Dependent variable: l_goldprice

Table 4.6: Log-Log regression results

	Coefficient	Std. Error	t-ratio	p-value	
const	1.69101	0.464659	3.639	0.0004	***
l_foreignexchangere serves	-0.212875	0.0668041	-3.187	0.0019	***
l_goldreserves	0.694765	0.0348170	19.95	<0.0001	***
l_interestrates	-0.0997012	0.0384913	-2.590	0.0108	**
l_exchangerate	0.758018	0.118596	6.392	<0.0001	***
l_inflation	0.0421723	0.0138839	3.037	0.0030	***

Mean dependent variable	10.31792	S.D. dependent variable	0.186655
Sum squared residual	0.198491	S.E. of regression	0.041727
R-squared	0.952125	Adjusted R-squared	0.950025
F(5, 114)	453.4359	P-value(F)	1.82e-73
Log-likelihood	213.9977	Akaike criterion	-415.9953
Schwarz criterion	-399.2704	Hannan-Quinn	-409.2032
rho	0.866732	Durbin-Watson	0.399932

Adjusted R-squared of this model is very good at 0.950025. The reason we take adjusted R^2 is because this is a multiple regression model. This R^2 means the Log-Log model explains 95% of the variation in dependent variable i.e. Gold prices. Which means that all the independent variables together explain 95% variation in Gold prices. Therefore we may say the goodness of fit of this model is very good as the adjusted R^2 is high.

The F calculated value here is 453.4359. the critical F value is 2.29391. Since the calculated value is greater than critical value we reject the null hypothesis which means that at least one

of the β coefficient is statistically significant i.e. at least one independent variable can explain the dependent variable.

The t-test for foreign exchange reserves showed calculated t-value equal to -3.187 and t critical equal to -1.65833 and since calculated t-value is greater than critical t- value the null hypothesis gets rejected which proves that the β value of the variable is statistically significant. As for gold reserves showed calculated t-value equal to 19.95 and t critical equal to 1.65833 and since calculated t-value is greater than critical t- value the null hypothesis gets rejected which proves that the β value of the variable is statistically significant. Then for interest rate calculated t-value is equal to -2.590 and t critical is equal to -1.65833 and since calculated t-value is greater than critical t- value the null hypothesis gets rejected which proves that the β value of the variable is statistically significant. Later for Exchange rate calculated t-value is equal to 6.392 and t critical is equal to 1.65833 and since calculated t-value is greater than critical t- value the null hypothesis gets rejected which proves that the β value of the variable is statistically significant. Finally for inflation rate calculated t-value is equal to 3.037 and t critical is equal to 1.65833 and since calculated t-value is greater than critical t- value the null hypothesis gets rejected which proves that the β value of the variable is statistically significant. This concludes that all the variables in this regression analysis are statistically significant.

4.2.4 Granger causality test

Causality in econometrics implies the ability of one variable to predict another. This is different than regression as regression analysis deals with dependence of one variable on another while causality views whether one variable causes another. The task here was to find an appropriate procedure to test and statistically detect causality. Vector Autoregression (VAR) modelling has been used here to shed light on the notion of causality. The number of lagged terms to be introduced in the Granger causality test is an important practical question, for the causality may depend critically on the number of lagged terms included in the model. Therefore Akaike's AIC criterion was used to determine the length of lags here.

Table 4.7: Granger Causality Results

Null hypothesis	Lags	F- statistics	P- value	Rejection criteria
foreign exchange reserves do not Granger-cause gold prices	2	2.0012	0.1376	Not rejected
gold prices do not Granger-cause foreign exchange reserves	2	4.015	0.01936	Rejected
gold reserves do not Granger-cause gold prices	12	1.6443	0.08402	Not rejected
gold prices do not Granger-cause gold reserves	12	2.8264	0.001513	Rejected
interest rate do not Granger-cause gold prices	2	0.1993	0.8194	Not rejected
gold prices do not Granger-cause interest rate	2	2.7546	0.06579	Not rejected
exchange rate do not Granger-cause gold prices	1	0.00035074	0.9851	Not rejected
gold prices do not Granger-cause exchange rate	1	1.2717	0.2606	Not rejected
inflation rate do not Granger-cause gold prices	12	1.3973	0.1717	Not rejected
gold prices do not Granger-cause inflation rate	12	1.8112	0.05007	Rejected

The p values were used here as to test whether to accept or reject the formulated null hypothesis such that if the p-value was less than 0.05 we rejected the null hypothesis and accept the alternative one for 5% level of significance whereas if the p-value was greater than 0.05 then we accept the null hypothesis proving absence of causality. For this test, based on the AIC criterion we were able to find the above stated optimum lags using the VAR model.

The granger causality test concludes firstly, that the null hypothesis in cases of foreign exchange reserves not granger causing gold prices was not rejected but gold prices not causing granger causing foreign exchange rate was rejected showing a Unidirectional causality at lag

2. Similarly null hypothesis for gold reserves not granger causing gold prices was not rejected but gold prices not granger causing gold reserves was rejected viewing another unidirectional causality at lag 12. Inflation too showed a Unidirectional causality at lag 12 as the null hypothesis gold prices not granger causing gold reserves wasn't rejected but gold prices not granger causing inflation rate was rejected. Finally both Interest rate and Exchange rate proved to be independent of gold prices as both their null hypothesis were not rejected at lag 2 and 1 respectively.

4.2.5 Discussion

The unit root test proved most of the variables stationary with a time trend but still there were two variables that showed non- stationarity which after testing at first difference became stationary. The regression analysis opted for was in a Log-Log functional form. Here for t-test was used to test the significance of individual coefficients which yielded the results that all the variables are statistically significant. Hence in this section we proceed to analyse them. In the Log-Log regression model we regressed foreign exchange reserves, gold reserves, bank rate, exchange rate and inflation against gold prices for the period 2011 to 2020 where the changes in dependent variables are in percentage form.

Here we observed that gold prices and foreign exchange reserves share a negative relationship such that one percent increase (decrease) in foreign exchange reserves will decrease (increase) gold prices by 0.212875 percent. This could happen since both gold and US dollars are global currencies which is why government holds reserves in both gold and forex. So if the general public and the government has a greater confidence in the USD then they would hold more of foreign exchange in their reserves. This will eventually increase the demand for USD and will make government even sell gold bullions to purchase more of USD. This will bring down the price of gold while increasing the forex reserves. But we may also say that the impact of this increase or decrease is not very high as the β value is much less than one.

Then we analyse the relationship between gold prices and gold reserves which we observed is a positive one. Which means here one percent increase (decrease) in gold reserves will cause a 0.694765 percent increase (decrease) in gold prices. This relationship seems to be pretty self-explanatory as gold reserves are the stock of gold held by central bank of that country. Here we may say that as the central bank holds more gold reserved the demand for gold goes up

globally which makes gold prices to rise. Here as well we see that the impact of this relationship isn't very strong as even though the β value is more than that of forex reserves it is still less than one which means gold reserves have more impact on gold prices than forex reserves but still isn't strong enough.

Later we observe that interest rate and gold prices share a negative relationship wherein one percent increase in bank rate will cause gold prices fall by 0.0997012 percent. Here we can see that the impact of this relationship is the lowest and the p value show 5% level of significance as opposed to others that showed 1% level of significance. This could be because there are many other variables bank rate will affect before it shows an effect on gold prices. For instance, when RBI takes certain expansionary measures such as say reduce cash reserve ratio, the less central banks will have to keep with RBI the more surplus amount they will have available with them to lend to willing investors. This will increase the overall investment in the economy, businesses will expand and people will generally earn more income side by side they will see these other investment avenues doing so well they would want to invest their savings in those which will in fact yield them returns as opposed to gold whose overall price might have increased over the years but won't yield regular returns. Yet gold prices continue to rise which means that at a core level gold is still purchased and even preferred because it proves to be a safe heaven.

Then we view the relationship shared by exchange rate and gold prices which is a positive one. Here one percent rise in exchange rate will cause a 0.758018 percent rise in gold prices and vice versa. Even here the impact of this rise or fall isn't very high as rise or fall in gold prices is less than proportional to rise or fall in exchange rate. Still the results are statistically different from zero so we attempt to justify this relationship. As we saw in chapter two, United states is one of the major supplier of gold to India. Now in order to purchase this gold, India would need large amounts of USD to trade for gold. So as the demand for gold increases in India, the demand for USD is bound to rise as for to purchase the said gold. This proves the positive relationship between the two. This relationship proves to be a particularly important one as both USD and gold are somewhat global currencies and both are considered to be strong and stable in their price.

Finally we analyse the relationship between gold prices and inflation which too is a positive one. This means one percent rise in inflation rate will cause gold prices to rise by 0.0421723%. In this study over and over we have witnessed theories claiming gold is used as a hedge against

inflation and that is exactly what we see happening here. When inflation in the economy is on the rise people will start investing their savings into gold as to hedge the value of their money which translates into rise in demand for gold hence the gold prices increase too proving the positive relationship between the two. This relationship also unfortunately here proves to be low impact as the rise in gold is less than proportional ($\beta < 1$) to the inflation.

Lastly the Granger causality test proved that while some variables showed unidirectional causality and others independent of each other, none of them showed a bilateral causality. The test viewed that foreign exchange reserves, gold reserves and inflation shared a unidirectional causality with gold prices such that in all three cases it was gold prices that granger caused foreign exchange reserves, gold reserves and inflation. This says a lot about dominance of gold not just in the Indian economy but globally as well. Unfortunately exchange rate and interest rate proved to be independent of gold prices. Gold reserves and Foreign exchange reserves are more dependent upon governmental efforts while inflation is managed by monetary authorities of the country in correspondence with government and the fact that these three variables are caused by gold prices show that the government maintains a portfolio that gives higher position to gold as they to follow the belief of it being a perfect hedging instrument. Also the fact that study proved that gold causes inflation means that gold prices can often be used as an indication of currency bubble in the economy. As for foreign exchange rate, it is not in the governments hand and different political, economic, social conditions of United stated of America will play a huge role in the movement of exchange rate. Finally as for the interest rate, it is used as a tool to control the growth in the economy and it is sensible that gold prices will be independent of it as interest rate is meant to promote more financial assets based forms of investment and promote expansion in the economy while gold is straight up a hedging element which is a mean to secure the purchasing power of already acquired wealth.

CHAPTER V

SUMMARY, FINDINGS AND CONCLUSION

5.1 Summary

Gold is one of the most precious metal on earth and serves to be more than just a shiny object. Back in the past the yellow metal was used as a currency and even a source of investment for the longest time. Now in present day and age it is used as a hedge against inflation. Gold maintains its value in terms of real purchasing power. If the purchasing power of the currency falls, inflation rate goes up and the price of gold rises. As for India gold has immense value to the society in terms of jewellery making for ornamentation as well as a major vehicle of wealth accumulation asset. It was observed that since the recent pandemic of covid-19 there has been a hike in gold prices as there has been increase in the demand of gold from central banks all over. Hence this study attempted to find reasons behind this constantly high demand for gold in India. This study attempted to fulfil three objectives to be precise. These were first to examine the trends in India's Gold Imports, Govt policy and the impact of Covid-19, second was to study the effect these macro-economic variables have on gold price and finally to study causality between all of the variables.

Policies revolving around gold really began to evolve post-independence. From 1947 till 1962 India experienced a restriction phase where policies were aiming to reduce the gold smuggling that happened at that time on a high scale due to the tension of partition. Then around 1962 government reduced its restrictions on production and transaction of gold through but this excessive gold import led to devaluation of Indian rupee hence the gold control act was introduced. Then came the liberalization phase in 1990 where the gold control act was revoked leading to free import of gold. Then around 2008 when financial crises struck, gold demand tripled. Hence by 2012-13 import duty was pushed from 2% to 10% also a ban was imposed on import of gold coins and its sale through banks or post office. But there is light at the end of the tunnel as from 2014 – 2018 government has been promoting transparency in all economic aspects.

Amidst the pandemic of covid-19 India saw a solid plunge in their demand for gold as the prices of gold skyrocketed almost hinting an upcoming global recession. Thankfully that

prediction did not fall true yet it was surprising to see this behaviour from a country who falls among top 5 gold importing countries. The top 15 countries from whom India imports gold are Switzerland, United Arab Emirates, Ghana, Peru, South Africa, United States, Bolivia, United Kingdom, Burkina Faso, Tanzania, Dominican Republic, Australia, Brazil, Colombia and Hong Kong. Over the years policies regarding gold imports have constantly changed and yet the demand for gold has continued to grow. Despite all this we can observe gold imports took a serious toll in the global pandemic when gold prices sky rocketed as people started investing in it as safe heaven eventually the imports reduced.

Gold's significant traditional and emotional connection with Chinese and Indians is almost identical as we Indians tend to purchase a lot around Diwali and similarly Chinese do around Chinese new year. The only difference seen here is Chinese prefer to buy 24K bars of gold i.e. they treat gold as an investment instead of an expensive gift as Indians do. As to speak of the attitude of central banks during this crisis period has been to have a reserve portfolio which performed better than only happened with higher allocations to gold than a portfolio without gold, preserving more financial firepower to support currency stability and market liquidity. The study referred to 19 odd journal articles to get a deeper insight on the movement of the chosen five variables i.e. exchange rate(Dollar v/s INR), country's foreign exchange reserves, country's gold reserves, inflation, gold prices and interest rates in the past.

As we move ahead to the more analytical part of the study, unit root test was conducted to test for stationarity of the data and after testing all three hypothesis i.e. random walk without drift, random walk with drift and random walk with drift and deterministic time trend. The results of which concluded that all the variables except gold prices and gold reserves proved to be stationary with a time trend. Later regression analysis was conducted of Log-Log functional form. Here all the values proved to be statistically significant where foreign exchange reserves and interest rate was shown to share a negative relationship with gold while rest all variables i.e. gold reserves, exchange rate and inflation shared an positive relationship with gold. As for Granger causality test foreign exchange reserves, gold reserves and inflation shared unidirectional causality with gold prices while exchange rate and interest rate stayed independent of gold prices.

5.2 Findings

After reviewing multiple journal articles, newspaper columns and textbooks along with the regression analysis and causality tested, the study had following findings to share.

1. Gold stands a very important part of Indian economy. The gold is more than often purchased in the form of jewellery as an expensive gift especially during the festival of Diwali but also plays an important role as an investment because during the times of economic distress and rising inflation, the yellow metal is used as a hedge against it because of its purchasing power retaining quality. It is also often used as a hedge against unstable US dollar values.
2. Because of the relationship the country shares with the metal, gold policies has been evolving since the country received it's independence. From heavily restricted policies to curb the heavy smuggling of gold during the post-independence period to heavy import bans during the 2008 financial crises, India has witnessed restrictive policies until the Liberalisation struck. After some ups and downs finally post 2018 India is experiencing more generous approach toward gold trade.
3. India unfortunately even after having a huge demand for gold doesn't produce enough of it hence is one of the biggest importer of the metal from fifteen odd countries. A similar attitude can also be seen in China's approach towards gold as they too buy huge amounts of gold around Chinese new year as we do for Diwali but instead of using it as a hedge, Chinese treat gold as investment by buying pure 24K bars instead of jewellery.
4. After viewing a serious plunge in gold demand while skyrocketing gold prices during the recent covid-19 pandemic even the central bank opted for a more gold base portfolio as a hedge which further proves the need for our country to start treating gold as a form of investment.
5. The regression analysis conducted proved all values to be significant but all the values were less then proportional to the change in gold price which showed a low impact of these variables. It was quite clear from the analysis that as inflation rises gold prises rise too which proves the metal in fact is hedged which also happens in the case of rise in exchange rate for USD as well. This rise is gold price could trigger government to shift their portfolios to more gold reserves based then forex reserves based which can be shown through their positive and negative relationship with gold respectively.

Finally interest rate proved to be quite a curveball as their negative relationship with gold proved that even when economy is in a expansion phase people would still buy gold keeping their prices growing.

6. The causality test showed that while interest rate and exchange rate stayed independent of gold prices the three variables of foreign exchange reserves, gold reserves and inflation shared a unidirectional relationship with gold prices such that that in all three cases it was gold prices that granger caused foreign exchange reserves, gold reserves and inflation. This showed that government manages a strong gold based portfolio in India for the gold prices to cause the government reserves variables. Gold prices could be taken as a hint of currency bubble in the economy as it causes inflation.

5.3 Conclusion

This study makes an attempt to explore the causal relationship between gold prices and macroeconomic variables in the Indian economy. The study primarily revolved around two major questions first, do macroeconomic variables impact on gold prices? Secondly, does there exists any interactive cause and effect relationship between macroeconomic variables and gold prices?

1. The answer to the first question is, exchange rate(Dollar v/s INR), country's foreign exchange reserves, country's gold reserves, inflation and interest rates significantly affect gold prices and the relationship they share may be of low impact but still is backed by theories of macroeconomics. Furthermore the analysis also proves the dominance of gold in the Indian economy and the need for general public to start viewing it as an investment avenue.
2. As for the second question, the causality test showed that while interest rate and exchange rate stayed independent of gold prices the three variables of foreign exchange reserves, gold reserves and inflation shared a unidirectional relationship with gold prices such that that in all three cases it was gold prices that granger caused foreign exchange reserves, gold reserves and inflation. This proved the importance government gives to gold as it has a strong impact on the government reserves.

On a concluding note, this study was done during the period of a major global pandemic as well as some political distress as during the chosen time period demonetisation had occurred in India as well. So study done in a different time period might yield different results.

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