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Structural Changes of the 21st Century and their Impact on the Gold Price

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Abstract: Beginning in the trough of 2000 and culminating in the peak of 2012, gold prices have exhibited a spectacular and unparalleled increase. Based on annual averages, the price of gold did not decrease at all over this 12 year period. The paper considers the various factors that have shaped the surge of gold spot prices over the last two decades using quarterly data. The analysis considers the role of structural changes such as China's liberalization of the domestic gold market post-2003 and its impact on demand as well as other important economic factors such as risk, the role of quantitative easing and other fundamental factors in the gold market. The study investigates which of the macroeconomic and structural factors are responsible for the long term bullish trend in the gold price, of which China, global economic risk assessments along with quantitative easing have been crucial to understanding the almost uninterrupted price increase over the period.

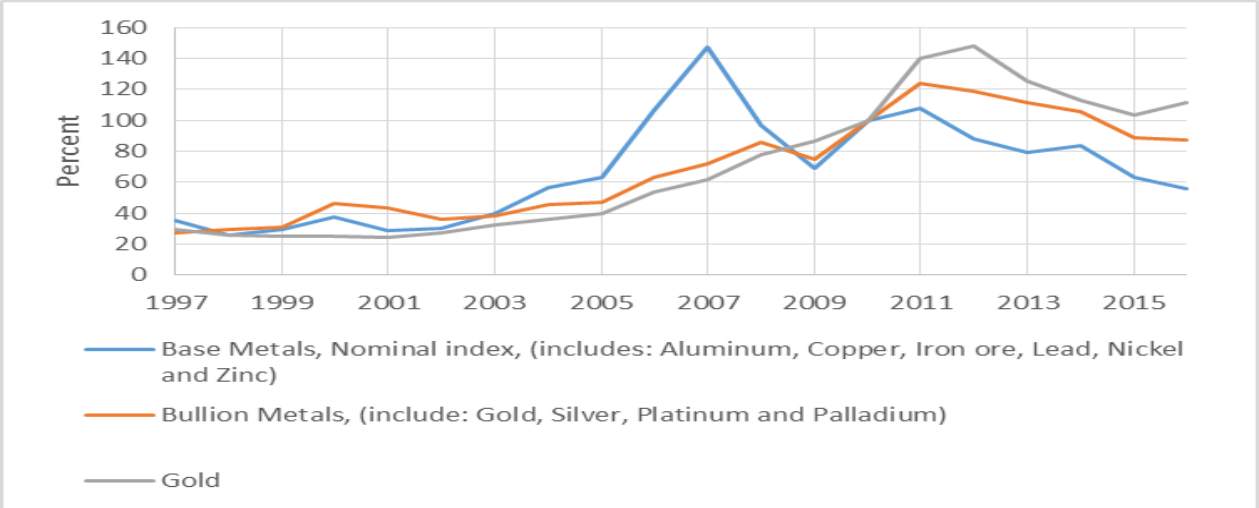
Keywords: *Gold price, China, intensity of use.*

1. Introduction & Background

The paper examines the long term gold prices over the last two decades and aims to determine the principal variables that best explain both the timing of the long bull market in gold and subsequent price fluctuations post 2011/12. Over the last two decades, the gold price experienced its longest nominal and real price increase since the end of the Bretton Woods system in 1973. In the case of base metals it was argued that there is a super cycle, which has generally been associated with the transformation and economic growth of China; or in the case of earlier cycles through the Schumpeter/Kondratieff transmission of changing technology, resulting in changing commodity demand that has in turn put pressure on commodity prices. It was generally noted that observed patterns of bullion[i] metal prices differ from that of base metals. This has been the case particularly because of the end uses and the difference in the use of the respective metal groups with bullion metals being used increasingly for investment purposes and base metals remaining predominantly used in industrial production. Figure 1 below illustrates the differences in the rise in gold prices from that of base metals though there have been similar trends over the last two decades. It is also apparent from the figure that the factors causing the price fluctuations and the timing of peaks and troughs for bullion metals are fundamentally different from that of base metals. These are volatility index, the exchange rate and quantitative easing. As gold is an internationally traded commodity, with its price relative to major currencies, which is an important factor thus, the study included it.

While there is indeed much in common, the common element in explaining both base and bullion metal prices over the last two decades is not short of the emergence of China as a consumer. This structural change, which has added 1.3 billion consumers with rising incomes to global markets has been the principal driver of both base (Garnaut, 2012; Eyraud, 2015) and billion prices; but this has remained so for quite different reasons. While there was clearly a rising intensity of use for base metals over the period under investigation, the opposite was the case for bullion metals, particularly for gold. Yet China appears to have played an important role in explaining the long term price of both. The rapid rates of economic growth since its membership of the WTO in 2002 which was followed by a 2004 liberalization[ii] of the gold market which permitted Chinese citizens to own gold, underpinned the expansion along of course with the rise is the uncertainty that came with the Great Recession in 2008/9. A long term upward trend, as well as volatility in the nominal prices of both metal groups, are illustrated below and it is more pronounced for base than for bullion markets. However, during the Great Recession, both groups of metals experienced a dip in prices – which is more pronounced in base metals than the bullion group due to the disproportionate significance of investment and hedging as a basis for the demand for bullion. However, of all the major exchange traded commodities, only gold experienced no price dip during the Great Recession and rose to even higher levels and more rapidly than the other metals before slowing down and declining in 2012 when a greater level of certainty returned to global currency and money markets.

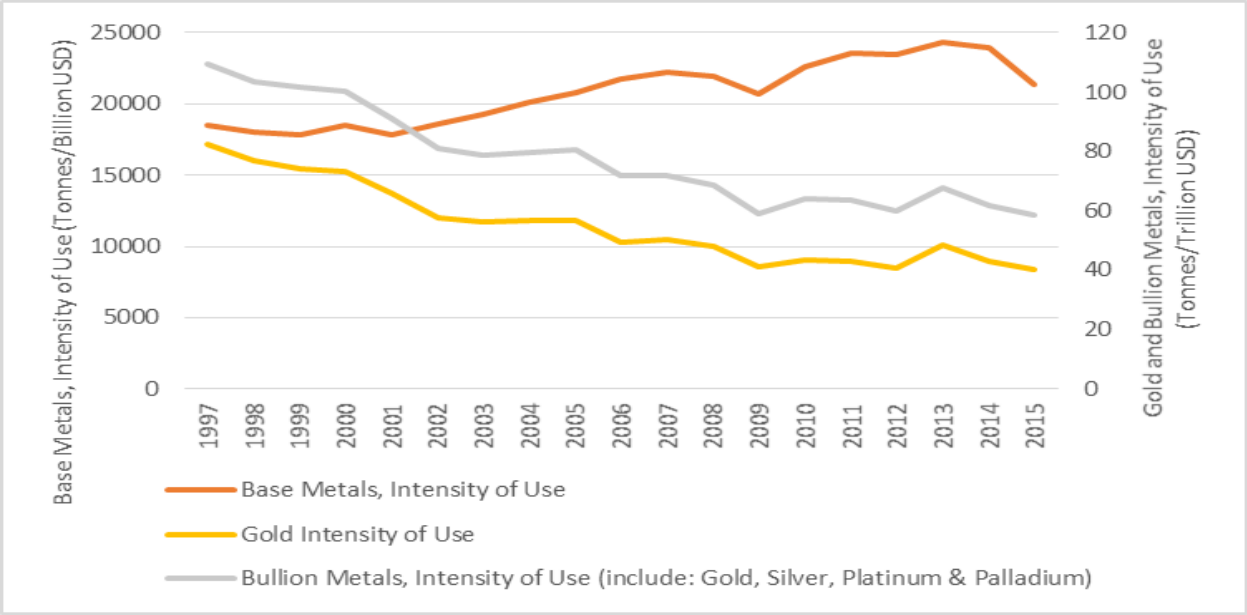
Figure 1: Nominal Price Index Comparisons of Bullion, Gold and Base Metals



Source: Authors' compilation of commodity prices (from the Federal Bank of St. Louis, Kitco.com and the World Bank commodity prices) into respective commodity indexes. With 2010 as the base year (2010=100).

The prices of base and precious metals have exhibited a similar trend, though the same cannot be said about the uses of the metals. It must be recalled that gold, silver and PGM are also industrial metals and in all cases, their industrial uses have been in rapid decline over the last two decades. This has been especially so for the electrical use of gold, as well as the medical and dental uses (GFMS Thomson Reuters, 2017). Similar trends in the de-industrialization of gold were observed in the case of both silver (GFMS, 2017; Metals Focus, 2017) and PGMs (GFMS Thomson Reuters, 2016) This is reflected below, as the intensity of use for base metals which has been rising over the last two decades, which is due in large measure, to the rise of the BRICs and China in particular, as opposed to what was observed for bullion metals where the opposite was the case.

Figure 2: Comparing the Intensity of Use of Gold, Bullion and Base Metals



Source: Authors' compilation of global metal consumption/fabrication demand as a ration of real global income (GDP - constant 2010 US$). NB: Sources of the data were extracted and compiled from various institutions (Gold - WGC & GFMS Surveys; Silver - GFMS, Thomson Reuters / The Silver Institute; Palladium & Platinum - Johnson Matthey; Copper - ICSG; Aluminum - ; Lead & Zinc – ILZSG; Crude steel -World Steel Association; and Nickel - WBMS) that specialize in the commodities.

The importance of this comparison stems from the fact that the intensity of use is an integral indicator (particularly from the demand side) of price behaviour[iii]. Therefore, if the intensity of use of a metal is in decline while its price is rising rapidly and consistently, then various questions regarding the explanation of the phenomenon are clearly warranted. The focus of this study is however, not on the differences of the metal groups per se, but rather on the gold price surge of the 2000s through the 2008/9 financial crisis and beyond. There are a number of scholarly articles on gold and the gold price that discuss factors that could explain the gold price behaviour, of which inflation and exchange rates in times of economic crisis have been commonly suggested. However, given the behaviour of the price of gold from 2003 to 2008 that rose more than double, cannot be well explained by the traditional economic arguments. One factor that has been discussed extensively and is believed to explain the gold price surge is the entry of China into the global gold market. China is currently regarded as the world's largest consumer of some "important" metals (Hammer & Jones, 2012; The Wall Street Journal, 2014), largely due to the country's transition to urbanization and industrialization from the early 2000's and, liberalization – particularly in the case of gold ownership around 2002-04 (The Wall Street Journal, 2014; Wang, Li, Zhang, & Zhang, 2018).

China has not only become the single largest consumer of gold, but it is now the biggest producer (World Gold Council, 2014). Furthermore, China's significance cannot be overlooked as even during times of slower economic growth, Chinese gold demand was still driven by rising disposable income rather than simple speculative investment as was witnessed in 2013 (Open Markets, 2015). Over the past 20 years or so, the price of gold among the major metals, saw a tremendous increase, driven predominantly by investors' perceptions of risk. As mentioned, this price increase is continually being influenced by the demands from emerging markets such as China - which is commonly considered a main driver of gold demand. However, others assert that while demand (from such emerging markets) has played an important role, the supply side (the lagged response of supply), has been of significance in explaining prices (Humphreys, 2010). Given the secular gold price increases described above, this 12 year period is sufficient to classify the bull market in gold as part of a super cycle, as a commodity super cycle is defined as approximately of 10-35 year duration[iv]. While the subject matter of gold prices and commodity cycles has received considerable attention, the empirical perspective explaining the recent and uninterrupted gold price surge are lacking. Furthermore, the various methodologies[v] that have been reviewed did not comprehensively address the causes of the price surge.

But merely what factors affect/affected the price of gold, its volatility or the properties of gold as a hedge. Hedging is one factor that all scholars are familiar with and one variable that is used to analyze the hedging property is the rate of inflation. The 12-year gold bull market was however, characterized by the lowest global inflation rates since the end of the Bretton Woods System[vi]. The declining inflation rates coupled with the declining intensity of use of gold eroded some of the definitive traditional emphasis that could have explained the gold price surge. The importance of this study therefore stems from its empirical analysis (as opposed to the mere discussion) of the structural changes of the 21st century and their impact on the gold price as opposed to the more traditional variables (e.g. inflation and intensity of use) which this study argues were not what drove the recent gold price surge. This study therefore seeks to examine the relative importance of both structural and macroeconomic factors in the determination of gold price in the 21st century. The paper asks what is the role of China, the Great Recession and risk perceptions in explaining the long bullish gold market? The subsequent section contains a thorough review of related research literature, which is followed by the methodology employed in the course of this study. Finally, the results are discussed before the conclusion.

2. Literature Review

This study explores the fundamental economic and structural reasons in relation to the price behaviour of gold over its super cycle. This section therefore discusses literature of interest in regards to factors that would fundamentally affect the gold price. Of all its attributes and uses, it is gold's investment property that sets it apart. In an early paper Macklup (1969), writing prior to the end of the Bretton Woods System undertook a study of the investment and speculative aspects of gold demand. Macklup sought to shed light on the demand and supply of gold and, to form an assessment of the prospects of future gold prices. He concluded incorrectly that the gold price would not hold without government intervention. Prior to the end of

the Bretton Woods System, the discussion on the gold price was on gold's role as a monetary asset. The discussion revolved around the price setting of gold and not its characteristics as a financial asset (Busschau, 1949; Johnson, 1950; Goodman, 1956). Following the collapse of the Bretton Woods System or otherwise known as the 'close of the gold window', more studies began to look at the other characteristics of gold. A major perspective being its ability to "hedge against inflation". Feldstein (1980) considered the theoretical reasons that relates the expected inflation with the price of gold. Feldestein, argued that the relationship exists because gold is like a currency whose value cannot diminish by sudden large increases in supply through printing as is the case of fiat currency (Feldstein, 1980).

Feldstein assumed that an increase in the expected inflation will lead to an increase in the gold price. This he postulated would happen as expected, since inflation causes nominal interest rates to increase and, assuming that investors are rational, the required rate of return on holding gold will increase, driving up the price of gold. Levin, Montagnoli and Wright (2006) provided a different channel of transmission, yet they proposed an increase in inflation would eventually lead to the rising price of gold. Radetzki (2006) in a study analyzing commodity booms, discusses the inflation issue. He alluded to the peculiar behaviour of inflation during commodity cycles, pointing out the ambiguity of a rising commodity price with very little inflation; rising commodity price with very high inflation; and rising commodity prices with very very low inflation[vii]. In relation to inflation and specifically the price of gold, Sjaastad (2008), found a small but negative relationship between gold and World inflation. Sjaastad's finding added more doubt in regards to the gold - inflation nexus. Whereas Batten, Ciner and Lucey (2010) found that between 1985 to 2012, there was no correlation between gold and the US CPI[viii]. The ambiguous relationship was best summarized and put into context by Zhu, Fan and Tucker (2018), who asserted that "once investors take into account the transaction costs associated with buying and selling of gold, they may decide that trading in gold is not worthwhile, and will stop treating gold as an inflation hedge".

Aside from its investment properties, gold has several industrial uses in dentistry, jewellery and various minor technological uses. The industrial uses are also significant since they provide another avenue of demand that could affect price through the intensity of use - the demand for commodities at different stages of economic development (Tilton & Guzmán, 2016). During the gold price surge, the demand for commodities was principally driven by emerging economies, of which China has been recognised as a significant actor in virtually all commodity markets[ix], particularly in the demand for base metals. However, at the same time, due to the liberalization of China's gold market, it became a significant player from both supply and the demand perspective. Though as mentioned earlier, others assert that while demand (from such emerging markets) has played an important role, the supply side (the lagged response of supply), has been of particular significance in explaining the price surge (Humphreys, 2010). Nevertheless, the magnitude of Chinese demand (World Gold Council, 2014; Wang, Li, Zhang & Zhang, 2018) cannot be ignored. Even with the increased demand of gold by such emerging economies like China, the commodity globally has been and is still significantly in decline with regards to its intensity of use. One relatively new aspect to the discussion of the determinants of the gold price is the role of Quantitative Easing (QE) – a form of monetary intervention.

While QE effects are similar to other general discussions of expectations and inflation, QE is unique as the central banks of several economies ventured on a large scale through unconventional methods to increase the liquidity of financial institutions in response to the great recession of 2008/09. QE, being a relatively new phenomenon has resulted in a significant outpouring of literature (Ugai, 2007; D'Amico & King, 2010; Krishnamurthy & Vissing-Jorgensen, 2011; Joyce, Lasaosa, Stevens and Tong, 2011; Neely, 2011; Wright, 2012; Zhu, Fan and Tucker, 2018). Such increase in liquidity, based on traditional theory, should have resulted in high inflation rates. However, the global inflation rate during the Great Recession was lower than in previous years, even though a slight increase was witnessed, inflation rates continued to fall shortly after. During this period, the price of gold soared. At the root of all these, uncertainty and mistrust in financial institutions than an inflation transmission channel. Various authors (Krishnamurthy and Vissing-Jorgensen, 2011; Wright, 2012) employed various methods, variables and periods; but did not negate the consensus that QE had a significant impact on various asset yields. However, the findings of Joyce, Lasaosa, Stevens and Tong, (2011), came to the opposite conclusion. The impact of QE on the price of gold has however, received little attention with the most noticeable exception being that of Zhu, Fan and Tucker (2018). Zhu, et al. conducted an event-study analysis of the impact of QE announcements.

Their findings were mixed: while they found that "the QE announcements of the US Federal Reserve and the European Central Bank exerted a strong and weak influence on gold, they also found that, the Bank of England and the Bank of Japan's QE announcements had no discernible impact on the price of gold." Despite the mixed and often inconclusive result, they argued that an announcement of QE should have a positive impact on the price of gold and vice versa given certain portfolio conditions (a condition being the replacement of gilts with gold as a result of QE– irrespective of the quantity of gilts previously held). Aside from the explicit issues discussed above, there are other different factors observed in regards to gold price determinants. These being "financial factors" such as – exchange rates, stock indices and US treasury bonds among others (Kagraoka, 2009; Toraman, Başarır, & Bayramoğlu, 2011; Jones & Sackley, 2014; Burkowski, 2016).

Other factors of interest considered are supply factors (Borensztein & Reinhart, 1994; Radetzki, Eggert, Lagos, Lima, & Tilton, 2008; Farooki, 2009) and alternative/complimentary commodity markets and prices (Zhang & Wei, 2010; Toraman, Başarır & Bayramoğlu, 2011). This section of the study explored several fundamental economic and structural reasons backing the price behaviour of gold over its recent super cycle. To have an even better grasp on the fundamentals of gold, see the seminal review article on gold by (O'Connor, Lucey, Batten, & Baur, 2015). The authors summarized a wide variety of literature, and began with a review of how the gold market operates, including the leasing market; physical gold demand and supply, gold mine economics and gold as an investment. They also included additional sections that provide context on the issue of gold market bubbles, gold's relation to inflation and interest rates, and on the behavioural aspects of the gold market.

3. Methodology

The period under review in this study is Q2, 2000 to Q3, 2017. The period was chosen as it coincides with the turn/beginning of the 21st century and because it also covers the full trade cycle for gold, which saw gold prices rise exponentially[x] and then eased but not to pre-boom levels. The data used was collected from various sources that include: the World Gold Council (WGC)[xi], the Federal Reserve Bank of St. Louis[xii] and the London Bullion Market Association LBMA[xiii]. Various methods have been applied in analyzing price determinants, but as Borensztein and Reinhart (1994) asserted, a majority of these methods are single equation frameworks with the Ordinary Least Squares (OLS) being of preference. The study therefore applied a multiple linear regression to observe what empirical impact if any, the select 21st century variables have had on the gold price. Other tests include pre estimation tests and post estimation diagnostic tests to ensure the validity of the results.

Therefore, the model applied in this study is:

$$lnGP_t = \beta_0 + \beta_1 lnCGD_t + \beta_2 lnVIX + \beta_3 lnQE_t + \beta_4 lnEXC_t + \xi_t \quad (1)$$

Where:

- GP - Gold price
- CGD - China gold demand
- VIX - Volatility index
- QE - Quantitative easing
- EXC - Exchange rate
- ξ - Error term

The Gold Price Data was Extracted from the London Bullion Market Association (LBMA): The gold price is an average between the average AM and PM LBMA price[xiv] from which an index was created with the base period Q4 2010. China gold demand was extracted from the World Gold Council and is the proxy for Chinese consumer demand. Whereas the volatility index, exchange rate index and quantitative easing variables were extracted from the Federal Reserve Bank of St. Louis. The volatility index was used as proxy for risk, and for this the Chicago Board Options Exchange (CBOE) Volatility Index was used. This particular index was used as it is one of the most recognized measures of volatility and is closely followed by various market participants (Deepa, et al., 2017). For quantitative easing, a composite variable was created using the Central Bank Assets of the U.S FED, the Bank of England and the European Central Bank as a proxy. A Trade Weighted U.S. Dollar Index: Major Currencies[xv] was used for the exchange rate variable.

Gold unlike other metals is predominantly a financial instrument, with approximately 45% of 2016 total demand coming from financial demand[xvi]. Therefore, the model used in this research considered the appropriate financial factors of relevance during the period of interest. The period of interest Q2, 2000 to Q3, 2017 was characterized by the global financial crisis that saw several states look to monetary policy (increased liquidity of financial institutions) as a solution, from which, stems our consideration of quantitative easing. As the literature suggests, the impact of QE on the gold price has received little attention, with the most noticeable exception being that of Zhu, et al. (2018), in which an event-study analysis of the impact of QE announcements was conducted. It is worth noting that this study is however, not primarily concerned with QE announcements (which has short run effects), but rather deliberated on actual QE. The volatility index on the other hand, was considered and chosen as it is a forecast measure of risk.

'Forecasting', something numerous analysts try to do with little success but cannot be overlooked as the risk component is integral to investor preferences and behaviour. While previous literature suggests that Chinese demand has a significant effect on the gold price, there are some that believe that the Chinese market is not. This may seem a contradiction, however, given the market's relative isolation – Shanghai Gold Exchange - (Lucey, Larkin, & O'Connor, 2014) results supporting its insignificance have a degree of validity. However, even given the isolation, the magnitude of total Chinese demand (Wang, Li, Zhang, & Zhang, 2018; World Gold Council, 2014) cannot be ignored or considered as insignificant. It is worth noting that while the literature review of the study discusses inflation, during the period of interest, global inflation was low and on a downward trend. For these reasons, Inflation was not considered as a significant factor in explaining the gold price surge over the past two decades.

4. Estimation Results and Discussion

All the variables were converted to log form before any estimation was carried out. Thereafter, the descriptive statistics were checked as is illustrated below to provide further insight on the variables used.

Table 1: Descriptive Statistics

	LNGP	LNCGD	LNVIX	LNQE	LNEXC
Mean	4.043655	4.802590	2.913275	14.92634	4.536784
Median	4.250711	4.771454	2.858031	15.15441	4.515015
Maximum	4.833275	6.178152	4.070665	15.92883	4.753504
Minimum	2.958146	3.793239	2.332914	13.57763	4.356705
Std. Dev.	0.613952	0.663144	0.348246	0.785485	0.110078
Skewness	-0.499571	0.041161	0.723046	-0.246787	0.237097
Kurtosis	1.751187	1.520466	3.460179	1.577777	1.785965
Jarque-Bera	7.993187	6.861868	7.196702	7.082294	5.308568
Observations	75	75	75	75	75

Source: Author's compilation of Eviews output

From Jarque-Bera test, the results suggest that there is sufficient evidence to support the hypothesis that a majority of the series are normally distributed. This is also evident from the skewness statistic, with a majority of variables close to zero. From the Kurtosis statistics, it is evident that on the average, the distribution is relatively flat. To avoid spurious results moving forward, time series properties of the data are examined. The variables were therefore pre tested using the Augmented Dickey Fuller (ADF) for stationarity, and it was found that all the variables except the volatility index and geopolitical risk became stationary at first difference (See table 2).

Table 2: Unit Root Test

Variable	Unit Roots			Degree of Integration
	Level	1st Difference	0.05 Critical Value	
LNGP	-1.65	-8.37	-2.90	1
LNCD	-0.78	-8.54	-2.90	1
LNVIX	-3.02	-	-2.90	0
LNQE	-1.04	-8.98	-2.90	1
LNEXC	-1.72	-5.87	-2.90	1

Source: Authors' computations. After the unit root tests were estimated, the Johannsen cointegration test was used to observe if the cointegration property is supported.

Table 3: Johannsen Cointegration Test, Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.362861	99.03620	95.75366	0.0291
At most 1	0.325118	66.58094	69.81889	0.0882
At most 2	0.216057	38.26928	47.85613	0.2904
At most 3	0.128456	20.74311	29.79707	0.3739
At most 4	0.097380	10.84393	15.49471	0.2213
At most 5	0.047015	3.467268	3.841466	0.0626

Source: Author's compilation. **NB:** Trace test indicates 1cointegrating eqn(s) at the 0.05 level.* denotes rejection of the hypothesis at the 0.05 level (null hypothesis, that there is no cointegration).

Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.362861	32.45526	40.07757	0.2787
At most 1	0.325118	28.31166	33.87687	0.1995
At most 2	0.216057	17.52617	27.58434	0.5350
At most 3	0.128456	9.899181	21.13162	0.7541
At most 4	0.097380	7.376659	14.26460	0.4456
At most 5	0.047015	3.467268	3.841466	0.0626

Source: Author's compilation. **NB:** Max-eigenvalue test indicates no cointegration at the 0.05 level. * denotes rejection of the hypothesis at the 0.05 level (null hypothesis, that there is no cointegration).

Regarding the Trace test (which is preferred over the Maximum Eigen test)[xvii] (Johansen & Juselius, 1990; Kasa, 1992; Serletis & King, 1997; Hubrich, Lütkepohl, & Saikkonen, 2001), the study surmised that cointegration was present among the variables and therefore, a long run relationship existed. Since cointegration existed, the Error Correction Model (ECM) was estimated. The results are presented in the table below.

Table 4: ECM Estimation Dependent Variable: Gold Price Index

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNVIX	0.037306	0.021519	1.733661	0.0874
D(LNEXC)	-1.068669	0.249175	-4.288828	0.0001
ECT(-1)	-0.145787	0.064444	-2.262228	0.0268
C	-0.088238	0.063024	-1.400078	0.1659
R-squared	0.252802	Durbin-Watson stat		2.145239
F-statistic	7.894445	Prob(F-statistic)		0.000131

Source: Author's compilation of Eviews output

The Error Correction Term shows and reiterates a long run relationship between the variables as it has a negative sign and is significant (p value < 0.05) at 0.0268. The coefficient shows the rate at which the

disequilibrium of the system of the previous period will be corrected in one year; being at a rate of 14.07%. The model was found to be significant with the F-Statistic at 7.894445 and, not spurious as the R squared (0.252802) is less than the Durbin Watson statistic (2.145239). From the results, it was observed that the R squared is low and there is only one insignificant t ratio of importance, implying that multicollinearity may be present but may not be an issue. This is all the more important given the individual significance of the variables, and the joint significance of the model.

The Durbin Watson statistic (2.145239) shows that there is no autocorrelation which was confirmed by the Breusch-Godfrey Serial Correlation LM Test as F test statistic was in excess of 0.05, at 0.4665. The other diagnostic tests included a normality check and a Heteroskedasticity Test. From the normality test, it was found that the normality assumption of the residual term had been supported as the P value was greater than 10%, 5% and 1% (at 0.192685), with the skewness statistic less than zero (at 0.001730), though the kurtosis was leptokurtic in shape. Furthermore, there was also no evidence of the presence of heteroscedasticity. Both the F and Chi-square test statistics suggested the same conclusion that there is no evidence for the presence of heteroscedasticity, since the p-values were in excess of 0.05 respectively (0.7820 and 0.7711). The estimation of the short run model revealed that only consumer perception and exchange rate are of significance. Whereas a depreciation will not as Beckmann, Czudaj and Pilbeam (2015) assert. Furthermore, the Error correction term was found to be significant with the correct sign. However, as has been alluded in the objective of the study, the long run structural shift that has occurred is of principal interest. Therefore the long run estimation is of importance to observe what variables, of the macroeconomic and structural factors are responsible for the price rise. The long run results are presented in the table below.

Table 5: Long–Run Regression Estimates Dependent Variable: Gold Price Index

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNCGD	0.221272	0.069601	3.179143	0.0022
LNVIX	0.105487	0.041915	2.516682	0.0141
LNQE	0.515755	0.058704	8.785694	0.0000
LNEXC	-1.611487	0.129593	-12.43500	0.0000
C	2.286291	0.862289	2.651419	0.0099
R-squared	0.964450	Durbin-Watson stat		0.704427
F-statistic	474.7618	Prob(F-statistic)		0.000000

Source: Author's compilation of Eviews output

The initial estimation suggested that all the variables were significant in affecting the price of gold. With an R^2 of 0.964450 (approximately 96%), the goodness of fit is relatively high. Furthermore, it was observed that the F-statistic is 474.7618 which is greater than the Prob (F-statistic) = 0.0000 showing that the overall fit of the regression is good. However, with the Durbin-Watson statistic at 0.704427, the issue of autocorrelation is present, which warranted post estimation tests.

Post Estimation Analysis: The residual diagnostic tests for normality, autocorrelation and heteroscedasticity were used. From the normality test, it was found that the normality assumption of the residual term was supported as the P value was greater than 10%, 5% and 1% (at 0.156951). However, it was found that the model suffered from autocorrelation as evidenced from the D-Watson Statistic in Table 5 and as per the Breusch-Godfrey Serial Correlation LM Test since the F test statistic was less than 0.05, at 0.000. There was, however, no evidence of the presence of heteroscedasticity as both the F and Chi-square test statistics produced the same conclusion that there is no evidence for the presence of heteroscedasticity, since the p-values were greater than 0.05 respectively (0.0714 and 0.0726). To address the problem of autocorrelation, the study used the Newey-West standard errors that are robust to autocorrelation. Upon using the Newey-West standard errors, the model estimated provided significant variables (though the coefficients changed slightly) and unchanged variable signs just as before (See table 6). However, the R^2 decreased to 0.830551 from 0.964450. With consumer perceptions having a positive relationship with gold price. As expected, exchange rate has a negative influence on gold price, implying that an appreciation of the exchange rate will be detrimental to gold price. Furthermore, upon testing for normality, it was observed that the normality assumption of the residual term had been supported as the P value was greater than 10%, 5% and 1% which is the same as the case of the long –run post regression analysis above.

Table 6: Long –Run Regression Estimation With Newey-West Standard Errors Dependent Variable: Gold Price Index

Variable	Coefficient	Std. Error	z-Statistic	Prob.
LNCGD	0.210780	0.075085	2.807200	0.0050
LNVIX	0.112568	0.045218	2.489469	0.0128
LNQE	0.525837	0.063330	8.303161	0.0000
LNEXC	-1.626019	0.139804	-11.63066	0.0000
C	2.233030	0.930236	2.400499	0.0164
R-squared	0.830551			

Source: Author's compilation of Eviews output

The inverse relationship between the composite exchange rate and the gold price is similar to that found by Sjaastad (2008). This indicated that an increase in risk/perceived risk, Chinese gold demand and quantitative easing will cause the gold price to rise: whereas, a decline in the exchange rate index will cause an increase in the gold price. Conversely, from the empirical results, the positive relationship between the variables (except the exchange rate) with changes in the gold price implies that decreases in risk/perceived risk, China gold demand and quantitative easing would lead to a decrease in the gold price. Of further interest is the "ranking" of the significance of the variables under study in terms of the long run 'Prob' Values. Implying the null hypothesis could not be rejected of a normal residual, with the skewness statistic fairly close to zero though the kurtosis was platykurtic in shape. This being the exchange rate first, followed by Quantitative easing, China gold demand, then risk. The finding that Chinese gold demand was significant, is simultaneously important, very much expected and adds to literature in regards to the phenomenon of the recent gold price "surge" as while it has been discussed in literature, empirical tests are minimal. This is the case even though it has been found that the Chinese gold market (Shanghai Gold Exchange) remains quantitatively insignificant (O'Connor, Lucey, Batten, & Baur, 2015).

The suggested finding that Chinese demand is significant also adds credence to the claims that Chinese gold demand is not reflected in the relative global significance of the Shanghai Gold Exchange. Other than Chinese demand, policy that affected the gold market and the risk component[xviii] associated with the commodity is of particular importance. The price behaviour of gold prior and during "the great recession" i.e. the upward trend with no dip - coupled with positive and significant outcome of the risk measure used, further highlight how speculative tendencies contributed to the upward pressure on gold price. The effect of Quantitative easing on the other hand, which is believed to contribute to gold price volatility, coupled with the timing of financial crisis is likely to have exacerbated the speculative tendencies of the gold market. The finding of quantitative easing putting pressure on commodity prices (in this instance the gold price) by increasing their volatility (Bernanke, 2012) and in turn price/value. The recession within the context of the large scale Quantitative Easing, increased the liquidity for banking institutions, whereas, inflation did not rise significantly as a result. Individually and collectively, there is no doubt that these issues contributed significantly to the gold price surge during this period of interest. It is worth noting that among other variables considered that may have affected the gold price surge, was geo political risk. However, as it was found insignificant and its exclusion did not affect the study's results it was eventually excluded.

5. Conclusion

The study sought to examine the long term gold price over the last two decades and to analyze certain fundamentals using principle variables that could explain both the timing of the long bull market in gold, through the "Great Recession" and subsequent post 2011 fluctuations. The results of the analysis, confirm that the structural and macroeconomic variables of interest are of significance in explaining the gold price. The positive relationship found between the risk index and the gold price, a common element in almost all studies of the gold price remains a timeless verity in the gold market. However, the relationship between Chinese gold demand along with the extent of quantitative easing and the gold price are new developments that reflect structural market changes in the 21st century. Significantly, China has played a central role in explaining global gold prices. This however, had nothing to do with the increased intensity of use as has been the case with base metals. The long pent-up Chinese demand for gold as an investment instrument combined

with the 2003 market liberalization in that country, are key to understanding the market pressures that have sustained gold prices in the 21st century.

The results further highlight how the traditional analysis of gold prices has changed over time. Moreover, economic policies such as the extensive use of quantitative easing aimed at facilitating the economic recovery post-2009, need careful consideration as its continuation clearly exacerbates commodity price bubbles such as has been observed with the price of gold. These structural changes have deepened our understanding of the gold price. This has meant that scholars, market participants and analysts need to re-evaluate the role played by these structural variables. Last but not least, it is clear from the analysis that neither inflation nor the intensity of use which have been traditional explanatory variables in our understanding of commodity prices in any way significantly contributes to our understanding of gold prices in the current century.

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[i] What metals constitute bullion are contested. However, the preference to call them bullion as opposed to precious metals is rooted in trying to emphasize the group metals investment characteristics. See: https://www.nzmint.com/about-gold-and-silver; http://www.businessdictionary.com/definition/bullion.html; https://www.bulliondesk.com/bullion-prices/ and https://www.quora.com/What-is-bullion among other sources.

[ii] See https://www.bullionstar.com/gold-university/the-mechanics-of-the-chinese-domestic-gold-market#enref-3154-1 and more specifically; Yunfei Wang, Xiaozhou Li, Zhichao Zhang & Zhuang Zhang (2018) Rise of the gold market in China: liberalisation and market development, *Journal of Chinese Economic and Business Studies*, 16:1, 17-38, DOI: 10.1080/14765284.2017.1378853

[iii] See: Warell, L. and Olsson, A. (2009) Trends and Developments in the Intensity of Steel Use: An Econometric Analysis. *Online at: http://pure.ltu.se/portal/files/3157773/ Paper.pdf*
who sought to analyze the trends and developments of steel consumption in the world by applying the Intensity of Use method, in which they allude to several factors that could affect intensity of use among which

is long run price trends. Whereas; Garnaut (2012) asserts that high commodity prices are a result of an increase in demand for commodities and more specifically "resource intensity" in China, given the focus of his paper.

[iv] Commodities super cycle is approximately a 10-35 year trend of rising commodity prices and as earlier mentioned, Gold prices have experienced their longest nominal and real price increase since the end of the Bretton Woods system in 1973. For more on the length of commodity super cycles see: FrikEls. (2013). 160-year study of real commodity prices sees beginning of the end of the supercycle. Retrieved from: http://www.mining.com/160-year-study-of-real-commodity-prices-23066/; Bilge Erten and José Antonio Ocampo. (2012). Super-cycles of commodity prices since the mid-nineteenth century. DESA Working Paper No. 110. Downloaded from:http://www.un.org/esa/desa/papers/2012/wp110_2012.pdf; and Cuddington, J., Jerrett, D., 2008. Super cycles in real metal prices? IMF Staff Paper 55 (4) to mention just a few.

[v] For instance see: Batten, Ciner and Lucey (2010), in a study entitled "The Macroeconomic Determinants of Volatility in Precious Metals Markets" considered price volatility as opposed to price increase which the study believes to be something entirely different. Furthermore, their study looked at factors that affect precious metals (gold, silver, platinum and palladium), while the focus of this study is on the commodity gold. Last but not least, while this study agrees with some of the factors used especially ones that drive consumer perception, this study does not agree with one particular factor in regards to gold – which is inflation - as is later discussed. Also see: Burkowski (2016) to identify the main factors which influence the gold price in the international market and used a volatility model. It is worth noting that this is not a critique of their work but an example to illustrate the difference from this study.

[vi] See World Bank Development Indictors on World - Inflation, consumer prices (annual %) and World - Inflation, GDP deflator (annual %). It is however, worth noting that some authors use inflation volatility and not just inflation as a factor that would affect the gold price. See: Oxford Economics. (2011). The impact of inflation and deflation on the case for gold. Oxford Economics. Downloaded from: https://www.gold.org/sites/default/files/documents/gold-investment-research/the_impact_of_inflation_and_deflation_on_the_case_for_gold.pdf

[vii] It is worth noting that this analysis was not specific to gold and inflation. However, the third boom Radetzki analyzes does have very low inflation and the very same period was highly characterized with the gold price soaring.

[viii] Several studies use US inflation as a proxy given the significance of the US, but it is worth noting that gold is not bound to one currency or economy though it is commonly traded with the US dollar. It is a widely globally traded commodity hence, some studies as did Sjaastad, look at world inflation.

[ix] China's significance is documented across various commodities and metals. More so, base metals. However, China's has experienced significant reform in terms of gold and aside from increased production, China's demand has risen significantly too. See:Yunfei Wang, Xiaozhou Li, Zhichao Zhang & Zhuang Zhang. (2018). Rise of the gold market in China: liberalisation and market development; World Gold Council. (2014).*China's gold market: progress and prospects; and* Calista Cheung and Sylvie Morin. (2007). The Impact of Emerging Asia on Commodity Prices. *Working Paper/Document de travail 2007-55*.

[x] The statistical package Econometric Views 9 was used for all the analysis

[xi] See: https://www.gold.org/goldhub/data

[xii] See: https://fred.stlouisfed.org/

[xiii] See: http://www.lbma.org.uk/precious-metal-prices

[xiv] The LBMA Gold price was used for this as it is an important global benchmark. It is an important reference price for the market, used globally by various participants and is determined via an electronic auction process, which complies with global regulatory standards. See: http://www.lbma.org.uk/precious-metal-prices and World Gold Council. (2018). *Gold Market Primer, Gold Prices*.World Gold Council. UK, London. Downloaded from: https://www.gold.org/goldhub/research/market-primer/gold-prices

[xv] The currencies include: Euro Area, Canada, Japan, United Kingdom, Switzerland, Australia and Sweden.

[xvi] Financial demand includes: total bar and coin demand, ETFs & similar products and Central banks & other inst. See: https://www.gold.org/goldhub/data

[xvii] Results of the trace statistic and maximum eigenvalue statistic usually produce little contradiction. However, when they do, one should give more importance to the trace statistic.

[xviii] The hedging properties but not forgetting the increased speculative trading practice.