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AN ANALYSIS OF THE RELATIONSHIP BETWEEN RUPEE-DOLLAR EXCHANGE RATE, CRUDE OIL PRICES AND THE GOLD RATE

HARDIK VORA
MANAGER
ELLCIUM SOLUTIONS PVT. LTD.
KARVENAGAR

ABSTRACT

This study analyses the relationship between dollar exchange rate, gold and crude oil price. This paper proposes that gold price is likely to be a common driver of the two prices and therefore, the bilateral relationship is a part of a triangular system of gold price, dollar exchange rate and crude oil price. The results show that while in the short run gold price movement does not cause the movement of the dollar exchange rate and crude oil price, it is the causality between the two prices in the long run. Causality is also identified from dollar exchange rate to crude oil price in both short run and long run. But crude oil price is much less influential in its bilateral relationship with dollar exchange rate. As a result, a triangular system of gold price, dollar exchange rate and crude oil price is established. Dollar exchange rate not only has direct impacts on crude oil price, but also functions as an intermediary vehicle through which gold price movement indirectly affects crude oil price. However, the relationship between dollar exchange rate and crude oil price is unstable with multiple structural breaks over the sample period. This paper tries to establish a triangular system among dollar exchange rate, crude oil price, and gold price, hoping to fill the gap in past literature and present a new way to understand the connection between dollar exchange rate and crude oil price.

KEYWORDS

Rupee-Dollar exchange rate, crude oil prices.

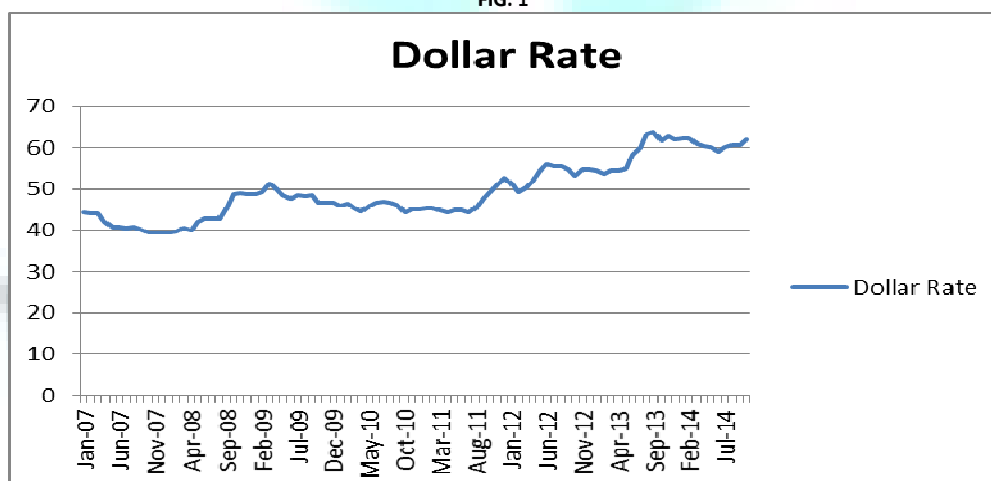
INTRODUCTION

The value of one unit of a currency in term of other currency is crucial aspect of stability of the country's economy in current uncertain global financial condition. The global financial crisis has resulted in the demolition of giant financial institutions & banks, tightening the flow of capital into the market, with considerable effects on the real economy all over the world. The crisis has a direct impact on demand and supply of currencies, leads to fluctuation of exchange rate, INR/USD, across countries, a shock to one currency is spreading rapidly to the economy, thereby frightening the stability of the whole economy. The conditions which have been produced in the economy due to devaluation of INR against the USD reveals a close statistical relation on many sectors, during the time span of 8 years, April 2006 to April 2014. The exchange rate has been witnessed high levels of volatility from a low of 39.37 in January 2008 to 66.89 in Sep 2013 during the chosen period.

THEORY

Brief Market Movement Review U.S. dollar exchange rate and crude oil price are two of the most influential asset prices in today's world economy. The U.S. dollar is the major foreign reserve currency of almost all countries and the payment vehicle that facilitates a predominant proportion of international transactions. The changes of dollar exchange rate affect not only the values of global products, assets and wealth, but also the investment decisions of individuals, businesses and sovereign wealth funds. Crude oil, on the other hand, plays a role of key source of energy, indispensable supplier of various chemical raw materials, and increasingly important investment commodity. As a result, the crude oil price drives the price level of a variety of inputs and outputs in the economy, as well as inter-market and international capital flows. Because of the functions of dollar exchange rate and crude oil price in the global economy and their ever changing co-movement patterns, it is necessary to explore further their relationship and reveal the reasons behind the numbers and charts. A better understanding of the linkage between dollar exchange rate and crude oil price will be valuable for investors in commodity and foreign exchange markets to shape reasonable anticipations of market movements and for researchers to comprehend the dynamics of the two prices respectively.

FIG. 1



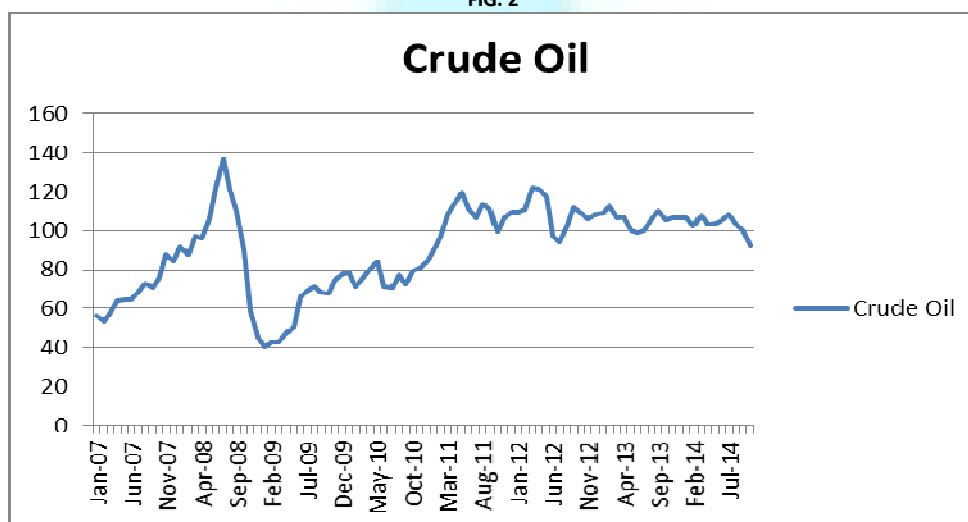
DETERMINANTS OF EXCHANGE RATES

Exchange rates are a significant indicator of the whole economy. Exchange rates, for instance, give information about the differences in economic activities among regions and are measured as significant economic barometers. Many factors determine exchange rates, and all are linked to the trading association between two or more countries. Remember, exchange rates are relative, and are expressed as an evaluation of the currencies of two countries. Some principal determinants of the exchange rate between two countries are following, these factors are not in a fixed order; like many aspects of economics, the comparative importance of these factors is much debate. Differentials in Interest Rates Interest rates and exchange rates are all highly correlated. By changing interest rates, central banks exert control over exchange rates, and changing interest rates directly impact currency values.

Higher interest rates pull foreign capital and result the exchange rate to rise. The reverse connection exists for decreasing interest rates - that is, lower interest rates cause decrease in exchange rates. During the last two decades, the countries with low inflation integrated Germany, Japan, and Switzerland, while Canada

and U.S.A achieved low inflation recently. The countries with the highest inflation normally sees depreciation in their currency in comparison to the currencies of other trading partner. This is also typically accompanied by upper interest rates. Public Debt Countries will engage in large-scale deficit financing to pay for public sector projects and governmental funding. While such activity stimulates the domestic economy, nations with large public deficits and debts are less attractive to foreign investors. A large debt encourages inflation, and if inflation is high, the debt will be serviced and ultimately paid off with cheaper real dollars in the future. In the worst case scenario, a government may print money to pay part of a large debt, but increasing the money supply inevitably causes inflation. Moreover, if a government is not able to service its deficit through domestic means (selling domestic bonds, increasing the money supply), then it must increase the supply of securities for sale to foreigners, thereby lowering their prices. Finally, a large debt may prove worrisome to foreigners if they believe the country risks defaulting on its obligations. Foreigners will be less willing to own securities denominated in that currency if the risk of default is great. For this reason, the country's debt rating (as determined by Moody's or Standard & Poor's, for example) is a crucial determinant of its exchange rate. Terms of Trade A ratio comparing export prices to import prices, the terms of trade are related to current accounts and the balance of payments. If the price of a country's export rises by a greater rate than that of its imports, its terms of trade have positively improved. Increasing trade shows greater claim for the country's exports. This results in raising revenues from exports, which provides enlarged demand for the country's currency which leads to increase in the currency's value. If the exports rises by a smaller rate than that of its imports, the currency's value will reduce in relation to its trading partners. Political Stability and Economic Performance Foreign investors inevitably seek out stable countries with strong economic performance in which to invest. A country with positive attributes will attract investment funds away from other countries supposed to have more economic and political risk. Political instability, for example, can reduce confidence and a movement of capital to the currencies of more stable countries. Speculators, Traders and Financial Instruments Past and expected values of the currency exchange rate itself may impact on current values of it. The foreign exchange traders, investors and speculator may turn out to be very relevant to the determination of the exchange rate in market. Financial instruments like F&O (future, Forward And option) may also play an vital role on the determination of exchange rates. A currency speculator, who expects the rate of a foreign currency to be higher in two months, may purchase the currency in the spot market at today's spot rate, hold it for two months, and then resell it in the spot market after two months. If he is right, he will earn a profit; otherwise, he will break even or get a loss. On the other hand, a speculator who expects the rate of a foreign currency to be lower in two months can borrow the foreign currency and exchange it for the domestic currency at today's spot rate. After two months, if the spot rate on the foreign currency is adequately lower, he can earn a profit by repurchasing the foreign currency (to repay the foreign exchange loan) at the lesser spot rate.

FIG. 2



CRUDE OIL

Crude oil price is denominated by dollars in the world crude oil market. Most of the crude oil transactions are settled in dollars.

India is the fourth largest oil importer in the world. It imports in excess of 3 million barrels of petroleum per day. From the fiscal year 2005-2006 to 2010-2011, on average, the import of crude oil has been equivalent to about 40% of the country's total export. In the fiscal year, 2011-2012, it increased to over 53% of the total export, a staggering \$160 billion in monetary value.

By providing crude oil, oil-exporting countries, especially the OPEC, hold a huge amount of petrodollars. But these countries spend much more in Euro area than U.S. for their imports. Euro area constitutes 27.95% of the OPEC's total import, compared with 9.73% of U.S. The OPEC's average import shares from these two partners during 1980 to 2007 are 36.22% and 13.33%. Each year huge amount of dollars is converted to Euros for the settlement of OPEC's imports. So the trade between Euro area and OPEC makes Euro an important currency when studying oil price.

The U.S. is the largest oil consumption country in the world. In 2008, the U.S. oil consumption was 22.5% of world total oil consumption. European Union (E.U.) also consumed 17.9%

Since both the U.S. and the E.U. are large oil consumers and both of their currencies are closely related to oil transactions in the world market, the Dollar/Euro exchange rate is a proper variable to study the relationship between dollar exchange rate and crude oil price.

FIG. 3



GOLD PRICES

Studies on Gold Price, Many studies on gold price focus on two issues: the role of gold as a hedge against risk and the role of gold as a safe haven. In practice, gold price is often considered a hedge against inflation, currency risk, political unrest and military tension. In economic studies, the first two, inflation risk and currency risk have drawn the most research attention. The literature on the relationship between gold price and inflation is quite rich and the results are generally consistent. Numerous studies show that gold is a useful hedge against inflation (e.g. Sherman, 1982; Worthington and Pahlavani, 2007; Bruno and Chincarini, 2010).

Gold is a weak safe haven for some emerging markets but a strong safe haven for most developed markets during the peak of the recent financial crisis. Investors react to short-lived and extreme shocks by seeking out the safe haven of gold. But gradual trends in stock markets, like weekly or monthly losses, do not appear to elicit the same impulsive response from investors. In addition, they find that gold is a safe haven for increased levels of global uncertainty not confined to specific crisis periods.

APPROACH / METHODOLOGY

Exchange rate is driven by a variety of variables, such as the relative economic performance, interest rate differentials and productivity differentials. The crude oil price is also influenced by issues like micro-market structure and world economic growth. Moreover, both prices are closely related to the gold price, the safe haven of capital. Therefore, it is highly likely that there are factors qualified as common drivers of U.S. dollar exchange rate and crude oil price. Another advantage of a triangular system is that the relationships of the common driver with the two prices respectively may provide an explanation to both the negative and positive correlation relationships observed between the two prices. So this study tries to fill the "blank" of the literature and present a new perspective on the relationship between U.S. dollar exchange rate and crude oil price.

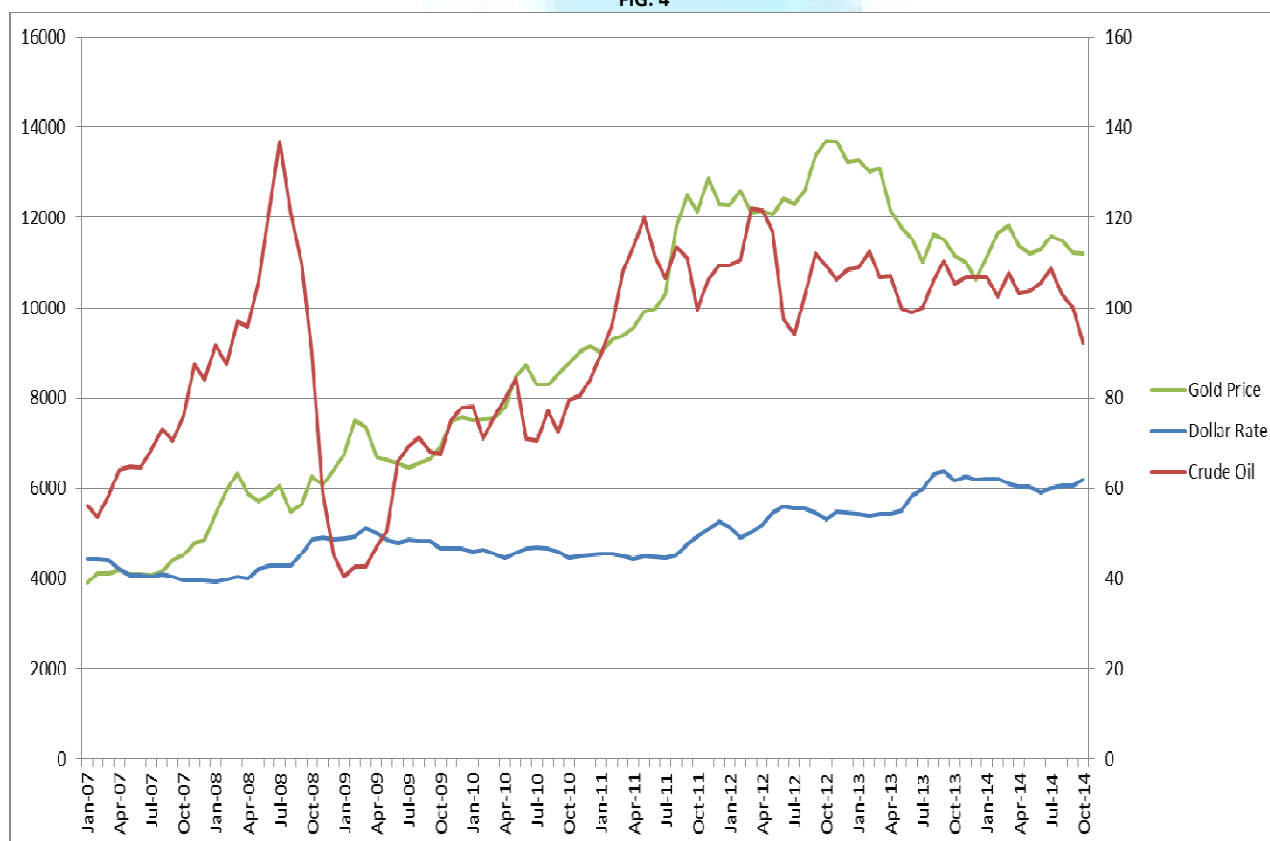
If a triangular system is the case, it is possible that the two prices are causally related with a third factor respectively but not so themselves. Their correlation relationships, then, are merely correlation relationships. Besides, although US dollar exchange rate and crude oil price show both positive and negative correlation relationships, most of the theoretical analyses focus on explanation of the negative ones. The periods when the two prices move together have not received enough academic attention.

SCOPE

There are 3 possibilities:

- 1) The U.S. dollar exchange rate and gold price have a statistical causality relationship running from gold price to dollar exchange rate. This is one of the three pillars of the triangular system proposition. The term "statistical causality relationship" here refers to the causality in the sense of Granger (1969), which is identified typically by Granger Non-causality Test. There are up to four outcomes that may come from the test.
- 2) The crude oil price and gold price have a statistical causality relationship running from gold price to crude oil price.
- 3) The dollar exchange rate and crude oil price have a statistical causality relationship.

FIG. 4



Two kinds of variables immediately meet the first requirement: macroeconomic fundamentals and gold price. Clearly, macroeconomic fundamentals such as interest rate, output and money supply have considerable impact on dollar exchange rate and crude oil price. But a major problem with them is their inherent endogeneity, which may result in causality interpretation difficulty and other problems (see, for example, Chen, Rogoff and Rossi, 2008). Gold price also has the potential to be a qualified candidate. Firstly, gold price is closely related to dollar exchange rate. Gold is mainly priced and traded in dollars in the international market. The demand for dollars may be affected by gold demand changes. In recent decades, gold is more and more frequently used to hedge inflation, political unrest and currency risk. So once there are exogenous shocks to the world economy, the gold price tends to respond quickly. Gold price has deviated from the inner value of gold especially after the year 2001 and is more likely to reflect investors' anxiety about economic prospects and capital safety. Dollar exchange rate to some extent mirrors the health of U.S. economic development and of world economic development. Gold price is likely to go up if dollar exchange rate is expected to depreciate due to factors that may cause economic slowdown and vice versa. Second, gold price is closely related to crude oil price. Both gold and crude oil are increasingly important investment options often added to investor asset portfolios. Their prices tend to move together driven by investment purposes. As a valuable and standard commodity, gold is also used to hedge inflationary risk. The upsurge of gold price may be interpreted as the rise of inflation

expectation. As a result, capital flows will rush to the gold market, crude oil market as well as other commodity markets and push up the prices of these commodities. Since gold price is heavily driven by demand for investment, inflation hedging and capital safety, it may be regarded as exogenous and be used directly in structural models and econometric models.

They explain that the exchange rate is fundamentally a forward-looking variable that likely embodies information about future commodity price movements. In contrast, commodity prices tend to be quite sensitive to current conditions because both demand and supply are typically quite inelastic. In addition, financial markets for commodities tend to be far less developed than for the exchange rate. Therefore, as interpreted by Breitenfellner et al. (2008), foreign exchange markets are possibly more efficient than oil markets and can anticipate developments in the real economy that affect the demand for and supply of oil. Clearly, most of the above reasoning implies that a causality relationship will go from the dollar to oil prices and that dollar exchange rate and oil price are negatively correlated. That is, crude oil price increases when dollar depreciates. These possible channels may be at work at the same time, but it is difficult to tell which one dominates.

TABLE 1

| | | | |
|-------------|------------|------------|----------|
| MEAN | 49.579 | 90.715 | 8965.572 |
| Median | 48.387 | 97.280 | 9011.685 |
| Std dev | 6.961 | 21.927 | 3002.811 |
| Correlation | | | |
| | R/\$-Crude | | |
| | 0.3585 | | |
| | R/\$-Gold | Crude-Gold | |
| | 0.7433 | 0.6433 | |

OBSERVATION

In July 2008, the crude oil price in the international market stopped its more than one year rapid escalation and started to decline. After the daily closing spot WTI price hit the bottom of 30.28 dollars/barrel on December 23, 2008, it gradually rebounded and reached around 78 dollars/barrel in November 2009. During this period, the U.S. dollar exchange rate (against the Euro) first appreciated from 1.59 in July 2008 to 1.25 in November 2008. Then starting from February 2009, the dollar exchange rate slowly depreciated to 1.50 in November 2009. Not surprisingly, there seems to be a negatively correlated relationship between crude oil price and U.S. dollar exchange rate. That is, the weaker the U.S. dollar exchange rate, the stronger the crude oil price. But this is not the only co-movement pattern shown by these two prices. During December 2009 and April 2010, the monthly crude oil price increased from \$74 per barrel to \$84 per barrel. The U.S. dollar appreciated from around 1.50 to 1.33. The two prices exhibited a positively correlated relationship. U.S. dollar exchange rate and crude oil price show both positive and negative correlation relationships, which switched back and forth in the past decade.

The Impact of the Dollar Exchange Rates on Crude Oil Prices. There are at least five possible channels through which a fall in the value of the dollar can raise crude oil prices. They are supply side purchasing power channel, demand side purchasing power channel, asset channel, monetary policy channel, and market adjustment channel.

The Supply Side Purchasing Power Channel Because almost all of standard commodities, including crude oil, are priced and settled in dollars, a change in dollar exchange rates alters the terms of trade of all the countries. The extent of this change depends on the proportion of "dollar goods" relative to "non-dollar goods" in their trade structure (Schulmeister, 2000). For oil-exporting countries, their export revenues are predominantly dollar denominated assets but their imports, largely from European countries, Japan and other non-U.S. areas, are mainly Euro-denominated.

So once the dollar depreciates, to maintain the purchasing power of their dollar export revenues, countries with pricing power tend to increase oil prices. Moreover, Cheng (2008) mentions that producers outside the dollar area also have price pressures facing declining profits in local currency caused by dollar depreciation.

The Demand Side Purchasing Power Channel Fluctuations in the exchange rate of the U.S. dollar create disequilibria in the market for crude oil. Since crude oil is priced and settled in dollars, dollar depreciation makes it less expensive for consumers in non-dollar regions, thereby increasing their demand, which eventually causes the oil price to go up (Austvik, 1987; Cheng, 2008).

CONCLUSION

Macroeconomic fundamentals have the potential to be common drivers of dollar exchange rate and crude oil price. Macroeconomic variables are usually inherently endogenous and thus fail to meet the requirements of common drivers. Therefore, macroeconomic fundamentals from the set of candidate common drivers. The studies of gold and gold price introduced document the role of gold as a hedge against risk and as safe haven, providing support to the argument that gold price is driven by need for risk hedging and capital safety in addition to consumption. So the gold price is considered an exogenous variable and a candidate common driver of dollar exchange rate and crude oil price. If the foreign exchange market is more efficient than the crude oil market, the former market absorbs new information and adjusts more quickly than the latter one. Then exchange rate may be useful for forecasting crude oil price movements, and exchange rate changes will likely affect crude oil price. This idea receives support from several studies.

Both the movement of dollar exchange rate and the movement of crude oil price are affected by the movement of gold price. Gold price contains important information influential in the price formation of dollar exchange rate and crude oil price crude oil price is much less influential in the movement of dollar exchange rate and not influential in the movement of gold price.

Gold price has stronger impacts on crude oil price than on dollar exchange rate in the long run.

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