

GOLD SMUGGLING IN INDIA AND ITS EFFECT ON BULLION INDUSTRY

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Abstract

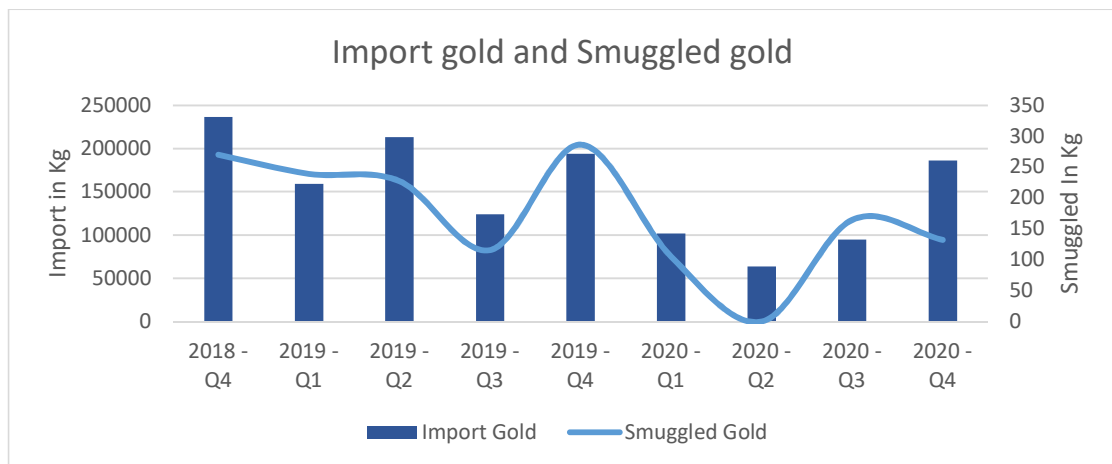
This study strives to examines when and where most of the gold smuggling takes place in India. Further, it analyses how the smuggled gold affects Indian bullion industry. The variables used in the study are monthly smuggled gold, exchange rates of rupees against major currencies, major stock indices in the world, number of auspicious days in a month, domestic and international gold prices, India's jewelry export, India's GDP, customs duty, and domestic gold supply. The results concluded that most of the gold smuggling takes place in week on Fridays and in terms of the months it is in the month of October, November, and December. During the study period West Bengal, Delhi, Maharashtra, and Tamil Nadu states account for most of the gold smuggling in India. A Positive correlation is observed between smuggled gold, India's gold demand, auspicious days in the month, India's jewelry export, GDP, domestic gold supply, and stock indices such as SENSEX, FTSE100, DFMGI. Smuggled gold maintains a negative correlation with the domestic and international prices as well as its exchange rates with all the major currencies. Gold smuggling in India is caused by India's gold demand, Jewelry export, GDP, domestic and international gold prices and exchange rates of rupees against USD and Yen. India's customs duty on gold encourages its smuggling in the long run.

Keywords: Gold smuggling, exchange rates, economy, stock indices, jewelry export, customs duty, gold price

I. Introduction

India is the second largest consumer of gold in the world gold markets. Gold import is treated as legitimate, when the shipments arrive with the certificate of mining origin. Gold enters into the country without the proper record of origin and not through the authorized agencies and 22 nominated banks called “Grey” importing. The smugglers are using innovative ways to bring in the metal illegally. Gold melted into seed-shaped chips and hidden in dates or capsules, or ground into granules and mixed with other metals to look like ore. Sometimes gold is converted into gold belt buckles and torch batteries and concealing it in bags, clothes and their rectums. By air, Directorate of Revenue Intelligence (DRI) and Enforcement Directorate officers have found gold hidden in ingenious places, including toys, chewing gum packets, sewing machines, wheelchair frames, and suitcase liners. The grey market operators and businesses are able to sell at a discounted price than the authorized agents in the domestic markets, as they avoid paying the customs duty.

Figure 1. Comparison between import gold and smuggled gold



Source: compiled and prepared by the researchers from <https://www.gold.org/> , <https://dri.nic.in/>

The Figure 1 clearly depicts the comparison between the gold that comes in the formal importing process and the illegal flow of gold. It is evident from the graph that the smuggled gold follows the same pattern as the official gold import. When the official gold import increased, the volume of smuggled gold also increased.

It is estimated that up to one-fourth of the total volume of gold entering India arrives here through illicit trade. India imports around 800-900 tonnes of gold every year while the annual consumption is around 1,000 tonnes. This suggests that up to 200 tonnes of gold is being smuggled into the country¹. This illicit trade represented over \$1 billion in value and at least \$20 million in lost tax revenue to governments². The World Gold Council (WGC) estimates 65-75% of smuggled gold comes by air, 20-25% by sea, and 5-10% by land. ³

One important factor that encourages the smuggler is the customs duty levied on the gold import. History shows that there is a considerable percent increase in the customs duty. PR Somasundaram, Managing Director for the region at the WGC said that the propensity to smuggle now is very high because every time you increase the tax rate, you give that much more incentive to smugglers. As per the present market value of gold in India, 1 kg of the smuggled yellow metal would fetch more than a profit of Rs 5 lakh on import duty alone⁴.

Data shared by the finance ministry showed that in the last three fiscals, the maximum amount of smuggled gold seized from international airports in Chennai, Kozhikode and Kochi, Mumbai, Delhi. Further, it shows that out of the top 10 airports where the maximum quantity of smuggled gold was seized, the top three international airports are from Kerala. Dubai is still the number one place from where gold gets in and Singapore is slowly emerging. Sri Lanka has become a staging point⁵. With one third of the world's gold

¹ What makes India a gold smuggling destination?. Prabhash K Dutta. Prabhash K Dutta

² BT Buzz: Why India is becoming main hub for smuggled gold. [businesstoday.in/latest/economy-politics/story/bt-buzz-why-india-is-becoming-main-hub-for-smuggled-gold-267332-2020-07-16](https://www.businesstoday.in/latest/economy-politics/story/bt-buzz-why-india-is-becoming-main-hub-for-smuggled-gold-267332-2020-07-16)

³ World Gold Council, India's gold market: evolution and innovation, p. 60.

⁴ Explained: How in Kerala gold smuggling rackets, the big sharks always escape. Written by Shaju Philip , Edited by Explained Desk | Thiruvananthapuram. [indianexpress.com/article/explained/explained-kerala-gold-smuggling-rackets-big-shark-escape-6499243/](https://www.indianexpress.com/article/explained/explained-kerala-gold-smuggling-rackets-big-shark-escape-6499243/)

⁵ In India, smugglers move gold like narcotics. A. Ananthalakshmi, Siddesh Mayenkar,, [reuters.com/article/india-gold-smuggling-idINDEE9B20HY20131203](https://www.reuters.com/article/india-gold-smuggling-idINDEE9B20HY20131203)

passing through its borders, India has established itself not only as one of the leading gold manufacturing centres, but also one of the world's largest smuggling hubs⁶. UAE is its primary source of smuggled refined bullion⁷.

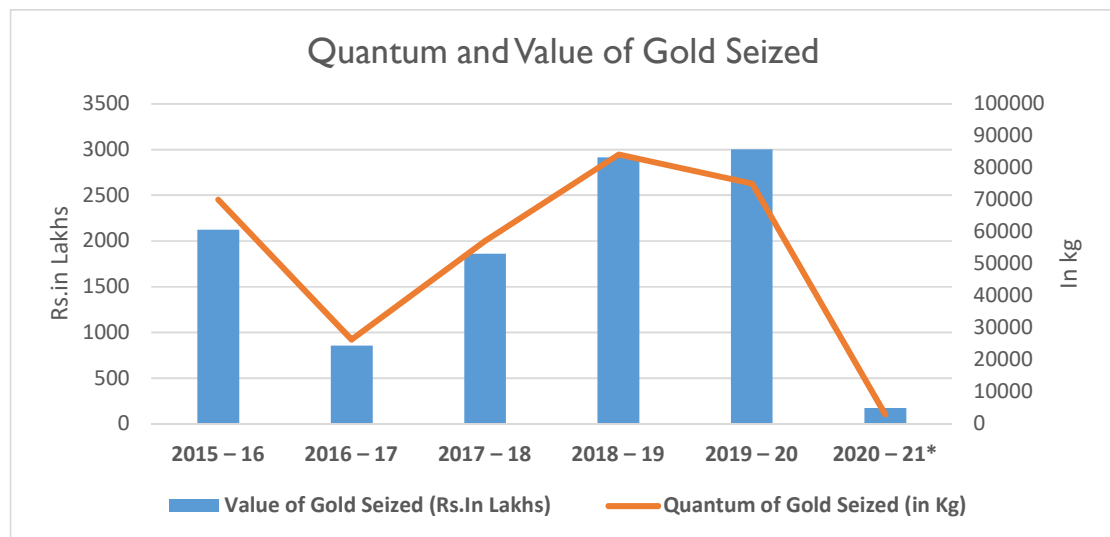
Table 1 – Gold Smuggling In India

Year	Number of Cases of Smuggling of gold at various airports	Quantum of Gold Seized (in Kg)	Number of People booked	Value of Gold Seized (Rs.In Lakhs)
2015 – 16	2696	2452.147	1408	60667.29
2016 – 17	1453	921.805	788	24375.62
2017 – 18	2911	1996.930	1525	53133.32
2018 – 19	4855	2946.097	2141	83354.89
2019 – 20	4444	2629.549	2339	85795.50
2020 – 21*	196	103.165	200	4955.566

*upto August, 2020

Source: Government of India, Ministry of Finance, Dept.of.Revenue, Lok Sabha unstarred Question No.28

Figure 2. Quantum and Value of Gold seized



*upto August, 2020

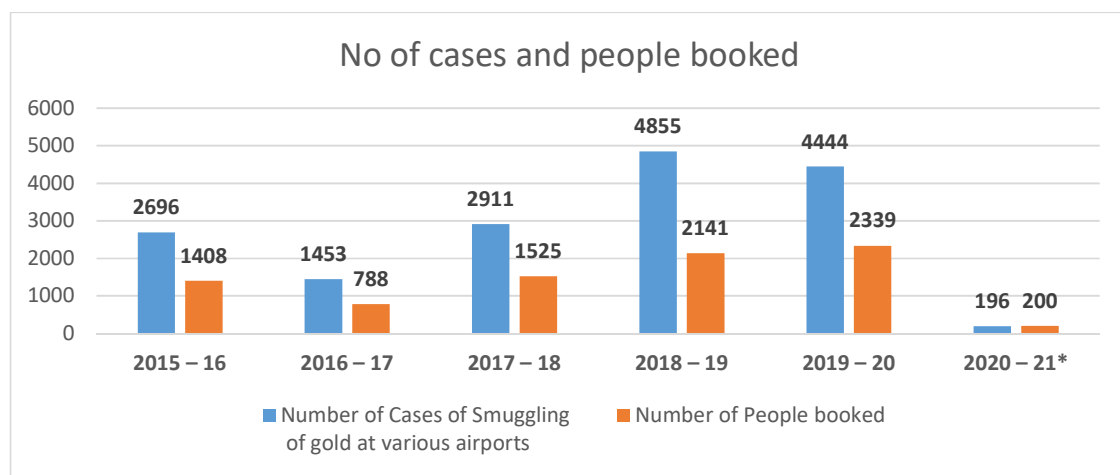
Source: Government of India, Ministry of Finance, Dept.of.Revenue, Lok Sabha unstarred Question No.28 , compiled and prepared by the researchers

⁶ Impact, A golden web: How India became one of the largest gold smuggling hub. Page 42

⁷ Impact, A golden web: How India became one of the largest gold smuggling hub. Page 27

Table 1, Figure 2 and 3 provides a detailed information about gold smuggling in India in the last 6 years. It is observed from the data that the quantity of gold seized keeps increasing over a period of time. Further the number of cases of smuggling at various airports and the number of people involved in gold smuggling also keeps increasing. During the year 2020-21 it is very minimal due to the Covid 19 restrictions imposed in the country. The international travelers were very less due to limited flight operation and other Covid 19 restriction implemented during this period.

Figure 3. Number of cases and people booked for gold smuggling



*upto August, 2020

Source: Government of India, Ministry of Finance, Dept.of.Revenue, Lok Sabha unstarred Question No.28, compiled and prepared by the researchers

II. Major Research Works Reviewed on Gold smuggling:

As stated in the introduction, almost one third of its annual gold demand is fulfilled through the illegal gold. Nevertheless, it is hard to find research in this field. There are a few studies documented the opinions of the industry experts about the gold smuggling in India. Prem Mahadevan (2020) covered exhaustively about the illicit gold flows to India. The report discussed in detail about the history of illicit gold flow into the country and various methods and routes used by the smugglers. The study concluded that high customs duty

and the abundance of black money encouraged smugglers to bring gold illegally into the country. Further, the lack of attractive investment opportunities makes people to buy the illegal gold at the cheaper rate.

The other important research study was undertaken by Impact (2019) an independent non-profit organization, authored by Alan Martin. This study focused on how India became one of the World's largest gold smuggling hub. It examined the link between India and the gold trade in South America and African resources. It extensively covered about, how the illicit gold produced in South American and African countries flow into India. In addition to this, it discussed about the policy vulnerabilities and drivers that make India to be a hub for illicit gold. The key findings of the study are traders create fake documents for importing gold doré illegally that may be linked to conflict, human rights abuses, illegality, and criminal networks from Africa and South America into India. Refined bullion is smuggled into India from other trading centers, notably UAE. The trade of illicit gold—both from Uganda to UAE, and UAE to India— is often financed through hawala. Illicit gold enters the country, is absorbed into the legal market with ease, and is re-exported back out as jewellery. The limitation of the above study is that the methodology used for research report. The author interviewed the experts in the industry and documented their opinions on gold smuggling in the report. No data was collected and no statistical analysis was made to verify the veracious of the information.

Andreas Buehn and Mohammad Reza Farzanegan (2011) undertook a study on smuggling around the world. Using a Multiple Indicators Multiple Causes (MIMIC) model to analyze the determinants of smuggling, it revealed that higher corruption and a lower rule of law encouraged smuggling. Tariffs and trade restrictions are important push factors, while a higher Black Market Premium (BMP) discourages smugglers. Based on the MIMIC analysis, they study calculated an index of smuggling which provided a ranking for 54 countries. It further concluded that smuggling is rampant in Cameroon, Pakistan and Kenya while it is least prevalent in Switzerland, Finland and Sweden. A report published by Thought Arbitrage Research Institute (TARI) (2016) focused on top five products smuggled into India found that smuggling of gold in India is primarily driven by the

demand and supply gap. The Indian gold jewellery industry is almost completely dependent on imported raw materials and about 90% of requirement are fulfilled by imports. The large domestic market provides smugglers enough arbitrage to fulfil needs of the market through smuggled goods as the domestic gold supply is limited.

2.1 Identification of Research Gap

From the above literatures reviewed, it is found that there is a need for taking up a research in the field of gold smuggling in India. The above mentioned studies have documented the opinions of the experts in the bullion industry. The information was collected through interviewing some of the experts and traders in the bullion industry. No empirical analysis was applied to support their opinions. Industry experts and government have opinions that only the customs duty that encourages the gold smuggling in the country. It may be partially true. There may be other variables having strong relationship with the gold smuggling. A detailed study is required to identify the other factors other than customs duty that are showing correlation with the gold smuggling. This study is an attempt to identify and analyse the trend in the gold smuggling with respect to various economic variables and using this trend it tries to predict when and where the gold smuggling likely to take place in the future. In addition to this, It also focuses on the factors that encourage the grey market operation in the country.

III. Data, Variables and Methodology

3.1 Methodology for the research work

The study has used secondary data collected from various sources for the period from September 2018 to December 2020 for the analysis. The variables are classified into different categories and volume and value of gold smuggling data is compared and analysed with all the variables individually. The variables used in the analysis are smuggled gold in Kg, smuggled gold value in Rs, India's gold import, India's GDP, India's jewellery export, number of auspicious days in a month, India's customs duty, national holidays in a month. Gold price variables are Mumbai price, International price and price spread between domestic and international prices. Gold demand variables are jewellery Demand,

Bar&Coin Demand and Consumer Demand of India, Middle East, USA and Hongkong. USA, Middle East and Hongkong are India's major jewellery export destinations. Major stock market indices considered in the analysis are India –Sensex, Japan-Nikkei 225, London-FTSE100, USA-S&P 500 and NASDAQ, France-CAC 40 and Dubai-DFMGI. Gold supply variables are India's Scrap gold Supply, India's Other gold supply, India Total gold Supply. Finally, the Exchange rates of Indian rupees against major currencies like USD, Pound, Euro and Yen are included in the analysis.

Gold smuggling data is sourced from DRI website. Domestic and international gold prices are collected from the websites of RBI and London Bullion Market Association (LBMA). The study extensively used the graphical analysis of data included in the study. In addition to this, statistical analysis like descriptive statistics is used for describing the nature of the data. Further, correlation is used to analyse the relationship between the variables. Lastly granger causality test is used to study the causal relationship between the variables.

3.2 Objectives of the Study

The overall objective of the study is to analyse the trend in the gold smuggling and how this smuggled gold is affecting its bullion industry. The specific objectives are as follows:
To assess the relationship between volume of gold smuggled with other variables like exchange rates of Indian rupees against major currencies, major stock market indices, domestic and international gold prices, domestic and international gold demand and supply, change of customs duty and major festivals in India

To analyse the impact of gold smuggling on Indian bullion industry

To examine the causal relationship between the smuggled gold and other variables included in the study.

To suggest policy measures to control the grey market operation in India

3.3 Major Research Question

The following research questions are framed to focus on the objectives of the study: Is there any pattern exists in the gold smuggling with respect to month wise or weekday wise or auspicious days or festive seasons etc? Is there any relationship between the smuggled

gold and the exchange rate of Indian rupee as this leads to arbitrary situation for the smugglers? Does the stock market movements play any role in the flow of illegal gold, as gold considered safe heaven by the investors? Other than customs duty, what other factors motivate the smugglers to bring illegal gold into the country? How does the flow of illegal gold affect the bullion industry? Does the illegal gold contribute to the growth of our economy? What are the policy changes required to control the flow of illicit gold into the country? Other than the import duty what else the Government should do to discourage the gold smuggling?

3.4 Granger causality test

Causality test seeks to answer the simple question of the type, Do changes in X cause changes in Y. If X causes Y, lags of X should be significant in the equation for Y. If this is the case and not vice versa, it would be said that X Granger-causes Y or there exist a unidirectional causality from X to Y. On the other hand, if Y causes X lags of Y should be significant in the equation of X. If both sets of lags were significant, it would be said that there exist a Bi-directional causality. A time series X is said to Granger-cause Y if it can be shown usually through a series of F test on lagged values of X, that those X values provide statistically significant information about future values of Y. Consider series Y_t and X_t :

$$Y_t = \sum_{j=1}^p A_{11,j} Y_{t-j} + \sum_{j=1}^p A_{12,j} X_{t-j} + \varepsilon_{1t} \quad \text{----1}$$

$$X_t = \sum_{j=1}^p A_{21,j} Y_{t-j} + \sum_{j=1}^p A_{22,j} X_{t-j} + \varepsilon_{2t} \quad \text{-----2}$$

Where p is the maximum number of lagged observations included in the model, the matrix A contains the co efficient of the model and ε_1 and ε_2 are residuals for each time series. If the variance of ε_1 is reduced by the inclusion of the X terms in the first equation then it is said that X Granger-causes Y. In other world, X Granger-causes Y if the co efficient in A_{12} are jointly significantly different from zero. This can be tested by performing an F-test of the null hypothesis that $A_{12} = 0$ given assumptions of covariance stationarity on Y and X.

The magnitude of a Granger causality interaction can be estimated by the logarithm of the corresponding F-statistic

IV. Results and Discussion

The descriptive statistic of the variables are given in the Table 2. The average number of gold smuggling cases booked in various airports in the last six years is 2759 and average number of people booked under the gold smuggling case is 1400. The quantity of gold seized ranges from 103 kg to 2946 kgs. The lowest record during the covid 19 period.

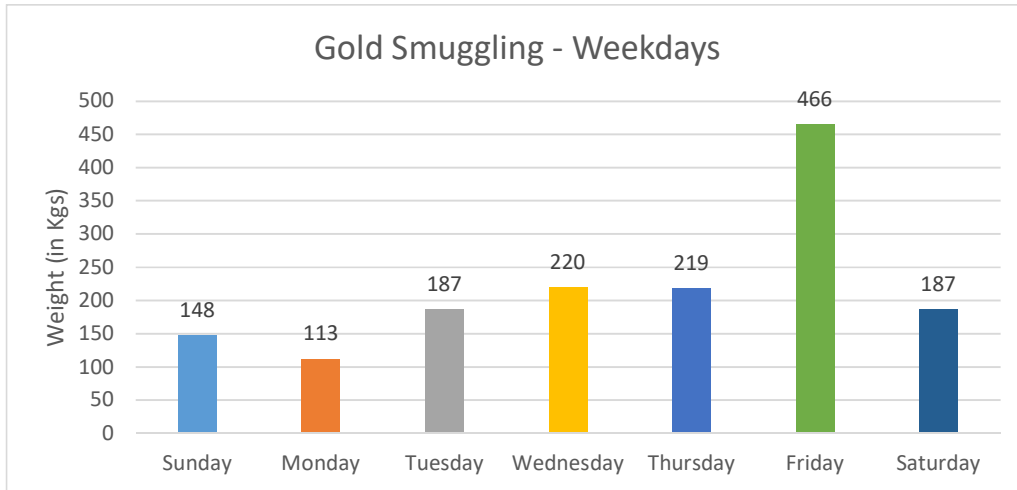
Table 2. Descriptive statistics of the variables included in the study

	Number of Cases of Smuggling of gold at various airports	Number of People booked	Value of Gold Seized (Rs.In Lakhs)	Quantum of Gold Seized (in Kg)
Mean	2759.167	1400.167	52047.03	1841.616
Standard Error	719.586	329.6986	13137.66	451.1412
Median	2803.5	1466.5	56900.31	2224.539
Standard Deviation	1762.618	807.5933	32180.56	1105.066
Sample Variance	3106824	652207	1035588629	1221170
Kurtosis	-0.92506	-0.83013	-1.17998	-0.68165
Skewness	-0.27808	-0.41128	-0.50277	-0.88131
Range	4659	2139	80839.93	2842.932
Minimum	196	200	4955.566	103.165
Maximum	4855	2339	85795.5	2946.097
Sum	16555	8401	312282.2	11049.69

Figure 4 shows the gold smuggling trend in weekdays. It clearly indicates that most of the gold smuggling activity takes place on Fridays. On Fridays, it is more than double the amount of gold smuggled on other days in a week. All other days the quantity of gold smuggled is almost similar except Monday.

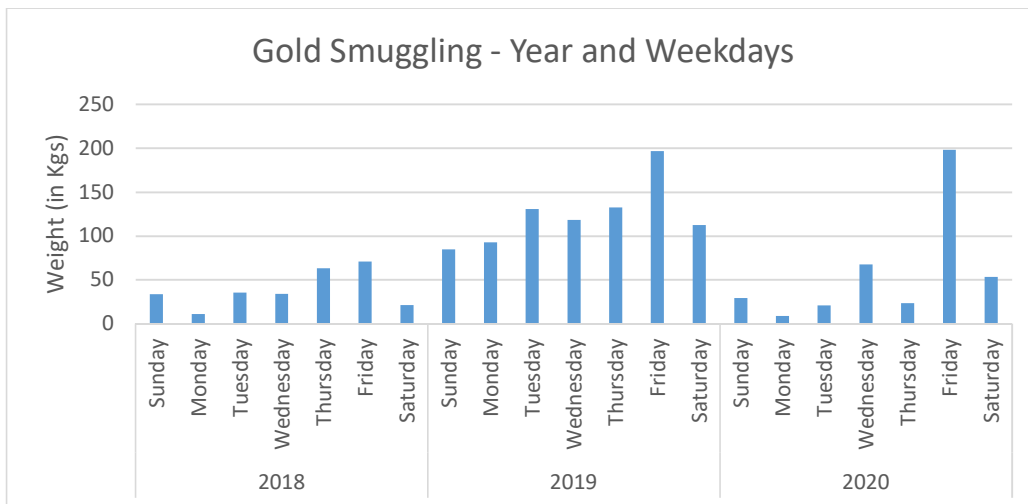
Figure 5 supports the above conclusion that in the last three years, all Fridays registered higher quantity of gold than other days in a week. Also the quantity of gold smuggled is comparatively higher in the year 2019 than the other years. Smugglers are found traveling to India mostly on Fridays.

Figure 4. Gold smuggling trend – Weekdays



Source: <https://www.dri.nic.in/>, compiled and prepared by the researchers

Figure 5. Gold smuggling trend – Weekdays in year wise

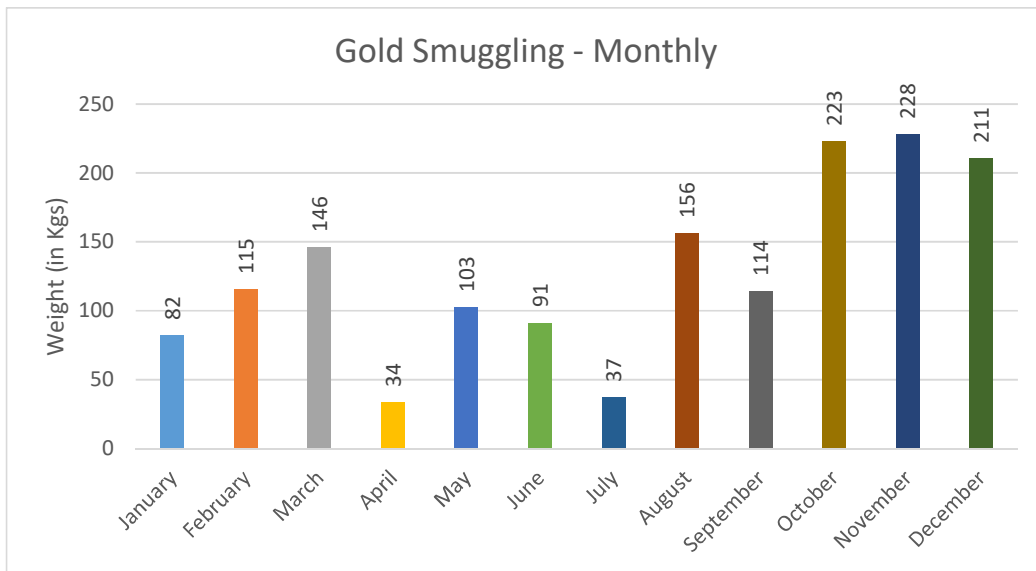


Source: <https://www.dri.nic.in/>, compiled and prepared by the researchers

Month wise gold smuggling trend is illustrated in figure 6 and 7. Over all it is very clear from the figure that most of the gold smuggled in the month of October, November and December. Least smuggling takes place in the month of July and August. This results correlates with the number of auspicious days in these months. We find many auspicious

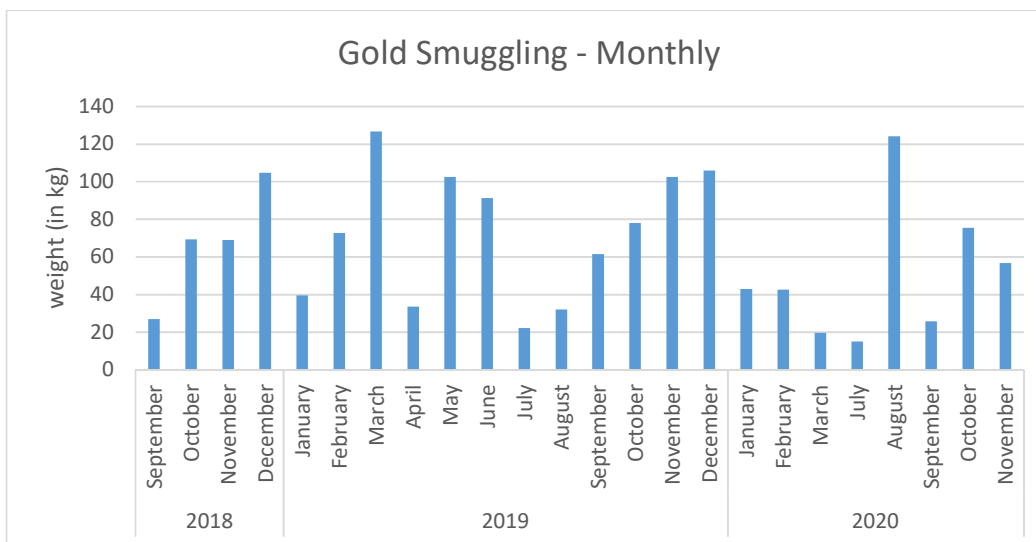
days in these months and also many festivals falls in these months like Diwali, Navarathri, Christmas etc...

Figure 6. Gold smuggling trend – Monthly



Source: <https://www.dri.nic.in/>, compiled and prepared by the researchers

Figure 7. Gold smuggling trend – Monthly in year wise

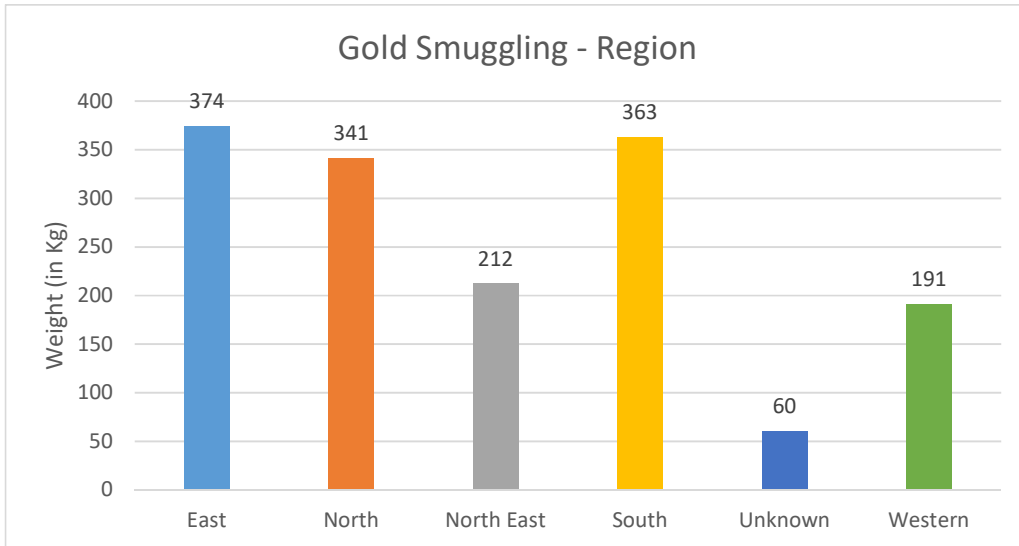


Source: <https://www.dri.nic.in/>, compiled and prepared by the researchers

Which region in India accounts most of the gold smuggling is outlined in figure 8 and 9. Southern and Eastern region in India accounts most of the smuggled gold. Next we have

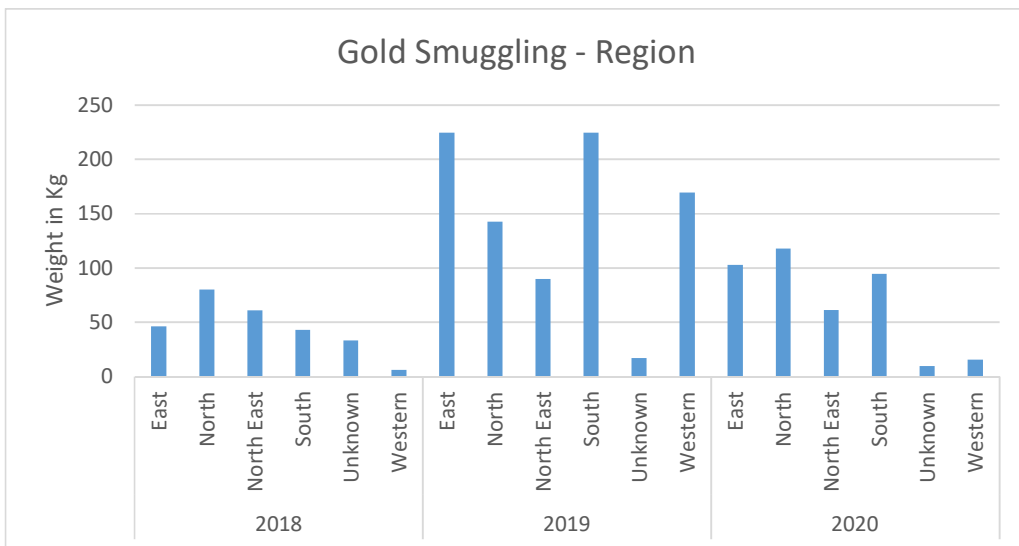
the northern region. The unknown category is a missing data as the location of gold smuggled not found in the dataset.

Figure 8. Gold smuggling trend – Region



Source: <https://www.dri.nic.in/>, compiled and prepared by the researchers

Figure 9. Gold smuggling trend – Region in year wise

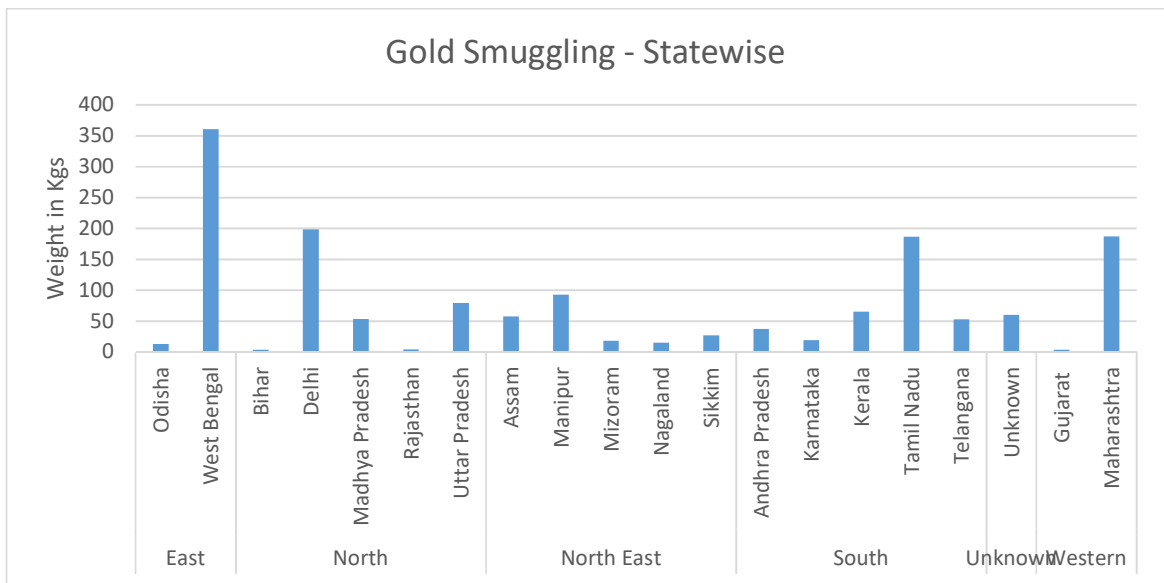


Source: <https://www.dri.nic.in/>, compiled and prepared by the researchers

In the southern region, to be specific, Tamilnadu accounts most of the smuggled gold and in the Eastern region it is West Bengal. Figure 10 is the evidence for this conclusion.

Tamilnadu, West Bengal, Delhi and Maharashtra are the four states in the country where most of the gold smugglers enters into the country.

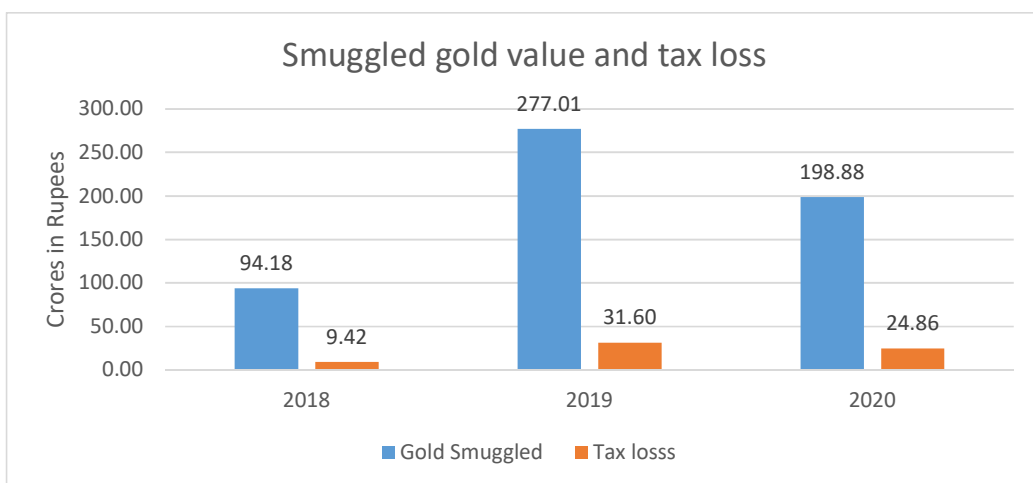
Figure 10. Gold smuggling trend – State wise



Source: <https://www.dri.nic.in/>, compiled and prepared by the researchers

Figure 11 compares the value of gold smuggled and the estimated tax loss for the government. The amount is significantly higher in the year 2019 than other years.

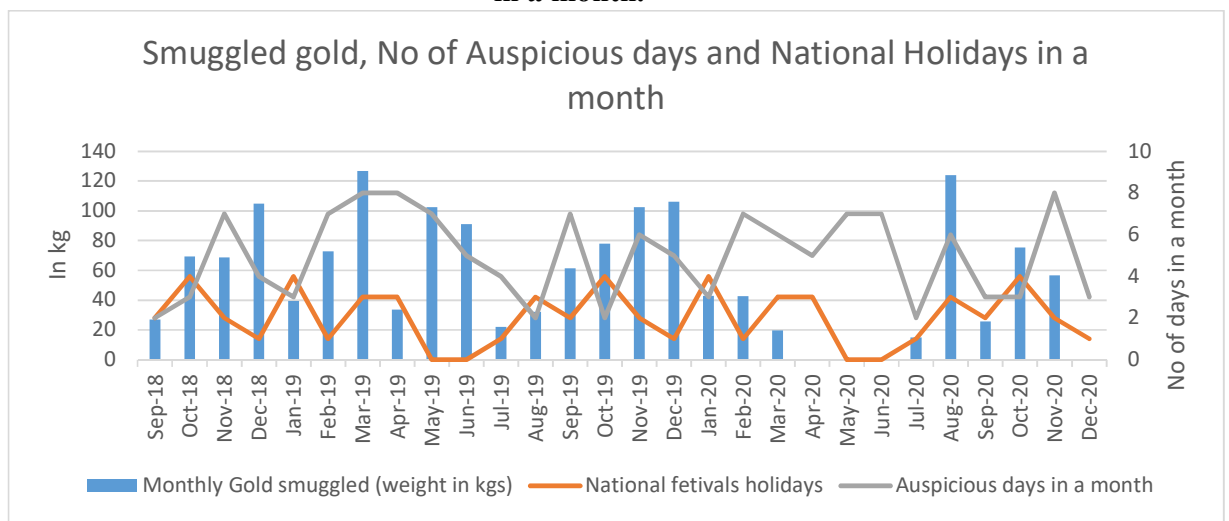
Figure 11. Smuggled gold and tax loss



Source: <https://www.dri.nic.in/>, compiled and prepared by the researchers

Figure 12 compares the smuggled gold with the number of auspicious days and national holidays in a month. It is evident from the figure that they closely follow the same pattern. The quantity of gold smuggled is higher when we have many auspicious days and national holidays in a month. It is a signal to the customs authority that more number of auspicious days and national holidays are likely to have more smugglers bringing illegally gold into the country.

Figure 12. Comparison of Smuggled gold with auspicious days and national holidays in a month.



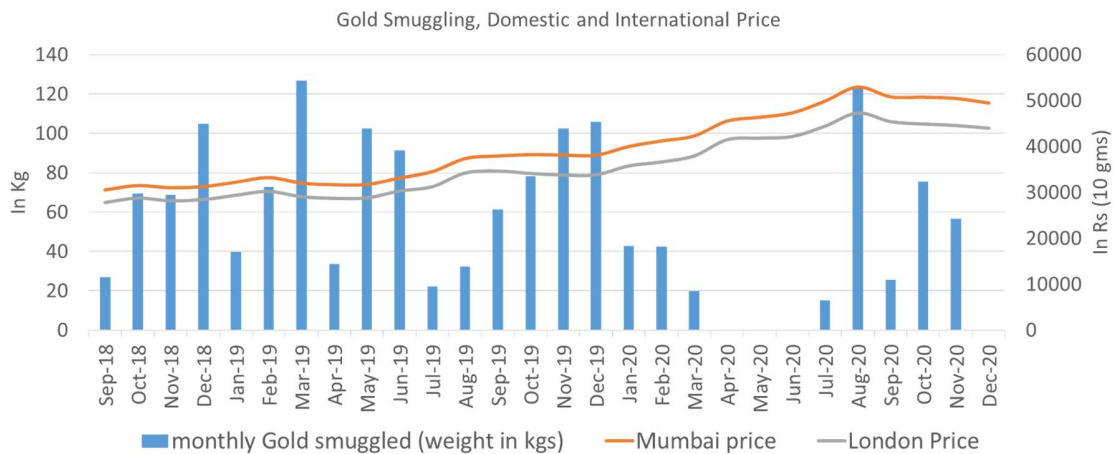
Source: <https://www.dri.nic.in/>, compiled and prepared by the researchers

Figure 13 compares the volume of smuggled gold with the movements in the domestic and international gold price. It is observed that the volume of gold smuggled increases when domestic and international gold price decreases and vice versa. This shows that the smugglers are watching the price movements closely and react accordingly to the price fluctuations to make more money. They bring the gold illegally into the country and make money by selling it in the local market when the price goes up. They take the advantage of price arbitrage.

The above result is confirmed with the estimated correlation analysis. The estimated correlation between smuggled gold, domestic and international gold price is given in the table 2. There exists a negative weak correlation between the volume of gold smuggled and

domestic and international gold prices. On the other hand a strong positive correlation exists between domestic and international gold price.

Figure 13. Comparison of smuggled gold with domestic and international gold price



Source: <https://www.dri.nic.in/> , <https://www.gold.org/>, <https://www.rbi.org.in/> , compiled and prepared by the researchers

Table 3. Correlation between smuggled gold, domestic and international gold price.

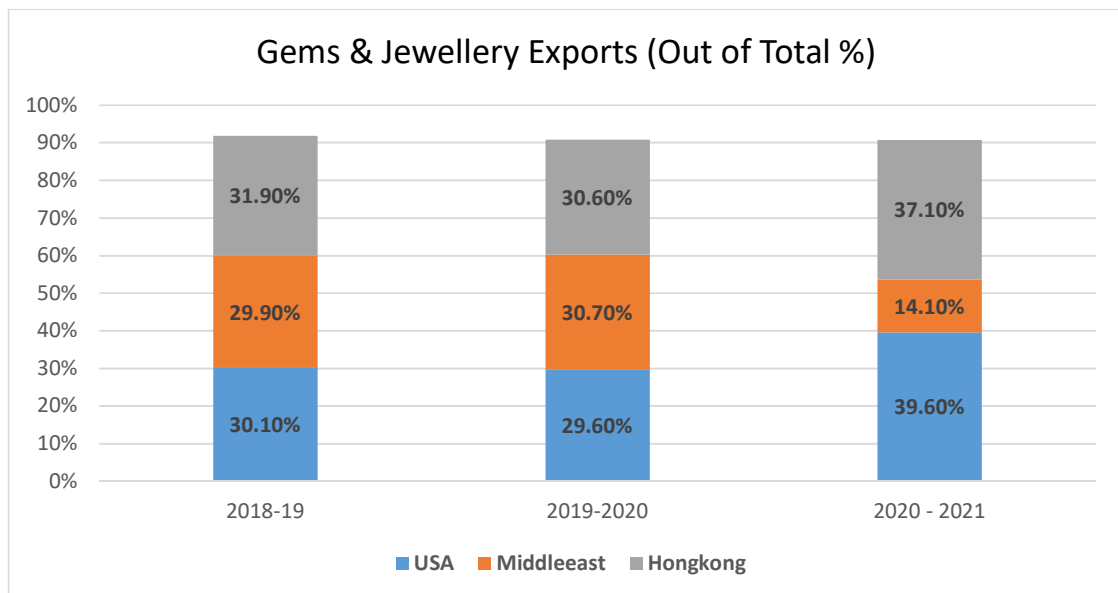
	monthly Gold smuggled (weight in kgs)	Mumbai price	International Price	Spread
monthly Gold smuggled (weight in kgs)	1			
Domestic price	-0.337	1		
International price	-0.351	0.999	1	
Spread	-0.237	0.961	0.948	1

Figure 14 provides information about India’s major jewellery export destinations. It is observed from the figure that around 90% of India’s jewellery is exported to three major destinations in the world such as USA, Middle East, and Hong Kong. Hence this study attempted to find out how India’s smuggled gold correlate with the gold demand of these

destinations. The results of correlation estimated between India’s major jewellery export destinations and smuggled gold is given in Table 4.

It shows a strong positive correlation between the smuggled gold, jewellery and consumer demand of all the export destinations. It is inferred from the results that the gold that enters illegally in India is re-exported as gems and jewels to these major destinations (Impact 2019). Thereby the smugglers make more money by taking the advantage of price arbitrage.

Figure 14. India’s Gems and Jewellery Exports



Source: Source: <https://gjepe.org/statistics.php>, compiled and prepared by the researchers

The results of correlation analysis between volume of smuggled gold and India’s jewellery export is given in the Table 5. A positive correlation exists between the smuggled gold and India’s jewellery export. Hence we infer that gold that illegally enters country is positively affecting its economy.

Table 4. Correlation between smuggled gold and India’s major jewellery export destinations

INDIA	Smuggled Gold
Smuggled Gold	1
India jewellery	0.810751
India_Bar&Coin	0.7488
India_Consumer	0.81776
USA	Smuggled Gold
Smuggled Gold	1
USA_Jewellery	0.58298
USA_Bar&Coins	-0.51157
USA_Consumer	0.28065
MIDDLE EAST	Smuggled Gold
Smuggled Gold	1
ME_Jewellery	0.785238
ME_Bars&Coins	0.628985
ME_Consumer	0.814034
HONGKONG	Smuggled Gold
Smuggled Gold	1
HK_Jewellery	0.817117
HK_Bar&Coins	-0.21982
HK_Consumer	0.833414

Table 5. Results of correlation between smuggled gold and India’s jewellery export.

	monthly Gold smuggled (weight in kgs)	Gold Smuggled Value (cr)	Jewellery Export data
monthly Gold smuggled (weight in kgs)	1		
Gold Smuggled Value (cr)	0.823357185	1	
India’s Jewellery Export	0.427271256	0.254883	1

The estimated correlation between the smuggled gold and various forms of domestic gold supply is given in Table 6. It shows a strong positive correlation between the smuggled gold and domestic gold supply. The illegal not only increases its jewellery exports, but also increases its internal gold supply in the domestic market.

Table 6. Results of correlation between smuggled gold and various modes of gold supply in India

	Smuggled Gold	Scrap Supply	Other sources of supply	India's Total Supply
Smuggled Gold	1			
Scrap Supply	0.206998	1		
Other sources of supply	0.736627	0.366147	1	
India's Total Supply	0.764728	0.338821	0.497299	1

The correlation between the smuggled gold and various components of GDP variables is given in Table 7. Except Financial, Real Estate, and Professional Services, all the GDP components maintain a positive relationship with the volume of gold smuggled. The overall results are also positive. This indicates that the illegal flow of gold into the country is positively affecting its economy. On the one hand, the illegal gold produces tax loss for the government. On the other hand, it promotes the country's jewellery exports and domestic gold supply.

Table 7. Results of correlation between smuggled gold and GDP variables

	Smuggled Gold
Smuggled Gold	1
Agriculture, Forestry and Fishing	0.353682883
Mining & Quarrying	0.323680179
Manufacturing	0.579550294
Electricity, Gas, Water Supply & Other Utility	0.21897382
Construction	0.648016049
Trade, Hotels, Transport, Communication and Services Related to Broadcasting	0.620959828
Financial, Real Estate and Professional Services	-0.522026518

Public Administration, Defence and Other Services	0.431459935
Total Gross Value Added	0.575677754

The volume of smuggled gold is compared with the exchange rates of Indian Rupees with the four major currencies in the world. The correlation result is given in the Table 8. The smuggled gold quantity maintains a negative relationship with the exchange rate of rupees with all the major currencies. We infer from the results that the quantity of smuggled gold reduces when Indian rupee depreciates, as it becomes expensive for the smugglers. When currency appreciates the smugglers buy from the international markets and bring it illegally into the country to take the advantage of price arbitrage.

Table 8. Results of correlation between smuggled gold and exchange rate of major currencies

	monthly Gold smuggled (weight in kgs)	Gold Smuggled Value (cr)
monthly Gold smuggled (weight in kgs)	1	
Gold Smuggled Value (cr)	0.823357	1
US Dollar	-0.47632	-0.18199
Pound Sterling	-0.14308	0.073473
Euro	-0.28248	-0.00458
Japanese Yen	-0.47517	-0.14253

The quantity of smuggled gold is further compared with the performance of major stock markets in the world. The correlation between the volume of smuggled gold and the major stock market indices in the world is given in the Table 9. It maintains a positive relationship with the stock market of India, UK, France, and Dubai and shows a negative relationship with the stock market of USA and Japan.

Table 9. Results of correlation between smuggled gold and major stock indices

	monthly Gold smuggled (weight in kgs)
monthly Gold smuggled (weight in kgs)	1
SENSEX	0.253354
Nikkei 225	-0.05873
FTSE100	0.357147
S&P 500	-0.14055
CAC 40	0.281322
DFMGI	0.385787
NASDAQ	-0.25592

Table 10 provides the results of causal relationship between the variables included in the study. The pair wise Granger causality is estimated using equation 1 & 2 given in Table 10. It shows that a bidirectional causal relationship existed between the variables like smuggled gold, India's jewel export, domestic gold price, India's GDP and India's jewellery demand. Unidirectional causal relationship is observed between the variables like smuggled gold, India's gold import, India's consumer demand, international gold price, price spread between domestic and international gold price, stock markets of USA, UK and Dubai, exchange rates of Indian Rupees against USD and Yen.

Table 10. Results of pairwise granger causality test : significance of smuggled gold variables with other variables included in the study

Pairwise Granger Causality Tests : Hypothesis	F-statistic	Prob.
India's Jewel Export does not Granger Cause Smuggled Gold	6.13083	0.0207**
India's gold Import does not Granger Cause Smuggled Gold	13.6118	0.0684***
India's GDP does not Granger Cause Smuggled Gold	5.10911	0.0733***
India Jewellery demand does not Granger Cause Smuggled Gold	18.6647	0.0509**
Domestic price does not Granger Cause Smuggled Gold	2.35487	0.1041***

International Price does not Granger Cause Smuggled Gold	2.81174	0.1066***
FTSE100 does not Granger Cause Smuggled Gold	2.70699	0.1029***
S&P 500 does not Granger Cause Smuggled Gold	3.02685	0.0538***
DFMGI does not Granger Cause Smuggled Gold	3.91994	0.0593***
YEN does not Granger Cause Smuggled Gold	3.48369	0.0742***
USD does not Granger Cause Smuggled Gold	2.99582	0.0530***
Customs Duty does not Granger Cause Smuggled Gold	2.48965	0.0908***
Smuggled Gold does not Granger Cause GDP	8.25073	0.0349**
Smuggled Gold does not Granger Cause Price Spread	3.31755	0.0810***
Smuggled Gold does not Granger Cause Domestic price	9.45537	0.0052*
Smuggled Gold does not Granger Cause India's Jewellery Demand	471.523	0.0021*
Smuggled Gold does not Granger Cause India's Consumer	13.4089	0.0694***
Smuggled gold does not Granger Cause India's Jewel Export	2.79594	0.0838***

Significance level: * 1% , ** 5% and *** 10%

The significant point to be noted here is that the customs duty causes the gold smuggling. The smuggled gold causes GDP and other important variables like India's jewellery demand, and jewellery export as well as its consumer gold demand. We conclude from this that the illegal flow of gold into the country is positively affecting the India bullion industry.

The study further examined the relationship between important variables like auspicious days, customs duty and domestic and international gold prices. Table 11 reveals that auspicious days in a month and India's custom duty significantly cause the domestic and international gold prices and the price spread. A unidirectional causal relationship is observed between the auspicious days, India's custom duty and gold price of both domestic and international.

Table 11. Results of pairwise Granger Causality test: Significance of Auspicious days and customs duty with other variables

Pairwise Granger Causality Tests : Hypothesis	F-Statistic	Prob.
Auspicious days does not Granger Cause International gold Price	4.38175	0.0257**
Auspicious days does not Granger Cause Domestic gold price	5.58010	0.0114*
Customs duty does not Granger Cause International gold price	3.19352	0.0866***
Customs duty does not Granger Cause domestic gold price	3.63113	0.0688***
Customs duty does not Granger Cause gold price spread between domestic and international	2.77158	0.0855***

Significance level: * 1% , ** 5% and *** 10%

Finally, the factors that cause India's jewel export is examined. It is found from the results that in addition to the smuggled gold, the performance of all the major stock markets in the world causes India's jewellery export. In addition to this the exchange rate of Indian Rupees against US Dollar is also causing India's jewellery exports.

Table 12. Results of Pairwise Granger Causality test : significance of stock market indices and exchange rates with India's Jewel Export

Pairwise Granger Causality Tests : Hypothesis	F-Statistic	Prob.
DFMGI does not Granger Cause India's Jewel Export	14.0248	0.0001*
FTSE100 does not Granger Cause India's Jewel Export	8.31730	0.0022*
S_P_500 does not Granger Cause India's Jewel Export	4.31336	0.0270**
SENSEX does not Granger Cause India's Jewel Export	5.02102	0.0165*
CAC_40 does not Granger Cause India's Jewel Export	3.66436	0.0320**
USD does not Granger Cause India's Jewel Export	3.92365	0.0357***

Significance level: * 1% , ** 5% and *** 10%

V Conclusion

The study aimed to analyse the pattern in gold smuggling in India and its causal relationship with other variables like gold demand and supply in India, India's jewellery export, exchange rate of rupees against major currencies, major stock markets in the world, number of auspicious days and national holidays in a month. It is found from the results that most of the gold smuggling takes place on Fridays and in the month of October, November and December in a year. Region wise analysis shows that West Bengal, Delhi, Maharashtra and Tamil Nadu states account most of the gold smuggling in India.

Results of the correlation analysis reveals that a positive relationship observed between smuggled gold, import gold and auspicious days in the month. Smuggled gold shows a negative relationship with the domestic and international gold prices as well as its exchange rates with the major currencies. Smuggled gold maintains a high and positive relationship with the gold demand of countries USA, Middle East and Hongkong, where most of India's jewellery export takes place.

Due to the smuggled gold, there is a tax loss for the government. However, it shows a positive correlation with India's domestic gold supply, GDP and India's jewellery export. Further, smuggled gold shows a positive relationship with the stock indices India (Sensex), France (FTSE100) and Dubai (DFMGI).

It is found from the pairwise Granger Causality test that gold smuggling in India is caused by India's Gold import, India's Jewellery export, GDP, domestic and international gold price, exchange rate of rupees against USD and Yen. India's customs duty on gold import encourages its smuggling activity in the long run. Its customs duty on gold import causes its exchange rate against major currencies, domestic and international prices. Smuggled gold causes India's GDP, its jewellery demand and its domestic price as well. Number of auspicious days in a month in India significantly causes domestic and international gold prices. Finally, all the stock indices, exchange rate of rupee against USD and smuggled gold significantly causes India's jewellery export.

In conclusion, the study suggests that gold smuggling produces tax loss for the government. However, it is highly negligible. At the same time, it is positively affecting India's GDP, India's jewellery export and gold demand and supply. Smugglers try to take the advantage of price arbitrage to make more profit. Government may pay attention to the price spread between domestic and international prices. If the price spread is less, then there is a less chance for making money by taking the advantage of price arbitrage through smuggling. The price spread may be caused due to the customs duty and exchange rate of India rupees. The customs duty can be minimized to encourage more gold import in the formal process. This loss can be compensated when they are re-exported as jewellery to other countries, as there is a greater demand for Indian jewelers in other countries.

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