

**Impact of QE on US Dollar Index and
COMEX-Gold: a Statistical Interpretation**

**Divya Mendiratta
PGDM Number: 11076**

**Deepak Todi
PGDM Number: 11005**

**Abhijith Seetharam
Assistant Professor-Finance**

Comment by the Faculty

The current Federal Reserve Chairman Ben Bernanke has a rather unusual nickname, “Helicopter Ben”. This is a reference to his 2002 speech, where he famously said that the Fed could reverse deflation by just printing money and dropping it from helicopters.

During the initial days of the ongoing Great Recession, hitherto called the Financial Crisis, the Fed decided to spend about \$1.25 trillion to buy different variants of securitized mortgage bonds, ostensibly to avert a potential deflationary spiral arising from poor liquidity, failure in interbank lending and freezing of asset and capital markets. This transaction has been termed Quantitative Easing (QE). The reason Fed can engage in a transaction of this magnitude is because it has a special power: it can create money out of thin air; in this case with a few keystrokes on a computer. The large scale intervention was termed as “extraordinary measures” with reference to Section 13 of the Federal Reserve Act, which allows it to buy almost any financial instrument from anyone, under “unusual and exigent circumstances”. As the crisis progressed the complex financial securities became illiquid, and those with a large quantum of such securities on their books essentially became insolvent sparking deflationary fears. The Fed, in order to “restore” market balance and confidence, added about \$1.2 trillion to “base money” of the system and hoped that the multiplier will take effect with money ultimately trickling down to the public and “main street”; just as the textbook says it should. Ultimately, QE should stimulate the economy to get onto a growth trajectory.

Now almost 5 years since the first interventions, QE has been a dud, at least to most of the people. Effectively none of the positive outcomes, on which taxpayers were sold into bearing the burden of QE, have manifested. As Cullen Roche has described it: QE has merely been a process where more money was pumped to those already having much of it, in this case super-sized banks. What should’ve been additional money to avert potential deflation, has effectively been an asset swap: cash for illiquid securities. Unless money is “dropped from Helicopters”, it is most likely that QE money is going to be trapped in corporate coffers and bank reserves. Irrespective of whether QE will yield benefit to the society at large, one thing needs

attention: cumulative national debt. QE has forced the government, i.e. taxpayers, to shoulder additional debt which is likely to come due (with interest) sometime in the years. If the debt becomes too large, either the country can default or choose to inflate it away. Either way, the impact on US dollar, considered to be one of the safest currencies, will be almost catastrophic and will most likely force investors to look for alternative stores of value.

This study by Divya Mendiratta and Deepak Todi is a preliminary and diligent attempt to explore a statistical relationship between the value of dollar, as measured against other leading currencies, and price of gold. The study focuses on the events surrounding rounds one and two of QE, and charts out potential areas future research.

S. Abhijith

Impact of QE on US Dollar Index and COMEX-Gold: a Statistical Interpretation

Introduction

Charles de Gaulle once said, “There can be no other criterion, no other standard than gold. Yes, gold which never changes, which can be shaped into ingots, bars, coins, which has no nationality and which is externally and universally accepted as the unalterable fiduciary value par excellence”. With these famous words, prompted and perhaps even written by his adviser Jaques Rueff, Charles de Gaulle summarised both a long held view of gold and many of the reasons for that view being held. It is durable, divisible, and, for many years over a large part of the world, was indeed the ultimate standard of value, and not only that, but a standard which held steady its purchasing power in terms of goods over a very long period of years, although the behaviour of Gold has changed after collapse of Bretton Woods system, and many fluctuations were observed in dollar price of gold with value of other currencies.

So there is a relationship between Gold and Dollar and many observers have long noted a positive relation between the Dollar price of Gold and weakness in the Dollar

Beckers. & Soenen.(1984) verifies the gold/Dollar inverse relation empirically and draws a strikingly asymmetric implication for US and non-US investors. They say that the correlation between the Dollar price of gold and the Dollar’s weakness implies that

“A non-US Dollar base currency investor will have to take into account his implicit foreign exchange risk position when he invests in gold or gold-linked instruments. It turns out that the total risk of his position valued in a non-US Dollar base currency is usually lower than when it is valued in US Dollars, (p. 112).”

They conclude that a non-US investor will want to hold more gold because of its implicit foreign exchange hedging properties.

Capie et al., (2004) begin their paper by arguing that

“It has long been thought that gold was a good protection against depreciation in a currency’s value, both internally (i.e. against inflation) and externally

(against other currencies). In the latter case it is normally considered, in particular, to be a hedge against fluctuations in the US dollar.

The US dollar gold price was found to move in opposition to the US dollar and the movement was essentially contemporaneous”

After an extensive theoretical development and rigorous testing, the major reason attributed to start off this relation was with the final breakdown of the Bretton Woods system in 1971, exchange rates of the major currencies floated, thus becoming persistently variable against each other. This created an opportunity for international traders and investors because now the value of Gold and other currencies were completely dependent on market forces rather than Government policies

Kavalis (2006) studied the relation between Commodity prices and influence of the US Dollar on them. It also quantified the relation between USDI and Gold.

The above studies found that there is an inverse relationship between Gold and US Dollar. But now that the economy is volatile and many external factors are affecting the relation between Gold and US Dollar; Recession and QE are amongst those factors which have weakened the established relation.

Journalists are fond of periodically writing about gold and dollar and the affects of QE on gold. Recently, for example, Fontevecchia & Agustino (2012) article talked about

“The latest FOMC statement surprised many; suggesting the economic outlook faces significant downside risks and announcing interest rates would remain zero-bound for even longer than before, until at least late-2014. Gold, which jumped on the news, is poised to benefit from additional easing and the possibility of further monetary stimulus in the form of QE3”

Gold, which had traded in negative territory through most of the session, surged on the Fed’s statement. Many researchers and observers regularly write articles on QE and simultaneously on Gold and Dollar. In contrast to much of the received academic and popular literature, our contention here is that there is nothing special about relation between the dollar and gold in recent times of Recession and QEs. This statement would be proven with some statistical tools and recent data in report.

Examine the relationship between Gold and USDI in three different Phases and whether the relationship is still valid or not and if QE3 happens then what will be the scenario. For the above purpose, study is divided in three different Phases which are

- ◆ Phase I: Before Recession (2001-2007)
- ◆ Phase II: Recession to QE1 (2008-June 2010)
- ◆ Phase III: QE2-till date (July 2010-31st May 2012)

Methodology

Study and its Objectives:

The undertaken study is exploratory type of research. The study aims to find out the relationship between GOLD and USDI in last decade which is divided into three phases.

The Objective of the Study is:

The objective of report is to find out correlation between Gold and US Dollar Index in three different phases and what decision a normal commodity trader should take to maintain the risk/reward ratio.

Data and its Analysis

Data

In recent times, nations have adopted gold as a store of wealth and as a medium of international exchange, also many individuals have sought to possess gold as hedge against the constantly ongoing current inflationary trend and their mistrust of paper money .Gold market futures, are directly correlated to the COMEX live spot gold prices (which are quoted in US dollars), which float freely in accordance with supply and demand, and correspond rapidly to the political and economic climate of the day. The value of Gold is measured in terms of troy ounce; 1 unit= 100 troy ounces. Gold is measured in terms of troy ounce because ozt was retained from the Roman system for four commodities in order to preserve the standards previously set across time, as the two-system standard would have created problems for the monetary system of the day.

US Dollar Index is a measure of the value of U.S. dollar relative to majority of its most significant trading partners. This index is similar to other trade-weighted indexes, which also use the exchange rates from the same major currencies. Currently, this index is calculated by factoring in the exchange rates of six major world currencies: the Euro, Japanese yen, Canadian dollar, British pound, Swedish krona and Swiss franc. This index started in 1973 with a base of 100 and is relative to this base. This means that a value of 120 would suggest that the U.S. dollar experienced a 20% increase in value over the time period.

The price of GOLD and USDI (as a proxy for US Dollar exchange rate) is taken to study the relation from year 2001 to May 2012. This duration involves the year of Financial Crisis 2008, QE1 and QE2. The above time frame for research was taken considering, NBER's Report on Business Cycle (Dating Committee), according to which a peak in business activity occurred in the U.S. economy in March 2001. A peak marks the end of an expansion and the beginning of a recession. The determination of a peak date in March is thus a determination that the expansion that began in March 1991 ended in March 2001 and another stage of recession began in March.

According to NBER, November 2001 was marking of trough and beginning of recovery. These movements represent the business cycle which ended with a peak in December 2007. NBER after analysing all the relevant reports of Federal Reserve Board industrial production index, Bureau of Economic Analysis, U.S. Department of Commerce, BLS payroll survey, BLS household survey and Census data on manufacturing and trade sales determines the date of peak and through. Considering all these factors, we have taken Business cycle (2001-2007) as Phase I for study.

To observe the effects of recession & QE1 on gold and dollar, we have included period of recession (2008) & QE1 (November 2008-June 2010) as Phase II. Phase III include period after QE1 and period of QE II till date, this phase will examine the relation between yellow metal and dollar after increasing of liquidity in economy, and is gold still considered as 'Safe Heaven'.

Data Collection

Secondary data was used to perform the study. The End of the month data of US Dollar Index and Gold in USD was taken from ForexPros and Gold Price Network⁷ website. Later the data was divided into 3 Phases as mentioned above.

Tools for Data Analysis

The collected data was then analyzed using various statistical techniques, like calculating regression and correlation coefficient. All the analysis has been done using Data Analysis Tool in excel.

¹ <http://www.forexpros.com/quotes/us-dollar-index-historical-datahttp://goldpricenetwork.com/gold-price-history/>

Factors Affecting US Dollar Index

USDI is a measure of the value of U.S. dollar, relative to the majority of its most significant trading partners. This index is similar to other trade-weighted indexes, which also use the exchange rates from the same major currencies. Currently, this index is calculated by factoring in the exchange rates of six major world currencies: the euro, Japanese yen, Canadian dollar, British pound, Swedish Krona and Swiss franc. Now we will see the different factors that affect USDI⁸

- ◆ Supply and demand
- ◆ Market sentiment
- ◆ Economic and political factors
- ◆ Historical patterns

Factors affecting Gold Prices

- ◆ US Unemployment Rate
- ◆ World Inflation
- ◆ Federal Funds Rate
- ◆ US New Home Sales
- ◆ Dollar Index

Quantitative Easing

Quantitative Easing, a concept first introduced by Japanese, was one of the last few resorts left with the Fed after the financial crisis of 2008. Quantitative easing or popularly known as QE is a government monetary policy occasionally used to increase the money supply by buying government securities or other securities from the market. Quantitative easing increases the money supply by flooding financial institutions with capital, in an effort to promote increased lending and liquidity⁹. The crisis and its repercussion had proven to be a great challenge for the Federal Reserve and hence in late 2008, in response to rapidly deteriorating economic and financial conditions, the Federal Open Market Committee (FOMC) pushed the federal funds rate target¹⁰ close to zero and as conditions worsened, the Fed turned to non-traditional policies to bolster financial market conditions. Such policies included large-scale asset purchases.

⁸ <http://www.americanessays.com/study-aids/free-essays/finance/gold-price-in-mcx-and-comex.php>

⁹ http://www.investopedia.com/terms/q/quantitative-easing.asp#axzz24 FzAq_ZUF

¹⁰ For more on traditional monetary policy and the federal funds rate, see Liborio, Constanza S. "Fiscal and Monetary Policy in Times of Crisis." Federal Reserve Bank of St. Louis Liber8, March 2011

The first round of QE – “QE1” - began in November 2008 and concluded in March 2010. One of the primary goals was to increase liquidity in the economy by the availability of credit in private markets and in turn revitalize mortgage lending and support the housing market. To accomplish this goal, the Fed purchased \$1.25 trillion in mortgage-backed securities¹¹ and \$200 billion in federal agency debt¹². To help lower interest rates in general and thaw the frozen private credit market, the Fed also purchased \$300 billion in long-term Treasury securities. However, the outcomes of QE1 were not very encouraging. The U.S. economy registered three quarters of economic growth by the end of the QE1 program but the unemployment rate in March 2010 stood at 9.7%, which was a small decline from a high of 10.1% in October 2009. The unemployment rate failed to register a significant drop until later in 2010. And hence the elevated unemployment rate was one of the main reasons for second round of QE - QE2. In addition, inflation readings were also below levels consistent with price stability, another factor which led to QE2¹³.

The second round of QE, widely called QE2, began in November 2010 and was concluded by the end of the second quarter of 2011. Its goal was to strengthen the economic recovery and therefore combat a possible Japanese-style deflationary outcome. During QE2, the Fed purchased up to \$600 billion in long-term Treasury securities.

After understanding all the different factors and QE now we can try to find out the relationship between Gold and USDI.

PHASE I: Before Recession (2002-2007)

Correlation between gold and USDI is said to be highly inversely related. This concept has been proven by many financial managers and it is quite evident from the analysis of USDI and Gold in USDI.

The basic reason for inverse relationship between gold and USDI is that gold is considered as a safe hedge against USDI. Many foreign banks hold dollars as a reserve currency (a backup), although it has been suggested that this era may be drawing to a close (Reuters, 2009). If banks get nervous that dollar is weakening they need a hedge (vice versa), so they go for gold as it is universally accepted and finite in supply.

¹¹A mortgage-backed security is an investment vehicle composed of pools of mortgages. Banks create mortgage loans that comply with standards set by Fannie Mae and Freddie Mac. These institutions then pool the mortgages for sale to investors. This allows banks to free up capital for other loans.

¹²Debt issued by Fannie Mae, Freddie Mac, and Ginnie Mae to fund the purchase of mortgage loans

Therefore, as the dollar's exchange value decreases, more dollars are required to buy the gold, increasing the value of the same. This shows that there is a strong correlation between the US dollar exchange rate and the gold price. We have taken data from 2001-2007, period before recession to represent the correlation. There is a very strong negative correlation between gold and USDI of around 0.85 (Table 1)

With the data analysis tool Regression, the value of R-square was 0.73. R-Squared value is a statistic that indicates how good one variable is at predicting the other. In simple terms it is a measure of how good a decline in the USD index is at predicting a rise in gold. If the R-Squared value is 1 then given the value of one variable, one can exactly predict the value of the other. If R-squared is 0 that means that knowing the value of one variable does not help you predict what the other variable will be (Dey, 2010). So the higher the R-Squared value the better one variable is at predicting what the other may be and therefore the stronger the implied relationship is between them. An R-squared value of 0.73 (Table 2) predicts that a decline in USDI will help in predicting the price of gold.

Table 1: Correlation and Regression Gold & USDI

	USDI	Gold price Comex/ounce
USDI	1	
Gold price Comex/ounce	-0.85886	1

Table 2: Regression table for Gold and USDI from 2001-2007

SUMMARY OUTPUT	
<i>Regression Statistics</i>	
Multiple R	0.8588552
R Square	0.7376322
Adjusted R Square	0.7344326
Standard Error	110.39674
Observations	84

Figure 1: Relation between Gold and US Dollar from 2001-2007



PHASE II: Recession to QE 1 (January 2008 to June 2010)

This period includes the period of recession i.e. year of 2008 and period of QE 1 (November 2008 to June 2010)

Demand of Gold during Recession

The demand for gold during Q1 of year 2008 was increasing but after that till July 21st 2008 the demand for gold and USDI did not had any relation. Later it was observed that gold started decreasing because in Q1 the US economy was struggling and according to the most respected ISM survey, employment was falling (almost a quarter of a million people lost their jobs in the rst quarter of year). After Q1, due to unemployment and economic downturn consumers were less confident and investment demand of gold was decreased.

As per World Gold Council report Natalie Dempster (2008) there has been five US recessions, according to the National Bureau of Economic Research, an economic research organization charged with setting the US economy's official business cycle dates. There was no relationship between the gold prices and USDI during those recessionary phases. Therefore, recession may or may not have effect on gold.

A US recession would undoubtedly have negative implications for gold jewellery demand in America, as consumer spending slows. However, this negative implication could be at least partially offset by the higher share of gold jewellery in the retail market that gold jewellery has enjoyed in recent years. Moreover, gold is much less vulnerable than other jewellery materials, such as diamonds or platinum, to a US recession as far more demand for gold comes from outside of the US – 70% of diamond jewellery demand comes from the US market, compared with just 10% for gold.

The other reason for the demand of gold is that many investors buy gold as a hedge against inflation and USDI. This reflects gold's unique and diverse demand and supply base, which as for any freely-traded good ultimately determine the price. Consequently, a US recession does not have negative implications for the gold price. The only element of demand likely to be affected by a recession is investment demand, but that in turn will depend on the "type" of recession. So far, the brewing recession has been positive for gold, as it has been accompanied by a rise in inflation and a falling dollar, which has boosted demand for gold as a dollar and inflation hedge.

Quantitative Easing (QE 1)

[i] Effect on Gold

During the period of QE1 i.e. November 2008 to June 2010, the gold price increased from \$767 on 25th November 2008 to \$1 125 on 31st March 2010, for a total increase of around 46%. This increase was due to increase in liquidity in market and as gold is considered a safe hedge when compared to USDI, investors preferred investing the money in Gold and thus there was increase in demand of gold which resulted in increase in price.

[ii] Effect on US Dollar Index

- ◆ When QE1 was started (November 2009), the USDI was at 85
- ◆ When QE1 was expanded dramatically, the index was at 84.19
- ◆ At the end of Q1 2010, QE1 finished, the dollar index sat at 81.47

As it is clearly visible that the value of USDI was decreased from 85 to 81.47 because of increase in the flow of money in market, resulted in higher volume of spending and higher level of production and consumption but the purchasing power of money was reduced which resulted in depreciation of USDI.

A number of studies ,including Neely (2010) and Morgon (2011) have observed that the Fed's LSAP program resulted in the decline of US Dollar by 3.6% to almost 10.8%- depending on the currency—over the five days with significant LSAP purchase announcements—25 November, 1 December, 16 December, 28 December, and 18 March—examined in the study. The use of the event window approach is rationalized by the assumption that the surprise news embodied in these announcements was rapidly discounted by the market.

Correlation between Gold and USDI during Phase II

If we analyse the whole data from January 2008 to May 2010 (Figure 2), there was no correlation between the price of gold and USDI and the correlation coefficient was of around 0.0093 (Table 3a) which is not significant to establish any relationship. But during QE 1 period, negative correlation of 0.3744 (Table 3b) was observed for some time but again from December 2009 to June 2010, gold and USDI were moving in same direction because dollar was volatile while gold was steady and

ascending. The main reason behind this can be the extremely loose monetary policy of US Central Bank¹⁴.

Table 3: Correlation between Gold & USDI

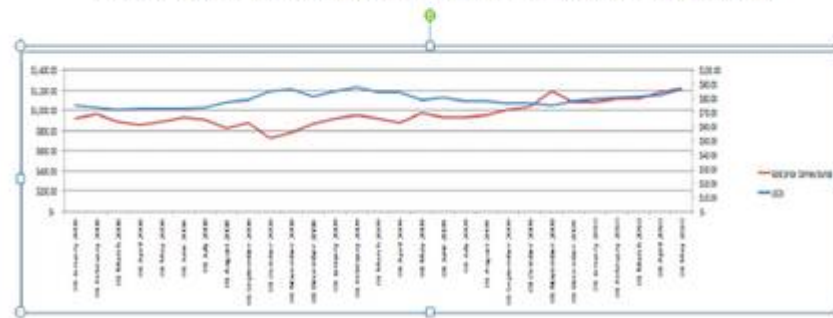
(a) January 2008-June 2010

	USDI	Gold
USDI	1	
Gold	-0.3744	1

(b) November 2008-June 2010

	USDI	Gold
USDI	1	
Gold	0.009319	1

Figure 2: Relation between Gold and US Dollar Index from January 2008-May 2010



According to traditional approach, if liquidity in market is increased the value of the currency will decrease but US being the strong economy could resist the pressure of QE and thus the fall of around 3% in case of USDI minute. Thus no relationship was established during Phase II, but in some instances the effect of QE 1 was seen in the price of Gold

PHASE III: After Quantitative Easing 1

(30th June 2010- 31st May 2012)

QE2 was announced unofficially at Jackson Hole on the 28th August 2010. It was officially announced on the 3rd November 2010, and it ran for 8 months— from November 2010 to the end of June 2011. It was for \$600bln dollars of U.S. treasuries purchases at the rate of \$75bln per month.

The duration of QE2 used for analysis is 28th August 2010 to the 30th June 2011 (approximately 9 months). It was during the same date that both gold and the S&P500 started to gain after the Jackson Hole announcement.

¹ http://www.gold-eagle.com/editorials_08/basile020411.html

Effect of QE2

[i] On Gold

The Gold price increased from \$1250 on the 28.8.2010 to \$1486 on the 30.6.2011, for a total gain of \$231 (19.6%). This equates to a gain of 2.2% per month, or 3.3% for each \$100bln purchased by the Fed.

Therefore, QE1 was more successful in raising the price of gold than QE2. QE1 was much larger and longer than QE2, and so it would be expected to have had a larger effect. It seems clear that the duration and amount of investment are relevant factors. However, it seems logical to conclude that the background economic conditions will play a role and the amount of perceived risk in the financial system will affect the gain in gold.

[ii] On US Dollar Index

- ◆ When Bernanke hinted at QE2 on August 2010, the dollar index was at 82.89
- ◆ With the start of QE2, the dollar index sat at 78.10
- ◆ When QE1 was announced the dollar index started falling (Armo, 2011) because of probability of more liquidity in market the value of US \$ was decreased¹⁵.

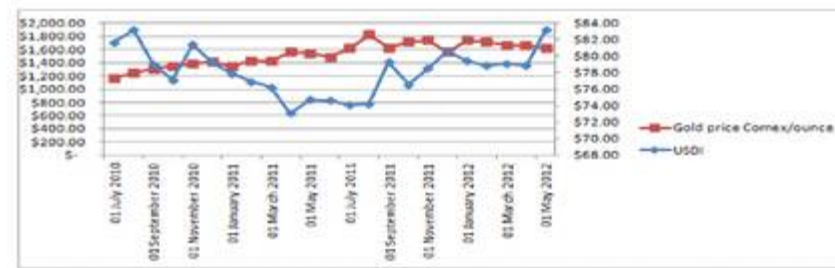
Thus again it shows a inverse relationship between USDI and Gold. But, statistically speaking, correlation between Gold and USDI from June 2010 till date is -0.30 (Table 4), which means that they are negatively correlated but the relation is not that strong and R square is 0.095 which means that USDI is not useful in predicting value of Gold, the relationship which was established earlier is no more applicable in today's condition where the economy is volatile.

Table 4 Correlation between USDI & Gold from June 2010- May 2012

	Gold	USDI
Gold	1	
USDI	-0.30937	1

Regression Statistics	
Multiple R	0.309367
R Square	0.095708
Adjusted R Square	0.052646
Standard Error	173.118
Observations	23

Figure 6: Relationship between Gold and USDI from July 2010 to May 2012



¹ <http://www.goldprice.org/live-gold-price.html>

Chances of QE 3

On June 6th 2012 after the U.S. Labour Department announced the disappointing non-farm payroll report gold started to surge higher. This is clearly shown in Graph 5. The catalyst for the rise in gold is the anticipation and speculation of another quantitative easing program by the Federal Reserve.

Something that traders must realize is that the Federal Reserve is still in the middle of doing its Operation Twist¹⁶ program. This program is where the central bank sells short to medium term bonds and buys long term bonds in order to push interest rates down. This helps investors and potential borrowers to get a low interest rate on loans such as mortgages and construction borrowing.

Another QE-3 could inflate the stock markets and help raise the price of food and energy. Traders in the past will usually be able to telegraph artificial inflation when the price of gold and silver rise¹⁷.

Therefore if QE 3 takes place then chances are high that price of Gold may go up, but it is too early to predict the long term relationship between yellow metal and USDI.



¹ Operation Twist is the name given to a Federal Reserve monetary policy operation that involves the purchase and sale of bonds. “Operation Twist” describes a monetary process where the Fed buys and sells short-term and long-term bonds depending on their objective. For example, in September 2011, the Fed performed Operation Twist in an attempt to lower long-term interest rates. In this operation, the Fed sold short-term Treasury bonds and bought long-term Treasury bonds, which pressured the long-term bond yields downward. (<http://www.investopedia.com/terms/o/operation-twist.asp#axzz1zTHN7p1k>)

Read more: <http://www.investopedia.com/terms/o/operation-twist.asp#ixzz1zVHsaqZ9>

² <http://wallstreetpit.com/92605-gold-surges-on-qe-3-rumors>

Limitations

The research is limited only to 10 year time period and focussed on relation between USDI and Gold, not considered the time before 2001. Moreover, simple statistical tools like correlation and regression are used, correlation does not imply causality.

Avenues for further research on the above context by using advanced statistical techniques and effect of financial crisis on gold and other correlated commodities.

Conclusion

This paper has attempted to quantify the outcome of recession and US Fed Monetary policies (QE1 and QE2) on relationship between Gold and USDI. On the whole, the decline in the correlation was to the extent of +0.009 in Phase II and -0.30 in Phase III whereas in Phase I the correlation was -0.83. This decrease in the inverse correlation between USDI and Gold can be attributed to QE policy; which resulted in increase in liquidity and thus deviation from Gold as 'Safe Heaven' towards other investment vehicles.

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