Policy uncertainty spillovers across G7 countries and central banks gold reserves: an empirical exploration with future directions

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Presentation Flow

1. Background
2. Empirical Methods
3. Results
4. Conclusion, implications, limitations and future scope

Background and Introduction

Record high demand for gold by the global central banks in 2022 and 2023

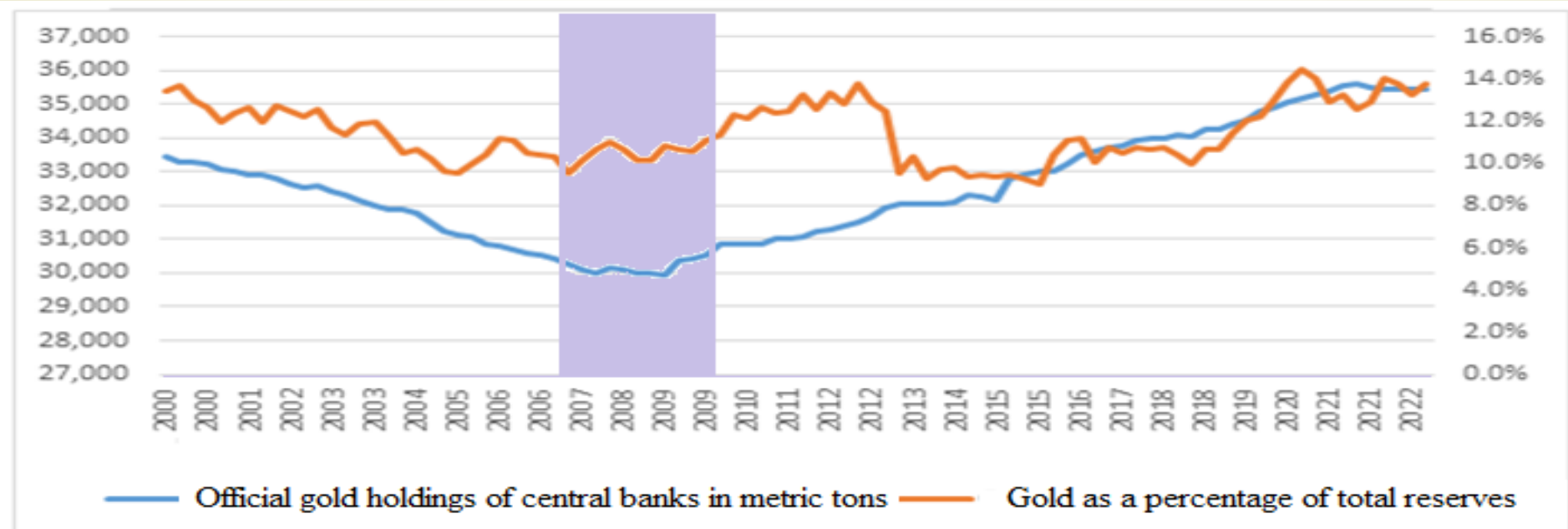

Figure 1. Quarterly official gold holdings and gold as a percentage of total reserves held by global central banks

Preference for gold

- The preference for gold in the central bank's balance sheet is credited to the confidence it instils in fiat currency during financial and political emergencies, and its use as collateral
- Global financial crisis, European debt crisis, COVID-19 pandemic period followed by Russia's invasion of Ukraine in early 2022 with record high inflation and banking panics was (and is still) a perfect mix of these challenges
- **Existing studies-** Macroeconomic, Financial and Geopolitical factors (Ghosh, 2016; Gopalakrishnan and Mohapatra, 2018; Oztunç and Orhan, 2021; Arslanalp et al., 2023)
- We intend to explore how policy uncertainty spillovers (or policy interdependence) across countries are related to gold reserves

Policy interdependence and gold reserves

- Each country has a unique set of economic, social, and political challenges (inflation and unemployment tradeoffs)
- The domestic policies (monetary or fiscal) are therefore unlikely to be in line with the shared international objectives
- Plazza Accord of 1975; the Louvre Accord of 1985; Financial Stability Board
- Domestic economic policies could result in volatile exchange rate movements, global financial uncertainty and policy spillovers to other countries
- US monetary policy tightening (Asymmetric position as a dominant reserve)
- US and EU sanctions on Russia and the nationalistic macroeconomic policies

Cont….

- Given the historical relevance and the properties of gold as a safe asset with no one's liability, we **hypothesize** that the gold reserves are also related to policy uncertainty spillovers across countries
- G7 countries
- Following the existing literature- USD movements, US treasury yield, inflation, and market uncertainty (VIX) as additional control variables
- Focus on the US macroeconomic variables

Data description

- Gold reserves as a percentage of total reserves-WGC, USD index, VIX, US CPI, and treasury yields comes from *www.investing.com* and *Fed*
- Monthly economic policy uncertainty (EPU)- *policyuncertainty.com*
- Data range: Q4 2006 to Q4 2022
- The data range accounts for minor banking crises, record-high inflation, monetary policy tightening, Wars, record-high gold reserves demand

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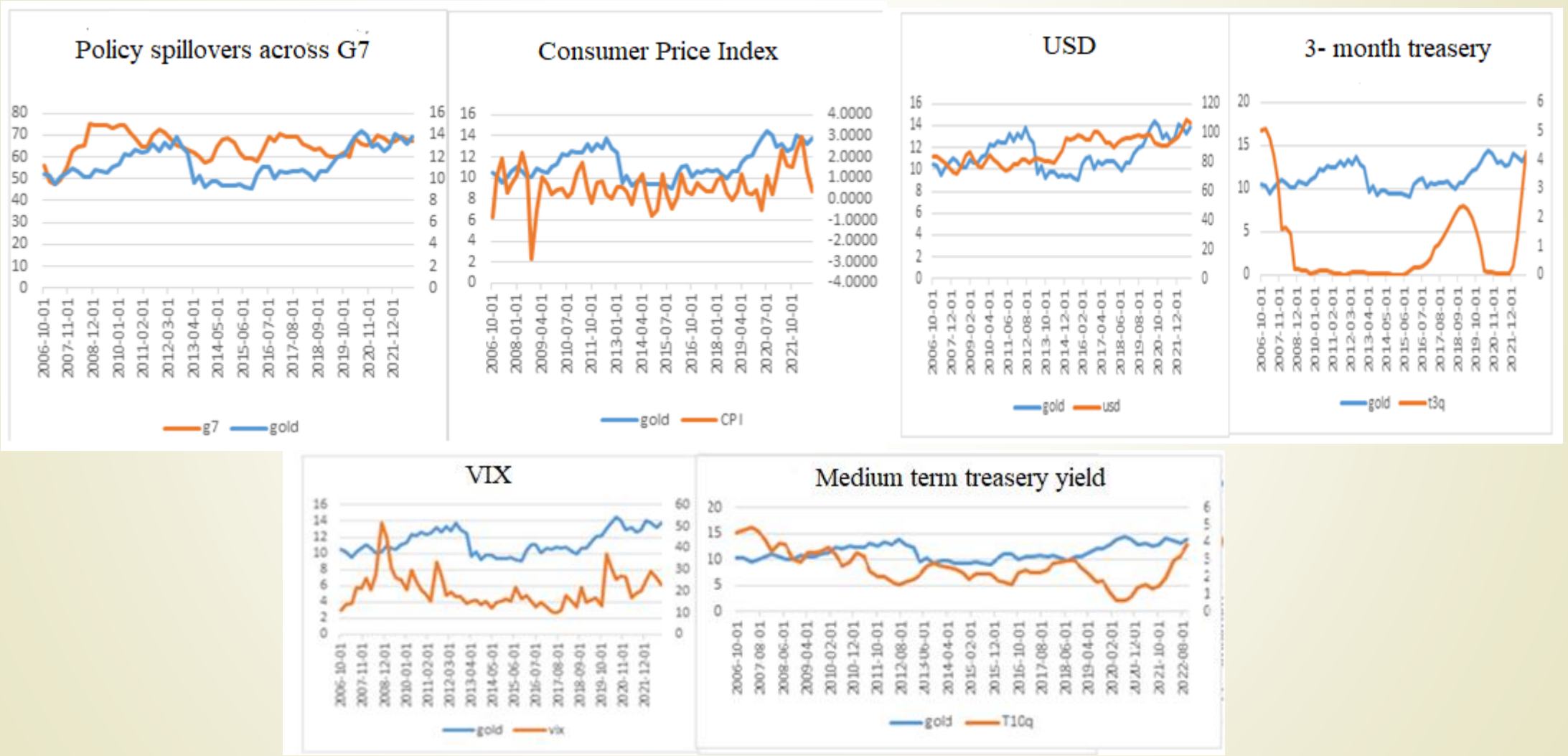
Evolution of gold as a percentage of total reserves vs policy uncertainty spillovers, and other macroeconomic variables

Figure 2.



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Correlation

	GOLD	CPI	G7	T10Q	T3Q	USD	VIX
GOLD	1						
CPI	0.298	1					
G7	0.332	-0.111	1				
T10Q	-0.412	0.066	-0.276	1			
T3Q	-0.146	0.080	-0.596	0.650	1		
USD	0.132	0.019	0.002	-0.407	0.125	1	
VIX	0.322	-0.223	0.408	-0.007	-0.173	-0.089	1

Table 1

Methodological Framework

- VAR-based, GFEVD, measures h-step ahea Forecast error variance in variable, say EPU of EU due to a shock in the EPU of US

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- Total Spillover Index (G7): sum of non-diagonal elements to total markets (variables) involved.

$$\frac{1}{N}\sum_{i,j=1}^{N} d_{ij}*100$$

Table 2. Overall Connectedness Table

	x_1	x_2	…	x_N	From
x_1	d_{11}	d_{12}	…	d_{1N}	$\sum_{j=1}^{N} d_{1j}, d_{11} = 0$
x_2	d_{21}	d_{22}	…	d_{2N}	$\sum_{j=1}^{N} d_{2j}, d_{22} = 0$
⋮	⋮	⋮	…	⋮	⋮
x_N	d_{N1}	d_{N2}	…	d_{NN}	$\sum_{j=1}^{N} d_{Nj}, d_{NN} = 0$
To	$\sum_{i=1}^{N} d_{i1}$, $d_{11} = 0$	$\sum_{i=1}^{N} d_{i2}$, $d_{22} = 0$	…	$\sum_{i=1}^{N} d_{2j}$, $d_{22} = 0$	$\sum_{i,j=1}^{N} d_{ij}$, $d_{ij} = 0 \; if \; i = j$

Policy uncertainty spillovers across G7

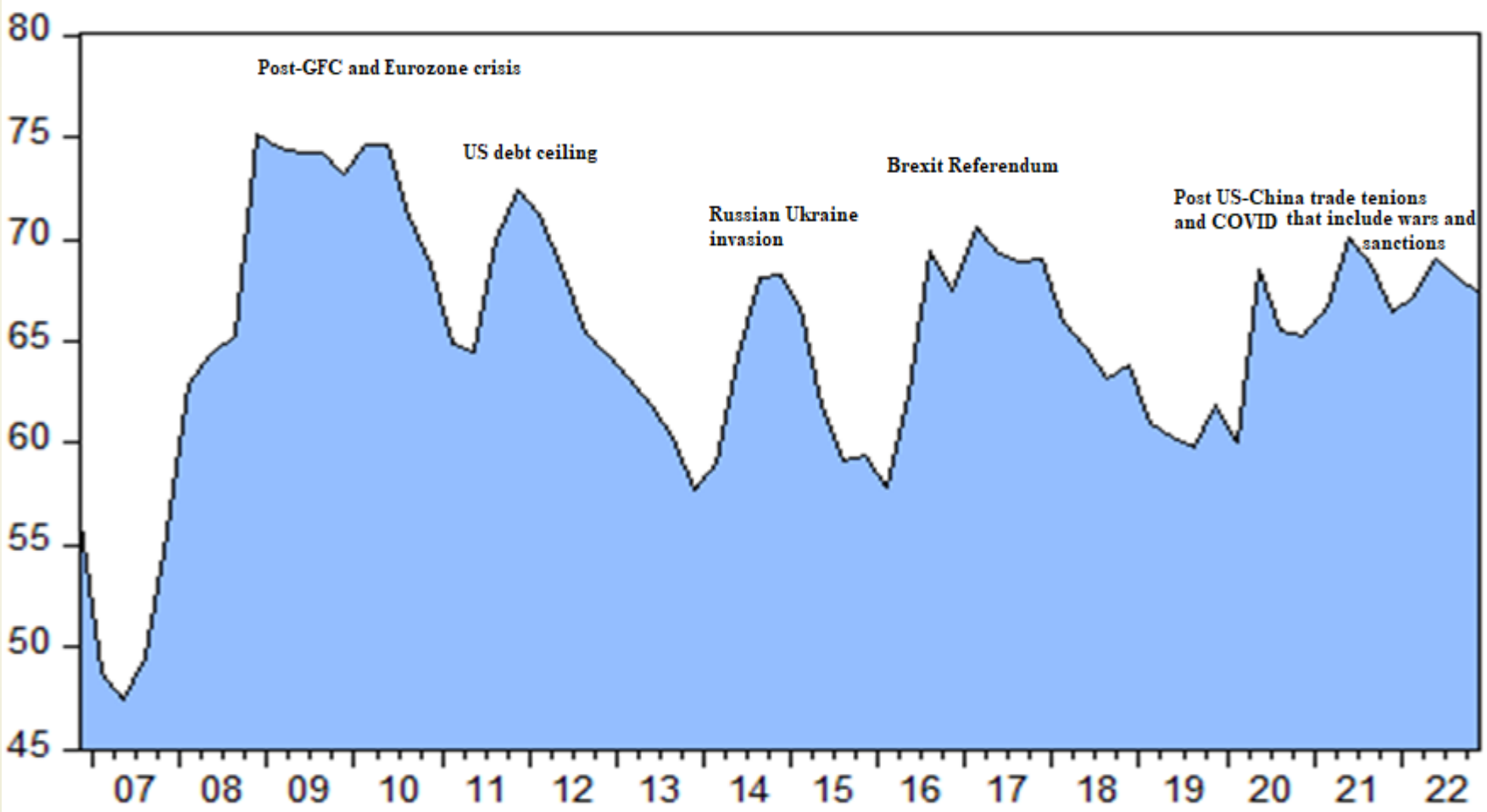

Figure 3

ARDL

- ARDL framework for its effectiveness in case of a modest sample size (which in our case is 65), variables being stationary at level or at the first difference and the provision of long-run, short-run and error correction coefficients

$$Gold = F(G7, CPI, T10, T3, USD, VIX)$$

$$Gold = \omega_0 + \omega_1 lnG7 + \omega_2 CPI + \omega_3 T10 + \omega_4 T3 + \omega_5 lnUSD + \omega_6 lnVIX$$

- $\Delta(Gold)_t = b_0 + \sum_{i=1}^{l} \Upsilon_1 \Delta(Gold)_{t-i} + \sum_{i=0}^{m} \Upsilon_2 \Delta(lnG7)_{t-i} + \sum_{i=0}^{n} \Upsilon_3 \Delta(CPI)_{t-i} + \sum_{i=0}^{o} \Upsilon_4 \Delta(T10) + \sum_{i=0}^{p} \Upsilon_5 \Delta(T3)_{t-i} + \sum_{i=0}^{q} \Upsilon_6 \Delta(lnUSD)_{t-i} + \sum_{i=0}^{r} \Upsilon_7 \Delta(lnVIX)_{t-i} + \beta_1 (Gold)_{t-1} + \beta_2 (lnG7)_{t-1} + \beta_3 (CPI)_{t-1} + \beta_4 (T10)_{t-1} + \beta_5 (T3)_{t-1} + \beta_6 (lnUSD)_{t-1} + \beta_7 (LNVIX)_{t-1} + \varepsilon_t$
- Variables not I(2)- ADF and PP

Does co-integration exist?

- **Null Hypothesis:** H_0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = 0$, implying that there is no long-run steady-state equilibrium relationship, against
- **Alternative Hypothesis:** H_A: $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_6 \neq \beta_7 \neq 0$, meaning that the long-run relationship exists
- null hypothesis of no cointegration is rejected

F-Bounds Test		Null Hypothesis: No Levels relationship		
		Signif	I(0)	I(1)
Test Statistic	Value	Asymptotic: n=1000		
F-Statistic K	5.2406	10%	1.99	2.94
		5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99

Empirical results

Table 4. long-run -ARDL

Levels Equation				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LG7	6.495	1.992	3.260	0.002
CPI	1.671	0.247	6.765	0
T10Q	-1.457	0.208	-6.997	0
T3Q	0.684	0.200	3.413	0.001
LUSD	-4.544	1.572	-2.889	0.006
LVIX	2.339	0.447	5.226	0
C	-0.073	9.259	-0.007	0.993

Table 5. Short-run -ARDL

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
D(GOLD(-1))	0.410	0.127	3.218	0.0025
D(GOLD(-2))	0.336	0.136	2.458	0.0182
D(GOLD(-3))	-0.378	0.113	-3.338	0.0018
D(LG7)	3.471	1.955	1.775	0.0831
D(LG7(-1))	-3.782	2.647	-1.429	0.1604
D(LG7(-2))	-0.864	2.726	-0.316	0.7529
D(LG7(-3))	5.276	1.675	3.149	0.003
D(CPI)	0.245	0.113	2.169	0.0358
D(CPI(-1))	0.104	0.135	0.773	0.4437
D(CPI(-2))	0.204	0.126	1.616	0.1135
D(CPI(-3))	0.500	0.131	3.800	0.0005
D(T10Q)	-0.920	0.205	-4.470	0.0001
D(T3Q)	0.432	0.141	3.043	0.004
D(LUSD)	-10.061	2.193	-4.587	0
D(LVIX)	0.676	0.257	2.628	0.0119
D(LVIX(-1))	-0.690	0.303	-2.272	0.0282
D(LVIX(-2))	-0.548	0.279	-1.962	0.0564
CointEq(-1)	-0.631	0.090	-6.993	0

Diagnostic Tests

R-squared	0.639786	Mean dependent var	0.069496
Adjusted R-squared	0.551570	S.D. dependent var	0.685993
S.E. of regression	0.459375	Akaike info criterion	1.466140
Sum squared resid	10.34023	Schwarz criterion	1.912152
Log-likelihood	-32.45033	Hannan-Quinn criter.	1.641255
Durbin-Watson stat	1.883667		
Ramsey Reset Test (specification)		No misspecification (omission and non-linearity)	
Breusch-Godfrey Serial correlation LM test		No serial correlation	
Breusch-Pagan-Godfrey Heteroskedasticity Test:		Homoskedastic	
CUSUM		Stable	
CUSUM-Square		Stable	

Limitations and future directions

- Intended to direct the attention of gold policy researchers and central bank reserve managers on policy uncertainty spillovers across countries and their relationship with gold reserves
- Implicit assumption that gold is a global asset
- Domestic factors
- Exchange rate arrangement-
- Policy uncertainty spillovers among various groups of countries- (BRICSplus)
- Asymmetric relationship
- Similar investigation for dollar reserves
- Drivers of policy uncertainty spillovers- financial, macroeconomic or geopolitical

Results and implications

- This analysis confirmed the importance of various macroeconomic determinants, but highlighted the domination of policy uncertainty spillovers and USD in both the long and short-run.

- The revelations are important for central banks reserve managers to actively strategize their gold holdings amid rising global policy uncertainty spillovers

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THANK YOU!

Suggestions?