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BEHIND THE U.S. DOLLAR INDEX: ANALYSING THE ECONOMIC FACTORS

ABSTRACT

The U.S. Dollar index is a vital indicator for understanding the strength of the US in the global economy. Given that the US dollar is involved in most of all foreign exchange transactions for both trade and capital flows, it guides policy decisions across the globe. Both global asset prices and commodity prices are impacted by changes in the U.S. Dollar index. This immense pervasive influence of the U.S. Dollar Index creates interest in better understanding of factors that influence the index with the aim to enable better prediction of changes in the DXY. The current study has attempted to model the short-term and long-term impacts of various U.S.-based socio-economic factors, global commodity prices and geopolitical events on the U.S. Dollar Index using the Auto-Regressive Distributed Lag Model (ARDL). The results show that the U.S. Dollar Index is highly persistent and is also impacted by U.S. unemployment, U.S. interest rates and global commodity prices. Economies can hence be better prepared for the effects of changes in DXY on their domestic currencies by mainly keeping track of trend in the U.S. Dollar Index and U.S. economy data.

Keywords: Auto-Regressive Distributed Lag Model (ARDL); Commodity Prices; Federal Funds Rate; Unemployment; U.S. Dollar Index

JEL Classification: F31

RIASSUNTO

Dietro l'indice dollaro USA: un'analisi dei fattori economici

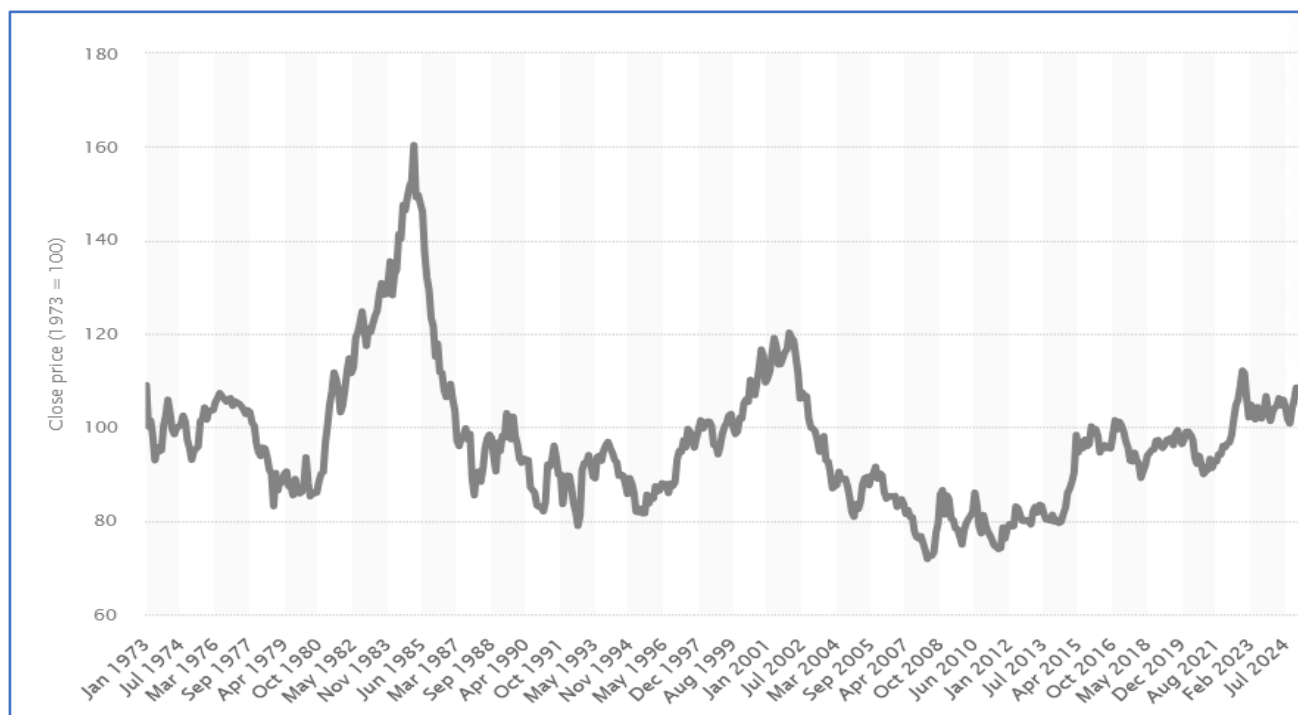
Il dollaro USA è un indicatore fondamentale per capire l'importanza del ruolo degli Stati Uniti nell'economia globale. Poiché la maggior parte delle transazioni internazionali, sia commerciali che finanziarie, si basano sul dollaro USA, quest'ultimo rappresenta un punto di riferimento a livello globale per le decisioni di policy. Le variazioni del dollaro USA influenzano a livello

mondiale sia i prezzi delle attività finanziarie che quelli delle merci. Proprio l'influenza pervasiva esercitata dal dollaro USA suscita interesse nel cercare di capire quali sono i fattori che lo possono modificare, allo scopo di meglio prevedere le variazioni dell'indice del dollaro (DXY). In questo articolo si cerca di analizzare, tramite un modello ARDL, gli impatti sul dollaro USA a breve e lungo termine di fattori socio-economici interni agli USA, delle quotazioni internazionali delle materie prime e degli eventi geopolitici. I risultati indicano che l'indice del dollaro USA è altamente persistente e influenzato dalla disoccupazione, dai tassi di interesse negli Stati Uniti e dalle quotazioni internazionali delle materie prime. Le altre economie potranno pertanto essere più preparate agli effetti delle variazioni di DXY sulle valute nazionali, prevalentemente analizzando i trend dell'indice del dollaro USA e dei dati economici degli Stati Uniti.

1. INTRODUCTION

The US Dollar Index (DXY), also known as the USDIX or simply DXY, is a crucial financial indicator that measures the value of the United States dollar relative to a basket of six foreign currencies. It serves as a key benchmark for evaluating the performance of the U.S. dollar against the major foreign currencies and assesses the performance of the dollar in the global economy. It was created after the collapse of the Bretton Woods system, which had fixed exchange rates, to provide a benchmark for the value of the U.S. dollar against a basket of major currencies. The breakdown of Bretton Woods created the need for a new system to track the dollar's value in a more dynamic environment.

The U.S. Dollar Index (DXY) was created by the Intercontinental Exchange (ICE), originally with a base value of 100.00. The DXY was introduced in March 1973 by the Federal Reserve. The index reached an all-time high of 164.72 in February 1985, reflecting a period of strong US economic performance and high interest rates. Following the Federal Reserve's aggressive monetary easing in March 2008 during the global financial crisis, it hit an all-time low of 70 (Fig.1).

FIGURE 1 - *DXY from Jan 1973 to March 2025*

Source: Statista.

The US Dollar Index plays a pivotal role in global financial markets. As the world's primary reserve currency, the US dollar is involved in approximately 88% of all foreign exchange transactions, making the DXY a critical barometer of global economic health. The DXY is closely observed by central banks and policymakers around the world. A change in the index can prompt adjustments in monetary policy, particularly in emerging markets sensitive to dollar fluctuations. A rising DXY indicates a stronger dollar relative to the basket of currencies, while a declining DXY suggests a weakening dollar, influencing trade dynamics. The Dollar Index influences the competitiveness of US exports and the cost of imports. A stronger dollar makes US exports more expensive for foreign buyers, potentially reducing demand, while making imports relatively cheaper for American consumers.

The DXY is a critical tool for Forex traders who need to assess market sentiment and predict currency movements. The index's movements can significantly impact trading decisions, making it essential for effective Forex trading strategies. The dollar index serves as a key benchmark for informing trading strategies based on changes in the index's value. Additionally, pricing

of commodities such as oil and gold, are typically denominated in dollars. A stronger dollar can influence commodity prices wherein a strengthening dollar can lead to fall in demand for gold as it is priced in the U.S. dollar.

The calculation of the Dollar Index is based on the geometric mean of the exchange rates of these six currencies against the US dollar. First, a Midpoint Calculation is made by taking an average of each currency/s bid and ask price. This value is then multiplied by its assigned weight and a weighted average is created and then, these figures are averaged to produce the final index value, which is updated every 15 seconds in real-time.

The weights of six major foreign currencies are as follows: i. Euro (EUR): 57.6%, ii. Japanese Yen (JPY): 13.6%, iii. British Pound Sterling (GBP): 11.9%, iv. Canadian Dollar (CAD): 9.1%, v. Swedish Krona (SEK): 4.2% and vi. Swiss Franc (CHF): 3.6%.

These currencies are selected based on their significant trade and financial relationships with the United States. The Euro, representing the largest share, accounts for 57.6% of the index, reflecting the extensive trade and economic ties between the US and the Eurozone. Any changes in the exchange rates of the component currencies will affect the overall value of the DXY.

2. OBJECTIVE OF THE PAPER

The US Dollar Index is unique due to its composition, global importance, and its demand as a ‘safe haven’. Its movements are driven by a mix of monetary policy, global economic trends, trade balances, and investor sentiment. This paper considers the dollar index from the period 1995-2024, analyses its trends, and identifies variables affecting the index.

This study has the following objectives:

- i. To understand the factors which impact the U.S. Dollar Index.
- ii. To create a model that has the ability to predict changes in the U.S. Dollar Index.

3. LITERATURE REVIEW

Several studies have analysed different time periods to understand the factors impacting the U.S. Dollar index. Jiang *et al.* (2022) examined the sustained appreciation of the U.S. dollar from 2011

to 2019, linking it to international capital flows and economic fundamentals (Jiang *et al.*, 2022). Yürük (2023) conducted a study covering 2000-2020, employing machine learning techniques to predict the Dollar Index (Yürük, 2023). Additionally, the Federal Reserve analysed the sensitivity of the U.S. dollar exchange rate to changes in monetary policy expectations between 2002 and 2017 (Federal Reserve, 2017).

Various methodologies have been employed to examine the determinants of the U.S. Dollar Index. Traditional econometric models, such as Vector Autoregressions (VAR), have been used to assess the impact of different economic shocks. The International Monetary Fund (IMF) employed VAR analysis to investigate the drivers of major U.S. exchange rate movements, highlighting the significance of risk premium shocks and interest rate differentials (International Monetary Fund, 2016). Machine learning techniques, including Random Forests, Support Vector Machines, and Artificial Neural Networks, have also been applied, with Yürük's study demonstrating that Random Forest models achieved high accuracy in predicting the Dollar Index (Yürük, 2023). Additionally, some researchers have used relative purchasing power parity (PPP) models to examine equilibrium exchange rates and forecasting accuracy (Grossmann and Simpson, 2011).

Several key factors have been identified as crucial determinants of the U.S. Dollar Index. International capital flows play a significant role, with increases in foreign investors' net savings and demand for U.S. financial assets contributing to dollar appreciation (Jiang *et al.*, 2022). Monetary policy divergence between the U.S. and other countries is another critical factor, as longer-term interest rate differentials, particularly in relation to the Canadian dollar and the euro, have been shown to influence exchange rate movements (International Monetary Fund, 2016). Risk premium shocks, often measured using volatility indices like the VIX, generally lead to dollar appreciation as investors seek safe-haven assets. Additionally, oil price movements impact commodity-linked currencies, such as the Canadian dollar, which in turn affects the Dollar Index (International Monetary Fund, 2016).

Notable findings from these studies highlight the evolving nature of exchange rate determinants. Yürük's (2023) study revealed that machine learning models, particularly Random Forests, outperformed traditional methods in predicting the Dollar Index, achieving an accuracy of 98.5%. The Federal Reserve's analysis (Curcuro, 2017) identified structural breaks in the

relationship between exchange rates and monetary policy expectations, particularly during the global financial crisis, indicating heightened sensitivity in the post-crisis period. The IMF's research also suggests that risk premium shocks and interest rate differentials are crucial in understanding exchange rate dynamics, aligning with theoretical models and supported by recent event studies (International Monetary Fund, 2016). An alternate study measured the impact of a percentage change in of the U.S. Dollar Index on the U.S. real GDP. This study concluded that any increase in U.S. Dollar Index would negatively affect U.S. real GDP with a one period lag suing the VECM model (Adhikari *et al.*, 2025).

The U.S. Dollar Index is influenced by a complex interplay of factors, including international capital flows, monetary policy divergence, risk premiums, and commodity prices.

4. AFFECTING THE US DOLLAR INDEX (DXY)

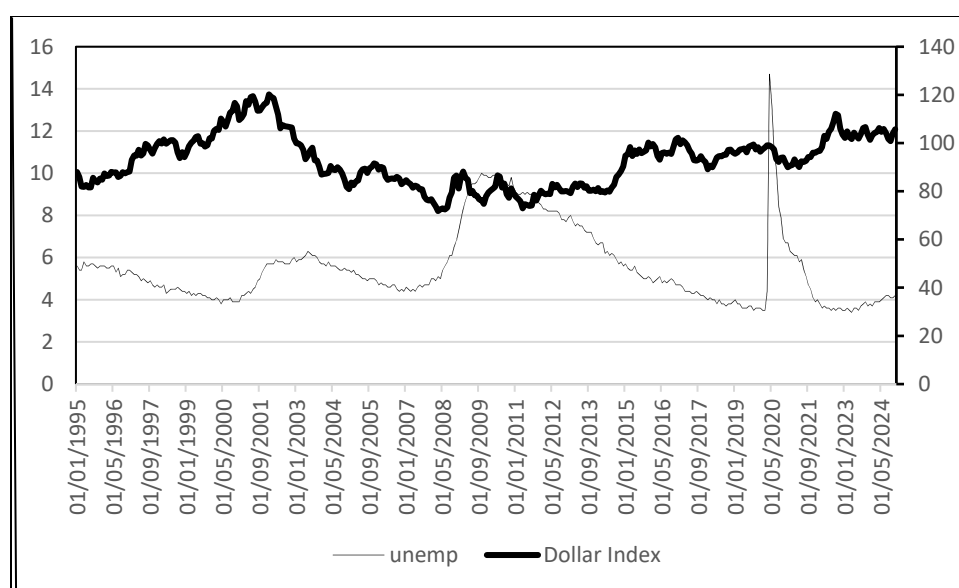
The US Dollar Index is influenced by economic, monetary, geopolitical, and market forces. This paper has selected the following variables: i. U.S. Unemployment rate, ii. U.S. Inflation rate, iii. U.S. Federal funds rate, iv. trade deficits viz. exports and imports v. U.S. capital inflows, vi. U.S. Consumer sentiments vii. Crude Oil price, viii. Gold price, ix. Geopolitical events. The first six variables represent U.S. economic indicators, the next two represent global commodities and the last variable represents the global geopolitical environment (Annexure I). Monthly data of the variables have been considered for the analysis.

4.1 Unemployment

As a key indicator of the economic health of the country, lower unemployment typically signals a strong economy, leading to a stronger dollar. During the 2008 financial crisis, the US economy contracted significantly with massive job losses, lower consumer spending, and reduced business investments. In the same period, the DXY fell sharply and worsened as the US Fed reduced interest rates. In Q2 2020, the US economy experienced a dramatic contraction of - **32.9%** annualized due to the lockdowns, reduced consumer spending, and disruptions to businesses caused by the COVID-19 pandemic. The dollar index contracted although its fall was not so sharp initially because the US was considered as a safe haven. This was short-lived and the dollar contracted to 90 by the end of the year. The combination of fewer jobs being added, and a

higher unemployment rate has led to concerns about the strength of the U.S. economy. Traders have reacted by selling off the U.S. dollar, causing the DXY to decline sharply. Following figure shows the trends in unemployment and DXY.

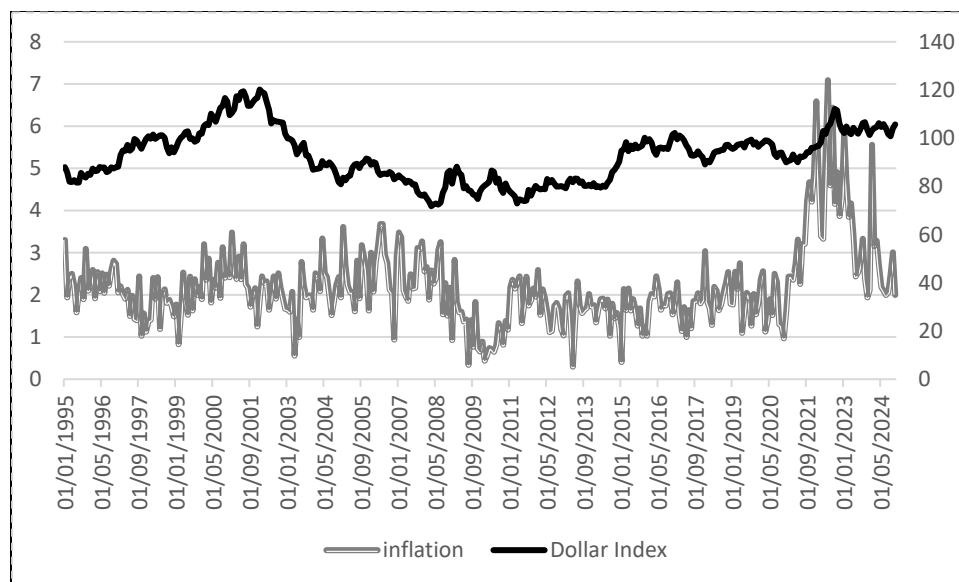
FIGURE 2 - *U.S. Unemployment Rate and DXY – 1995 to 2024*



Source: Based on data collected by authors.

4.2 Inflation

Inflation is a key economic factor that influences growth, purchasing power, and policy decisions. Central banks and policymakers monitor these factors to keep inflation under control while ensuring economic stability. High levels of inflation effect multiple economic variables, shaping economic conditions, policymaking, and financial markets including rise in the federal funds rate, to slow down bank borrowing, decreasing purchasing power, thereby weakening consumption. The U.S. Dollar index will weaken, if inflation in the U.S. is higher as compared to trading partners; trade balance may worsen as imports may be cheaper as compared to domestic output.

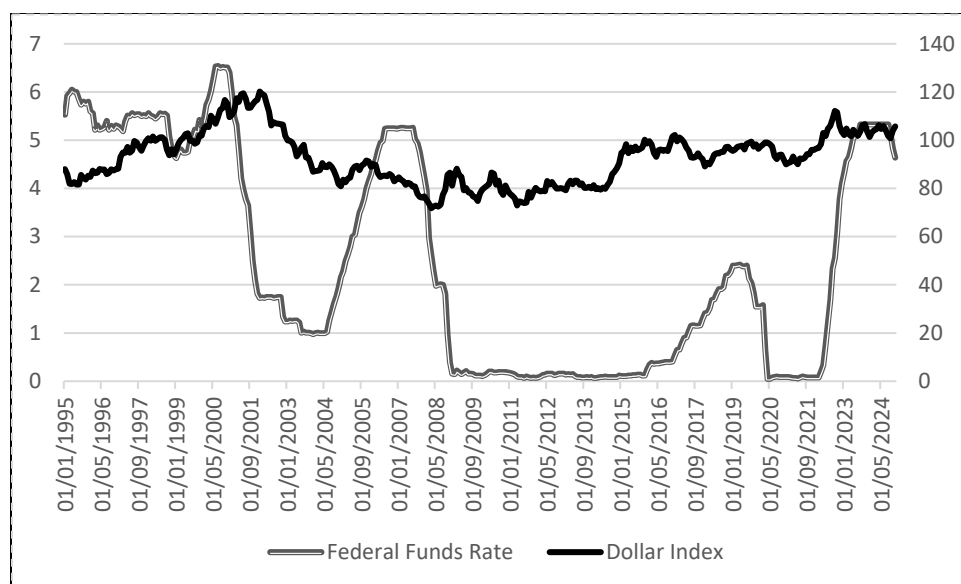
FIGURE 3 - *U.S. Inflation and DXY – 1995 to 2024*

Source: Based on data collected by authors.

In times of crisis (2008, 2020), the U.S. dollar strengthened despite lower inflation (Fig. 3), as global investors seek safety in U.S. assets. The biggest driver of the DXY is not just inflation alone, but how the Federal Reserve reacts to inflation through interest rate policy.

4.3 Federal Funds Rate

Generally, an increase in the Federal funds should typically result in strengthening of the US Dollar Index (DXY). Foreign flows will tend to flock to the U.S, as U.S. financial assets such as bonds and credit products will give investors a higher return. This will in turn, lead to increase in the price of assets, which should strengthen the U.S. dollar and the DXY. Hence, it can be said that federal funds rate and the dollar index should be positively correlated. Another important factor is interest rate differentials, where, in the case, the difference in interest rates between two economies causes capital to flow to the economy with the higher interest rates. This results in an increase in demand for the currency of the country with higher interest rates, strengthening its currency, here the US Dollar.

FIGURE 4 - *Federal Funds Rate and DXY – 1995 to 2024*

Source: Based on data collected by authors.

A rising federal funds rate should lead to a strengthening U.S. Dollar index. During the period under study, the correlation between federal funds rate and the dollar index is 0.24. The Federal Reserve Bank increased the federal funds rate during the periods: 1995-01, 2014-15, 2016-18 and 2023-24 and this led to a strengthening of the U.S. Dollar index (Fig. 4). The Fed had increased the rates to curb inflation with strengthening economic growth. While higher Fed rates generally strengthen the USD, external factors such as global crises, risk sentiment, and capital flows can override this effect. The relationship between Fed policy and DXY is strong but not perfectly linear, as seen in periods of financial instability.

4.4 Trade Deficits of US

A trade surplus for the US will support the dollar and conversely the dollar is likely to weaken if trade deficits are large. A trade deficit occurs when the imports of a country exceed its exports thus leading to a negative balance of trade. A growing trade deficit implies that the demand for foreign goods is high, which will create an increase in demand for foreign currencies and an increase in supply of US dollars. This creates a downward pressure on the dollar and hence in DXY. This paper has taken exports and imports as separate components of the trade deficit.

It must however be noted that despite a widening trade deficit the dollar index can remain strong if there is inflow of foreign capital in equity, bonds, real estate which can strengthen the dollar despite a widening trade deficit. A trade deficit can also be an indicator of a robust economy with high spending. In the 1980s, the United States experienced a wide trade deficit, particularly with Japan and Germany. Despite the growing trade deficit, the U.S. dollar initially appreciated in the early 1980s due to strong foreign investment, as well as higher interest rates set by the Federal Reserve under Paul Volcker to control inflation. However, the trade deficit eventually started to weaken the dollar, and the U.S. government intervened through the Plaza Accord of 1985. The U.S. Housing Crisis in the 2000s combined with a large trade deficit did not have a very strong impact on the dollar as China purchased large amounts of treasury bonds. In 2007-08 however, after the financial crisis, the dollar started losing strength. The trade deficit in this period had a much stronger impact on the index. The U.S. trade deficit continued to grow after the 2008 financial crisis and the dollar was relatively weak. However, the Federal Reserve's monetary policies (including low interest rates and quantitative easing) kept the dollar subdued during this period. It is thus apparent that the trade deficit plays a very crucial role in the strength of the index. Other factors sometimes take precedence and strengthen the dollar despite a large trade deficit. This continued during the Trump administration as well. Alongside trade deficits, tariff volatility as shown by Trump's policies can have an impact. On March 17th, the dollar index hovered around a five-month low against the major currencies after the president announced the tariffs.

4.5 Capital Inflows into the U.S.

As seen in the earlier examples, capital inflow into the United States can have a significant impact on the Dollar Index (DXY). Capital Inflows refers to the movement of money into the U.S. economy, typically in the form of foreign investment in assets like stocks, bonds, real estate, and businesses. The primary sources of capital inflows include foreign governments, multinational corporations, and investors. When capital flows into the U.S., foreign investors need to purchase U.S. dollars to make these investments. As demand for the dollar increases, its value strengthens. Conversely, if capital outflows occur, or if investors seek assets elsewhere (e.g., in emerging markets with higher growth potential or higher yields), it can weaken the dollar and lead to a decrease in the Dollar Index. The main drivers of capital inflows into the US are the U.S. Federal Reserve's interest rate policy. Higher interest rates tend to attract more

foreign investment which leads to more demand for the dollar, thereby pushing the DXY higher. A growing U.S. economy attracts investment. Investors may seek opportunities in a growing market, such as U.S. stocks or real estate, which requires the purchase of dollars. In periods of global uncertainty, the U.S. is often viewed as a safe haven, so capital inflows tend to increase. Investors wanting to escape volatility in emerging markets invest funds into U.S. assets, which strengthens the dollar and boosts the DXY. In 2022-23, foreign investment into U.S. financial markets increased significantly. This caused the value of the dollar to strengthen, pushing up the Dollar Index (DXY).

In the third Quarter of 2024, the U.S. recorded \$159.9 billion in net capital and financial account surplus in Q3 2024. This large influx of foreign capital into the U.S. financial system increased the demand for the dollar. Foreign investors buying U.S. bonds, stocks, and other financial instruments needed to convert their currencies into dollars, which raised the value of the dollar and strengthened the DXY.

The U.S. dollar is considered as a “safe haven” in times of economic uncertainty, geopolitical tensions, or financial market instability. A safe-haven asset is an investment that is expected to retain or increase in value during times of market turbulence or economic downturns. Investors rush to these assets as they are perceived as lower risk compared to other investments. When global markets experience turmoil – such as economic slowdowns, geopolitical crises, or financial market volatility – investors try to invest in U.S. assets (such as U.S. Treasury bonds, blue-chip stocks, and other dollar-denominated investments leading to a higher demand for the U.S. dollar, thereby driving up the Dollar Index (DXY). In the early stages of the COVID-19 pandemic, as global stock markets plummeted, investors rushed to the U.S. dollar and U.S. Treasury bonds for safety, leading to a sharp appreciation of the dollar. The Dollar Index surged in March 2020. In 2024, U.S.-based mutual funds and Exchange-Traded Funds (ETFs) received over \$700 billion in capital, particularly from foreign investors looking for safe-haven assets, pushing the DXY higher.

4.6 Consumer Sentiment and the Dollar Index

Consumer sentiment in a country is measured by the consumer confidence index. This can significantly influence the U.S. Dollar Index (DXY). A positive consumer sentiment (implying an

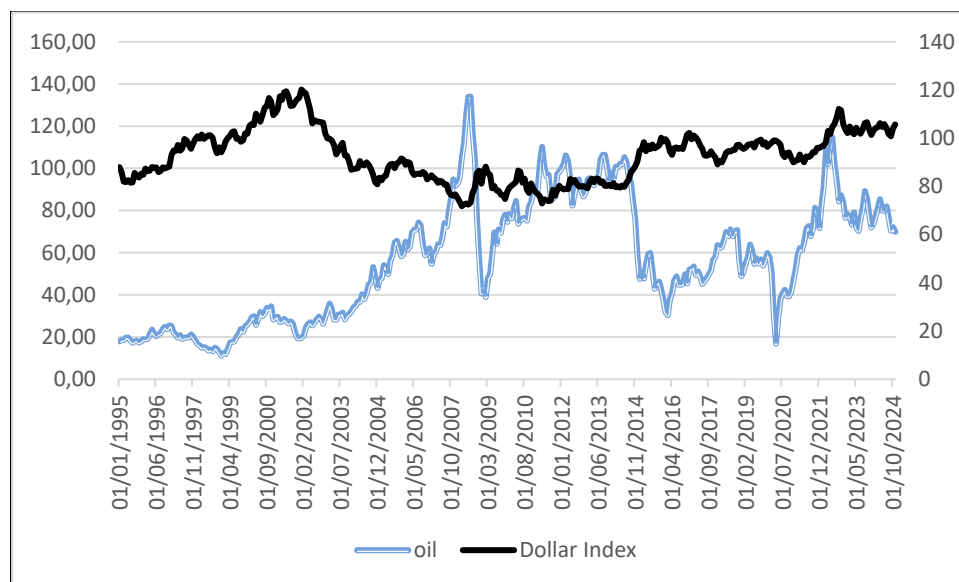
optimistic feel about the economy) suggests increased spending, which can boost GDP growth. This often leads to expectations of tighter monetary policy (higher interest rates), making the dollar more attractive. Alternatively, negative consumer sentiment (pessimism about the economy) can trigger weaker consumer spending, which might slow growth and lead to looser monetary policy (lower interest rates), weakening the dollar. The University of Michigan Consumer Sentiment Index fell from 101 in February 2020 to 71.8 in April 2020, reflecting economic uncertainty following the pandemic, lockdowns and job losses. The U.S. Dollar Index was strong in March 2020 (103) due to a flight to safety but weakened significantly later, reaching 89 by January 2021.

4.7 Oil Prices and the Dollar Index (DXY)

Oil prices can influence the DXY. The US was an importer of crude oil till recently. Increase in oil prices would increase the import bill and lead to a widening trade deficit thereby leading to a weakening of the dollar. Historical examples when the dollar index fell but the oil prices were going up can be noted. Crude oil prices surged from \$60 per barrel in early 2007 to \$147 per barrel in July 2008. In the same time, the DXY fell sharply during the same period, dropping from around 85 in early 2007 to nearly 72 in mid-2008.

We can also identify reasons for a positive relation between the index and oil prices. Crude oil is typically traded on global markets in U.S. dollars. Hence, countries that import oil need dollars to buy it. When oil prices go up, oil-importing countries (e.g., India, China, Japan, and the Eurozone) need more USD to buy the oil, which increases demand for the dollar and strengthens the dollar index. A rise in oil prices can also lead to inflationary pressures in the U.S. This could urge the Federal Reserve to increase interest rates. This would lead to a stronger dollar, which could push the DXY higher.

The US was traditionally an oil importer but with the introduction of shale, it became one of the world's top oil producers. Higher oil prices now benefit the U.S. economy which can strengthen the dollar. Supply shocks (e.g., OPEC decisions, Ukraine war, or sanctions) can drive oil prices higher regardless of the dollar's strength. Also, a strong global economy increases oil demand, irrespective of oil prices.

FIGURE 5 - *Crude Oil Price and DXY – 1995 to 2024*

Source: Based on data collected by authors.

The above diagram shows the trend in the dollar index and the oil prices. As discussed, the two have not consistently moved in either the same or opposite direction.

4.8 Gold Prices and Dollar

Gold prices and the U.S. Dollar Index (DXY) has an inverse relationship. Gold and the U.S. dollars are both seen as safe-haven assets with little risk. When investors lose confidence in the dollar (due to inflation, recession fears, or Fed policies), they often shift their assets into gold, thereby pushing up gold prices and weakening the DXY. Conversely, when the dollar is strong due to tight monetary policy and economic boom, gold is less attractive, leading to lower gold prices. In 2022, as the Fed aggressively raised interest rates, the dollar surged, and gold prices dropped. During the 1970s stagflation, gold surged while the dollar struggled due to inflation. If interest rates are high then investment moves towards the dollar and the gold demand falls. If interest rates fall, the opportunity cost of holding gold drops, making gold more attractive and weakening the dollar. Gold can also replace dollars in the reserves held by Central Banks. In recent years, China and Russia increased gold reserves reducing reliance on the dollar, which weakened the DXY.

4.9 Geopolitical and Economic Events

Geopolitical and economic events play a crucial role in shaping national and global economies. These include political, military, or international affairs that influence trade, investments, inflation, and financial markets. Recessions, like the 2008 Global Financial Crisis and the COVID-19 recession, have led to GDP declines, rising unemployment, and the introduction of stimulus measures. In the late 1990s, the Asian financial crisis (1997) and the Russian financial crisis (1998) led to a stronger dollar as investors sought stability. The dot-com bubble burst in 2000, and the Federal Reserve responded with rate cuts, impacting the DXY. Following the September 11 attacks in 2001, the dollar initially weakened due to economic uncertainty but rebounded with subsequent Federal Reserve actions. The U.S. invasion of Iraq in 2003 and the capture and execution of Saddam Hussein in 2006 had limited long-term effects on the dollar but influenced investor sentiment. The 2007-2008 financial crisis saw the DXY drop to a record low in early 2008 before recovering due to aggressive monetary policy interventions. The European sovereign debt crisis (2010) and the Arab Spring (2010-2011) further strengthened the dollar as a safe-haven asset. In the mid-2010s, geopolitical events such as the annexation of Crimea (2014), the Brexit referendum (2016), and the escalation of the U.S.-China trade war (2018) impacted market confidence in global currencies, contributing to fluctuations in the DXY. The COVID-19 pandemic in 2020 led to extreme volatility, with an initial flight to the dollar followed by a decline due to unprecedented monetary stimulus. More recently, the Russian invasion of Ukraine (2022) and the ongoing geopolitical tensions in the Middle East, including the Gaza War and the Houthi insurgency, have influenced global financial markets and the strength of the dollar. These events highlight how both economic crises and geopolitical uncertainties drive the demand for the U.S. dollar in global markets. The US Dollar Index is influenced by economic, monetary, geopolitical, and market forces.

DATA AND METHODOLOGY

The current study spans a period of thirty years between January 1995 and December 2024 on a monthly basis. Economic indicators are among the most significant drivers of the DXY. Key macroeconomic indicators, such as unemployment rates, inflation, exports and imports, federal funds rate, consumer confidence, foreign inflows; commodities prices including oil prices and gold prices; and geopolitical events.

The data series geopolitical events has been created as a dummy variable comprising 0 and 1, wherein the month has been marked as '1' to mark a significant geopolitical event that had occurred during the month and otherwise as '0'. The list of geopolitical events and economic crises that have had an impact on the U.S. Dollar index during the period 1995-2024, based on which the dummy series has been created, is included as Annexure II.

Given that the data is in the time series format and longitudinal data may suffer from stationarity challenges, first the Augmented Dickey Fuller test was carried out to test the stationarity of all the above-mentioned variables:

TABLE 1 - *Augmented Dickey Fuller Test Output*

Variable	ADF Statistic	p-value	Stationary (p < 0.05)
unemp	-3.085	0.028	Yes
inflation	-3.068	0.029	Yes
oil	-2.656	0.082	No
fed_rate	-2.892	0.046	Yes
Dollar Index	-1.605	0.481	No
Gold	0.906	0.993	No
Consumer Confidence	-1.636	0.465	No
Exports	-0.075	0.952	No
Imports	-0.372	0.915	No
GEOPOL	-18.148	0.000	Yes
Inflows	-2.95	0.040	Yes

Table 1 shows that Unemployment, Inflation, Federal Funds Rate, Foreign Inflows and the Geopolitical Events dummy variable are stationary while Oil Prices, US Dollar Index, Gold Prices, Exports and Imports are non-stationary.

Non-stationary data can lead to misleading or spurious results wherein regression output can show relationships that are statistically significant but meaningless. Hence, most time series

models assume data to be stationary or integrated to a similar order, i.e. either all variables are I (0) or all variables are I (1).

Since the data is a mix of stationary and non-stationary variables, for further analysis, the Autoregressive Distributed Lag (ARDL) model has been used in the current study. It is used in time series analysis when the dependent variable and one or more independent variables, are a mix of stationary I (0) and non-stationary I (1) variables. Table 2 shows that all the non-stationary variables (Table 1) are stationary at first difference.

TABLE 2 - *Augmented Dickey Fuller Test Output - (I(1))*

Variable	ADF Statistic	p-value	Stationary (at 5%)
Diff (Dollar Index)	-17.87	3.04E-30	Yes
Diff (oil)	-13.25	8.73E-25	Yes
Diff (Gold)	-12.7	1.07E-23	Yes
Diff (Consumer Confidence)	-11.18	2.47E-20	Yes
Diff (Imports)	-8.06	1.61E-12	Yes
Diff (Exports)	-4.78	5.96E-05	Yes

The Autoregressive Distributed Lag (ARDL) model

Steps in the ARDL Model:

Optimal Lag Lengths Selection: using criteria such as AIC, SIC, or BIC to select the best lag structure for ARDL (p, q1, q2, ..., qk). The appropriate lag length for the ARDL model, is best decided based on both statistical criteria and economic intuition:

- i. Statistical Criteria: Information Criteria (AIC/BIC) where the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) - The ARDL lag order selection process involves estimating models with different lag combinations and choosing the one with the lowest AIC or BIC.
- ii. Economic Theory & Data Frequency where the general lag lengths are based on data frequency. For monthly data typically lag length is 1–4, since economic effects may take several

months to materialize, for quarterly data typically lag length is 2–4 and annual data usually just 1 lag.

To ensure appropriate lag length has been selected, autocorrelation may be tested after model has been fitted; where in case, autocorrelation remains, lags could be increased.

For the current study, lag length of 4 is used and subsequently tested for stability.

ARDL Model Estimation:

The Autoregressive Distributed Lag (ARDL) model is a linear regression model that has the autoregressive section including lags of the dependent variable and the distributed lag section that includes lags of the independent variables.

ARDL (p, q) Model: For one dependent variable Y_t and one independent variable X_t :

$$Y_t = \alpha_0 + \sum_{i=1}^p \alpha_i Y_{t-i} + \sum_{j=0}^q \beta_j X_{t-j} + \epsilon_t$$

Where:

Y_t : Dependent variable

X_t : Independent variable

p, q: Optimal lags of YY and XX

ϵ_t : Error term

In the current study, Y_t includes U.S. Dollar Index and X_t include all variables at 4 lags (L0, L1, L2, L3 and L4) including lags of U.S. Dollar Index, itself.

The detailed ARDL output at lag length 4 (Annexure III A) shows that the Dollar Index is highly persistent with the first lag value having a significant coefficient of 0.72. Besides the US Dollar index impacting itself, a one unit increase in unemployment this month is associated with a 0.08 increase in the Dollar Index.

Oil prices have a lagged effect on value of the US Dollar Index this month with a one unit increase in oil price this month leading to a 0.04 decrease in the Dollar Index and the effect of

last month's oil price is also negative and significant. While gold prices have a small but significant negative effect on the Dollar Index.

The US Dollar Index is influenced positively by changes in the Federal Funds Rate where a one increase in the Fed Rate this month is associated with a 0.21 increase in the Dollar Index.

Since none of variables are significant after lag length 2, the output for lag length 2 is included in Annexure III B. The variables Consumer Confidence, Exports, Imports, Geopol and Inflows, being insignificant at all lag lengths, have not been included in the result.

The ARDL bounds test for cointegration yielded an F-statistic of 5.12, which exceeds the 5% upper critical value of 4.01. Hence, the null hypothesis of no long-run relationship is rejected and it can be concluded that the Dollar Index and its regressors are cointegrated.

Long-run Equation

The long-run equation derived from the ARDL model shows the equilibrium relationship between the US Dollar Index and the key macroeconomic indicators after the short-run fluctuations are adjusted.

TABLE 4 - Long-Run Coefficients with Standard Errors

Variable	LRC	SE(LRC)	t-Statistic	p-Value
Unemployment	4.67	2.4	1.95	0.052*
Inflation	-0.67	2.4	-0.28	0.78
Oil Prices	-2.33	0.73	-3.19	0.002***
Fed Rate	10.33	6.13	1.69	0.092*
Gold	-0.33	0	Undefined	1

*** denotes significance of 1%, ** denotes significance of 5%, * denotes significance of 10%.

Table 4 shows the results. Oil Prices have a statistically significant negative long-run effect on the Dollar Index while the Federal Rate has a marginally significant positive effect and unemployment is borderline significant. Inflation and Gold have no significant long-run impact.

Robustness Tests

To ensure the reliability and validity of an Autoregressive Distributed Lag (ARDL) model, robustness tests are critical. These tests verify that the model's assumptions hold and that results are consistent across specifications (Table 5). The Breusch-Godfrey LM Test, Breusch-Pagan Test and Jarque-Bera Test check serial correlation/autocorrelation, presence of heteroskedasticity and normality of residuals respectively. Additionally, the model was re-estimated using 3 and 5 lags and the key co-efficients were compared. The key co-efficients were compared and they remained similar in sign and significance indicating robustness to lag length.

TABLE 5 - *Robustness Tests*

Test	Statistic	p-value	Conclusion ($\alpha=0.05$)
Breusch-Godfrey LM Test	7.94	0.094	No autocorrelation
Breusch-Pagan	56.17	0.158	No heteroskedasticity
Jarque-Bera	2.76	0.251	Residuals are normal
ARDL (3) vs ARDL (4) vs ARDL (5)			Coefficients were stable

Results and Interpretation

Exchange rates and their indices often exhibit persistence due to market momentum, investor expectations, and gradual adjustments to macroeconomic fundamentals. In the short run, changes are sticky due to market frictions, policy anticipation, or global capital flows. The impact of unemployment rate on the U.S. Dollar Index being positive, may appear counterintuitive, as higher unemployment typically signals economic weakness and might lead to currency depreciation. However, in a situation of unemployment, markets are likely anticipating a stimulus, which paradoxically may attract capital inflows. The US Dollar may appreciate as a safe-haven currency, attracting demand despite domestic weakness.

The US is a net oil exporter, but higher oil prices often raise inflation, possibly triggering concerns about economic slowdown and weaker consumer spending. Moreover, oil is priced in dollars globally. When oil prices rise, other countries need more dollars to purchase oil, but this doesn't always strengthen the dollar due to the negative economic implications for oil-importing

countries, potentially reducing global demand and weakening the dollar. With respect to gold prices, the inverse relationship reflects shifts in global risk sentiment and inflation hedging behaviour.

Higher interest rates attract foreign capital, increasing demand for dollar-denominated assets. This result aligns well with interest rate parity theory, which states that currencies with higher interest rates tend to appreciate, *ceteris paribus*. Our ARDL analysis also shows that all the other variables included in the analysis do not have any significant impact on the US Dollar index.

In the long-run, monetary policy, here the federal funds rate, is the dominant long-run driver of the Dollar Index having the largest and most persistent effect (statistically significant at 10%). Whereas oil prices have lesser impact but significant at 1%.

5. CONCLUSION

This study set out to examine the macroeconomic determinants of the U.S. Dollar Index and to develop an econometric model capable of predicting its behaviour. The ARDL model confirmed both short-run dynamics and a stable long-run relationship between the Dollar Index and selected macroeconomic indicators.

For financial markets and investors, the findings underscore the Dollar Index's sensitivity to a combination of monetary policy, labor market signals, and global commodity trends. The strong persistence observed in the Dollar Index suggests that momentum-based strategies and trend-following behaviour are relevant. Furthermore, the confirmed impact of interest rates and global uncertainty reinforces the U.S. dollar's dual role – as both a policy-driven currency and a global safe-haven asset. These insights can enhance portfolio strategies that involve foreign exchange exposure, particularly in times of policy shifts or global volatility.

For policymakers, especially within the U.S., the results provide valuable signals on how domestic indicators such as the Federal Funds Rate and unemployment interact with external pressures like oil prices to influence currency strength. Understanding these relationships is crucial for anticipating the broader economic consequences of policy actions and for managing exchange rate expectations.

This research offers a useful framework for anticipating movements in the U.S. Dollar Index. It highlights the importance of closely monitoring both domestic macroeconomic trends and international market signals, as their interplay continues to shape currency valuation in a globally interconnected financial system.

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ANNEXURES

ANNEXURE I: DATA SOURCES

Factor	Source
U.S. Unemployment Rate	Macrotrends : U.S. Unemployment Rate 1991-2025
U.S. Inflation	Macrotrends : U.S. Inflation 1991-2025
Federal Funds Rate	Macrotrends : Federal Funds Rate 1991-2025
U.S. Consumer Confidence Index	FRED – St. Louis FED : University of Michigan: Consumer Sentiment (UMCSENT)
U.S. Imports	Federal Reserve Economic Data, Federal Reserve Bank of St. Louis Link: https://fred.stlouisfed.org
U.S. Exports	Federal Reserve Economic Data, Federal Reserve Bank of St. Louis https://fred.stlouisfed.org/series/BOPTEXP
U.S. Foreign inflows	U.S. Department of Treasury : TIC monthly data on cross-border portfolio financial flows
Price of Crude Oil	Macrotrends : Crude Oil Prices 1991-2025
Price of Gold	Indexmundi : Gold monthly price – US dollar per troy ounce
Geopolitical Events	Culled out by authors based on Annexure II
U.S. Dollar index	Macrotrends : U.S. Dollar Index 1991-2025

ANNEXURE II: LIST OF GEOPOLITICAL AND ECONOMIC EVENTS 1995 - 2024

Year	Geopolitical and Economic Events
1995	Federal Reserve raised interest rates slightly from 5.45% to 5.6% amid concerns of inflation due to economic boom; Bosnian War ends.
1997	Asian financial crisis; Long-Term Capital Management (LTCM) reform approved.
1998	Russian financial crisis; President Clinton impeached by the House of Representatives; U.S. Treasury reports budget surplus.
2000	Dot-com bubble collapses; George W. Bush elected President after Supreme Court decision on Florida recount.
2001	Recession from March to November; Economic Growth and Tax Relief Reconciliation Act passed; September 11 attacks.
2003	U.S. invasion of Iraq; Jobs and Growth Tax Relief Reconciliation Act passed; Capture of Saddam Hussein.
2006	Execution of Saddam Hussein.
2007	Global Financial Crisis and the ensuing recession begins in December.
2008	Record low DXY of 71.30 on March 17; Economic Stimulus Act passed; Global financial crisis intensifies; Barack Obama elected President.
2010	European sovereign debt crisis begins; Second period of quantitative easing (QE2) begins; Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act passed; Arab Spring begins.
2011	Syrian civil war and Libyan Crisis begin; Osama bin Laden killed; Operation Twist initiated; Budget Control Act passed.
2014	2010s oil glut; Euromaidan crisis in Ukraine; Greek debt crisis midpoint; Gaza War.
2015	Fed raised rates; European migrant crisis accelerates; Donald Trump announces his candidacy for President; Houthi insurgency in Yemen intensifies.
2016	Brexit referendum; Donald Trump elected President.
2018	Initiation of Trump tariffs; North Korea-U.S. summit; U.S. midterm elections lead to significant political shifts; Government shutdown.
2020	Assassination of Qasem Soleimani; COVID-19 pandemic declared; George Floyd protests.
2022	Federal Reserve raises interest rates; Russian invasion of Ukraine; Global energy crisis.
2024	Escalating geopolitical conflicts in the Middle East; Federal Reserve cuts interest rates; Donald Trump elected to second non-consecutive term.

ANNEXURE III A

Variable	Coefficient	Std. Error	t-Statistic	p-Value
L1.Dollar_Index	0.72	0.06	12	0***
L2.Dollar_Index	0.12	0.06	2	0.047***
L3.Dollar_Index	0.09	0.06	1.5	0.135
L4.Dollar_Index	0.04	0.06	0.67	0.504
L0.unemp	0.08	0.04	2	0.048***
L1.unemp	0.03	0.03	1	0.32
L2.unemp	0.02	0.03	0.67	0.504
L3.unemp	0.01	0.03	0.33	0.74
L4.unemp	0	0.03	0	1
L0.inflation	-0.04	0.04	-1	0.32
L1.inflation	-0.01	0.03	-0.33	0.74
L2.inflation	0	0.03	0	1
L3.inflation	0.01	0.03	0.33	0.74
L4.inflation	0.02	0.03	0.67	0.504
L0.oil	-0.05	0.01	-5	0***
L1.oil	-0.02	0.01	-2	0.046***
L2.oil	-0.01	0.01	-1	0.32
L3.oil	0	0.01	0	1
L4.oil	0.01	0.01	1	0.32
L0.fed_rate	0.21	0.09	2.33	0.021***
L1.fed_rate	0.07	0.08	0.88	0.381
L2.fed_rate	0.02	0.08	0.25	0.803
L3.fed_rate	0.01	0.08	0.13	0.894
L4.fed_rate	0	0.08	0	1
L0.Gold	-0.01	0	-2.2	0.029***
L1.Gold	0	0	-0.9	0.37
L2.Gold	0	0	0	1
L3.Gold	0	0	0	1
L4.Gold	0	0	0	1

Annexure III A - *continued*

Variable	Coefficient	Std. Error	t-Statistic	p-Value
L0.Consumer_Confidence	0.01	0.01	1	0.32
L1.Consumer_Confidence	0	0.01	0	1
L2.Consumer_Confidence	0	0.01	0	1
L3.Consumer_Confidence	0	0.01	0	1
L4.Consumer_Confidence	0	0.01	0	1
L0.Exports	0	0	1	0.32
L1.Exports	0	0	0	1
L2.Exports	0	0	0	1
L3.Exports	0	0	0	1
L4.Exports	0	0	0	1
L0.Imports	0	0	1	0.32
L1.Imports	0	0	0	1
L2.Imports	0	0	0	1
L3.Imports	0	0	0	1
L4.Imports	0	0	0	1
L0.GEOPOL	0	0.01	0	1
L1.GEOPOL	0	0.01	0	1
L2.GEOPOL	0	0.01	0	1
L3.GEOPOL	0	0.01	0	1
L4.GEOPOL	0	0.01	0	1
L0.Inflows	0	0	1	0.32
L1.Inflows	0	0	0	1
L2.Inflows	0	0	0	1
L3.Inflows	0	0	0	1
L4.Inflows	0	0	0	1
Intercept	1.02	0.84	1.21	0.228
Model Fit Statistics:				
R-squared	0.97			
Adj. R-squared	0.96			

*** denotes significance of 1%, ** denotes significance of 5%, * denotes significance of 10%.

ANNEXURE III B

Variable	Coefficient	Std. Error	t-statistic	p-value
const	1.02	0.84	1.21	0.228
L1.Dollar Index	0.72	0.06	12	0***
L2.Dollar Index	0.12	0.06	2	0.047***
L0.unemp	0.08	0.04	2	0.048***
L1.unemp	0.03	0.03	1	0.32
L2.unemp	0.02	0.03	0.67	0.504
L0.inflation	-0.04	0.04	-1	0.32
L1.inflation	-0.01	0.03	-0.33	0.74
L2.inflation	0	0.03	0	1
L0.oil	-0.05	0.01	-5	0***
L1.oil	-0.02	0.01	-2	0.046***
L2.oil	-0.01	0.01	-1	0.32
L0.fed rate	0.21	0.09	2.33	0.021***
L1.fed rate	0.07	0.08	0.88	0.381
L2.fed rate	0.02	0.08	0.25	0.803
L0.Gold	-0.01	0	-2.2	0.029***
L1.Gold	0	0	-0.9	0.37
L2.Gold	0	0	0	1

*** denotes significance of 1%, ** denotes significance of 5%, * denotes significance of 10%,