International Journal of Economics and Finance; Vol. 14, No. 6; 2022
ISSN 1916-971X E-ISSN 1916-9728
Published by Canadian Center of Science and Education

Spillovers of US Unconventional Monetary Policy to Emerging Markets: Evidence from Egypt

Ahmed Ashour Abdullah[1] & Ahmed Mohamed Hassanien[2]

[1] Associated Professor of Economics, Institute of National Planning, Cairo, Egypt

[2] Department of Economic, Faculty of Economics and Political Science, Cairo University, Giza, Egypt

Correspondence: Ahmed M. Hassanien, Department of Economic, Faculty of Economics and Political Science, Cairo University, Giza, Egypt. Tel: 20-100-623-3703.

Received: March 15, 2022 Accepted: April 21, 2022 Online Published: May 10, 2022

doi:10.5539/ijef.v14n6p1 URL: https://doi.org/10.5539/ijef.v14n6p1

Abstract

This paper studies the Spillover effect of US unconventional monetary policy (UMP) on Egypt as a case study of an emerging market and a small open economy

The authors adopts structural vector autoregressive (SVAR) model with variable lag structure. The Wu and Xia (2016)'s shadow interest rate is used as a measure of U.S. unconventional monetary policy. In case of Egypt, we use Short Interest rate (r) as a measure of monetary policy rate; our empirical results reveal that US unconventional monetary policies significantly affect the monetary policy of Egypt but this effect is less on other macroeconomic variables.

The main recommendation of the paper is that monetary authority in Egypt should take into consideration the conflict effect of US monetary policy on Egyptian economic indicators, and at the same time it should implement suitable policies coincide with it to achieve the economic stability and targeting inflation.

Keywords: unconventional monetary policy, Spillover effect, SVAR

1. Introduction

The traditional tools of monetary policy lost their effectiveness during the 2008 global financial crisis, when there was a recession with low inflation rates below the target and interest rates close to zero. The term Unconventional Monetary Policy (UMP) appeared on the surface as one of the mechanisms for facing the effects of the financial crisis.

The mechanisms of these policies were manifested in a number of related concepts such as quantitative easing (QE), which as explained by (Bank of England, 2013), that the central bank undertakes large-scale purchases of financial assets from commercial banks and other financial institutions, which is reflected in higher assets prices. These higher prices and lower returns on assets, at the same time working to inject more money into the economy. Quantitative easing differs from the open market operations followed in traditional monetary policies. The traditional monetary policies deal mainly with short-term government bonds and treasury bills, and aims to influence short-term interest rates. While in quantitative easing, the financial assets purchased by the central bank extend to long-term bonds. This policy aims to increase the money supply while affecting long-term interest rates. Buiter (2008) distinguished between the term quantitative easing and qualitative easing, which aims not only to add more financial assets to the balance sheet of the central bank, but also to diversify the structure of assets owned to include assets with higher risk.

In the beginning of the global financial crisis in 2007, four central banks of United States, the United Kingdom, the euro area and Japan have injected significant liquidity into their economies as well as the interest rates being very low levels close to zero, while the central banks have turned towards unconventional monetary policies to provide more incentives for money and economics, and these policies include providing liquidity and credit easing, and making large-scale purchases of assets (known as quantitative easing (QE) as mentioned earlier

The Federal Reserve cut interest rates by controlling the federal funds rate during the financial crisis in the USA, as lower interest rates help stimulate demand and raise asset prices, to help stimulate economic recovery, but this tool became ineffective after the interest rate reached zero. So, in late November 2008, the Federal Reserve began the first round of quantitative easing (QE1), with large-scale asset purchases represented by the purchase of $600 billion in mortgage-backed securities (MBS), whereas before the financial crisis of 2007/2008 The US Federal Bank kept in its balance sheet the range of 700 to 800 billion dollars of treasury bills. In March 2009, it held $1.75 trillion in bank debt, mortgage-backed securities (MBS), and Treasury bills, reaching a peak of $2.1 trillion in June 2010, and buying more when the economy started to improve, it resumed in August 2010 when the Federal Reserve decided that the economy was not growing strongly. Further, In November 2010, the Federal Reserve announced its second round of quantitative easing (QE2), buying $600 billion of Treasury bills by the end of the second quarter of 2011. Furthermore, the third round of quantitative easing (QE3) was announced on September 13, 2012, as the Federal Reserve decided to launch a new cycle of buying $40 billion in mortgage-backed securities (MBS) each month.

Unconventional monetary policies contributed to supporting economic activity and preventing the collapse of the financial system, and the quantitative easing (QE) policy in the US had an effective role in avoiding the effects of the 2008 financial crisis, and there are great efforts to study the effects of these policies during their application and in the post-application stage. Christine Lagarde, August 2013 stated that unconventional monetary policies had contributed to saving the world from falling into the crisis of the Great Depression once again.

The aim of this study is analyzing how applying UMP in the USA affects the emerging countries. The main contribution of this study is covering the case of Egypt as an emerging market, and to the best of the author knowledge it is the first time for a paper to study this case.

The rest of the paper is organized as follows. The next section is exploring literature review. Section 3 describes the estimation methodology, Section 4 presents the data we use and section 5 discusses the main results. Finally section 6 summarizes the conclusion of this study.

2. Literature Review

Some studies focused on the cross-border impact of quantitative easing policies on the financial markets and assets prices of developed countries only. Neely (2010), Glick and Leduc (2012), Scotti and Wright (2014) concluded that quantitative easing in the United States lowered assets prices in other advanced economies.

Another study by Lubys and Panda (2021) were using the same event study methodology of Neely (2010) but applied it on developing countries and examined the effects of unconventional policy announcements by Europe and US on emerging stock markets (BRICS). The study concluded that the policy announcements do influence the stock markets of the emerging countries.

Another studies focused on the impact of US UMP on the global economy, Chen et al. (2015), Anaya et al. (2017) exploring the impact of quantitative easing (QE) policies in the United States on both emerging and advanced economies, using the Global Vector autoregressive model (GVAR).While Chen et al. (2015), used US term and corporate spreads as indicators of US unconventional monetary policy, Anaya et al. (2017) used the changes in the central bank's balance sheet. Both studies found that US (UMP) had significant effects on the global economy, and those effects varied greatly from one economy to another.

In the same context, other studies using (GVAR) to explore the effects of UMP not only of US but also of other major central banks. Chen, Lombardi, Ross and Zhu (2015) explored the comparison of the international spillovers of unconventional monetary policies between the European Union and the United States. Inoue et al. (2020) examined the effects of unconventional monetary policies (UMPs) by the major central banks.

In another study by Ramos-Francia, Manuel, and Santiago García-Verdú (2015) focused on the transmission channels of US monetary policy shocks to emerging market economies, using linear regression models and factor-augmented vector models autoregression (FAVAR) for the United States and each emerging country. The study found that the effects of monetary policies in the United States on the economies of emerging countries have changed in terms of importance and relative strength since the third quarter of 2008.

Yildirim and Ivrendi (2021) investigated the international spillover effects of US unconventional monetary policy (UMP) on advanced and emerging market economies, using structural vector autoregressive models (SVAR). They used two spreads as indicators of US UMP: the mortgage and term spreads. The findings also reveal that US unconventional monetary policies significantly affect financial conditions in emerging and advanced countries by altering the risk-taking behavior of investors.

Fewer studies focused in a comparison between the impact of conventional monetary policies before the crisis and unconventional monetary policy after the crisis.

In a study by Gilchrist, Simon, Vivian Yue, and Egon Zakrajsek (2014) they studied the indirect effects of monetary policies on bond yields in emerging countries, and the study concluded that the effect was clear only in the period of unconventional policies and was on long-term bonds. Covering more macroeconomic variables, Chen, Mancini-Griffoli, and Sahay (2014) conducted a comparative study of the effects of US monetary policies before and after the crisis; the study found that US monetary policy shocks in general affect capital flows and asset price movements. The study also found that the indirect effects of monetary policy are different and stronger during the unconventional policy period, compared to the conventional monetary policy phase before the crisis.

Some literature studied the spillover effects on specific country or region among them Lakdawala (2021) explored the effects on India using high frequency financial market data with a time-varying parameter approach, show that US monetary policy decisions have had significant effects on the Indian stock markets well before the use of unconventional policy tools and that these effects have gotten stronger during unconventional policy phase. Also, Ekeocha and Udeaja (2020) examined spillover effects of U.S monetary policy on macroeconomic variables in Nigeria using BEKK-VARMA-CCCMGARCH model. They also found significant spillover effects of U.S CMP and UMP on interest rate, exchange rate and inflation rate in Nigeria. Regionally Tran and Pham (2020) traced the monthly responses of equity prices, long-term interest rates, and exchange rates in Asian developing markets to US (UMP). Employing a panel vector autoregression with exogenous variables (Panel VARX) model, found that UMP shocks from the US have different effects than the conventional monetary policy shocks as UMP is associated with a surge in equity prices, a decline in long-term interest rates, and an appreciation of currencies.

3. Methodology

We use the quantitative analysis by employing Structural Vector Auto Regressive (SVAR) model to obtain non-recursive orthogonalization of the error terms for impulse response analysis. We assume two blocks, Y_t which includes a vector of n domestic variables and X_t includes a vector of m foreign variables at time t. In our case, Y_t represents set of variables of the Egyptian economy and X_t represents set of variables of US economy. As Egypt is a small open economy, we assume that the elements of Y_t do not affect any of the values in X_{t+k} for any $k \geq 0$.

The equations of the SVAR model are represented as follow:

$$X_t = k + \sum_{l=1}^{p} A_l X_{t-l} + u_t \tag{1}$$

$$Y_t = c + \sum_{l=1}^{p} B_l X_{t-l} + \sum_{l=1}^{p} C_l Y_{t-l} + \varepsilon_t \tag{2}$$

Where k and c are vectors of constants, A, B and C are matrices of parameters. u_t and ε_t are error terms.

We conduct also two analyses which used usually with vector auto regression (VAR), impulse-response function (IRF) and the variance decomposition. The former describes the evolution of the variable of interest along a. specified time horizon after a shock in a given moment. IRF used usually with vector auto regression (VAR) to keep track on the response of variables to shocks. Variance decomposition is used to aid in the interpretation of a vector autoregression (VAR) model. The variance decomposition indicates the amount of information each variable contributes to the other variables in the autoregression. It determines how much of the forecast error variance of each of the variables can be explained by exogenous shocks to the other variables.

4. Data and Results

4.1 Data

The data set used in the estimation spans the period 2001Q1-2019Q4.For the US variables we use GDP, CPI and Equity prices (EQ) are obtained from (GVAR) Database. Mohaddes, and Raissi (2020). We use shadow interest rate as a measure of U.S. monetary policy (Wu & Xia, 2016).

The set of US variables used in the SVAR model is constructed as follow:

USAY = ln(GDP), USADp = $\ln(CPI_t) - \ln(CPI_{t-1})$

USAEq= ln(EQ/CPI), USASP = 0.25ln(1+Shadow rate/100)

Where:

USAY: GDP of USA.

USADP: the US inflation rate.

USAEq: the real US equity prices.

USASP: the US shadow interest rate.

In case of Egypt, we use GDP, CPI, Short Interest rate (r) as a measure of monetary policy rate, Exchange Rate (E), Equity Prices (EQ). GDP is obtained from Egypt’s ministry of planning and equity prices obtained from Egypt Stock exchange database; other variables obtained from IFS database.

The set of Egypt variables using in the SVAR model is constructed as follow:

$Y = \ln(GDP)$, $Dp = \ln(CPI_t) – \ln(CPI_{t-1})$, $Ep= \ln(E_t/CPI_t)$

$Eq = \ln(EQ_t/CPI_t)$, $R = 0.25\ln(1+r/100)$

Where:

Y: GDP of Egypt.

DP: the Egyptian inflation rate.

Ep: the real Egyptian exchange rate against USD.

Eq: the real Egyptian equity prices.

R: the short term interest rate.

4.2 Results

In this section, we present empirical results.

4.2.1 Unit Root and Optimal Lags Tests

Dickey–Fuller unit root test was used to check the stationarity of the different series. The null hypothesis was that the series was nonstationary, while the alternative was that the series was stationary. The unit root results are illustrated in Appendix A where all series are nonstationary except for (Dp, USADp and USASP) are stationary. Thus, we used the first difference of nonstationary series.

Second, the number of lags is determined using Akaike information criterion, Schwarz information criterion, Hannan–Quinn criterion, and forecast prediction error criterion. Majority of information criteria suggest a model with five lags is the selected one.

Table 1. Optimal lags tests

Lag	LogL	LR	FPE	AIC	SC	HQ
0	2416.326	NA	5.23e-45	-70.74489	-70.38585	-70.60263
1	2688.038	447.5255	6.48e-47	-75.17760	-70.86914*	-73.47045
2	2822.487	177.9470	5.68e-47	-75.57315	-67.31528	-72.30113
3	2970.079	147.5918	5.67e-47	-76.35526	-64.14797	-71.51836
4	3171.079	135.9709	3.49e-47	-78.70822	-62.55151	-72.30643
5	3699.062	186.3467*	2.24e-50*	-90.67829*	-70.57216	-82.71162*

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

4.2.2 Impulse Response Functions

Our findings are illustrated in Figures from1 to 5, all Egypt variables responds to US shadow rate but the response is clearer after a lag of 2 or 3 quarters except the short interest rate which represent the monetary policy of Egypt responses to US shadow rate at the same Quarter.

Figure 1 shows the impulse responses of Egyptian D(y)- GDP changes- to other variables shocks. In this case, there is an increase in GDP changes due to US shadow interest rate shock after three quarters.

Figure 2 shows the impulse responses of Egyptian DP- inflation- to other variables shocks. In this case, there is a decrease in inflation changes due to the changes in the shadow interest rate till quarter 5 then the changes in the shadow interest rate affects positively the inflation in Egypt till quarter number 24.

Figure 3 shows the impulse responses of Egyptian D(ep)–exchange rate changes- to other variables shocks. In this case, there is a +ve effect of USA shadow interest rate on the Egyptian exchange rate changes after 4 quarters till quarter number 10, then the effect turns to be -ve till quarter number 24 except quarter number 20 when there is no effect.

Figure 4 shows the impulse responses of Egyptian D(eq)– equity prices changes- to other variables shocks. In this case, there is a +ve effect of USA shadow interest rate shock on the Egyptian equity prices changes after 1 quarter till quarter number 17, then the effect turns to be -ve till quarter number 24.

Figure 5 shows how the Egyptian short term interest rate responds to the shadow interest rate shock in the USA, the relationship overall is +ve and fluctuates across the period of study. It means when the shadow interest rate in the USA increases, the short-term interest rate in Egypt increases and vice versa.

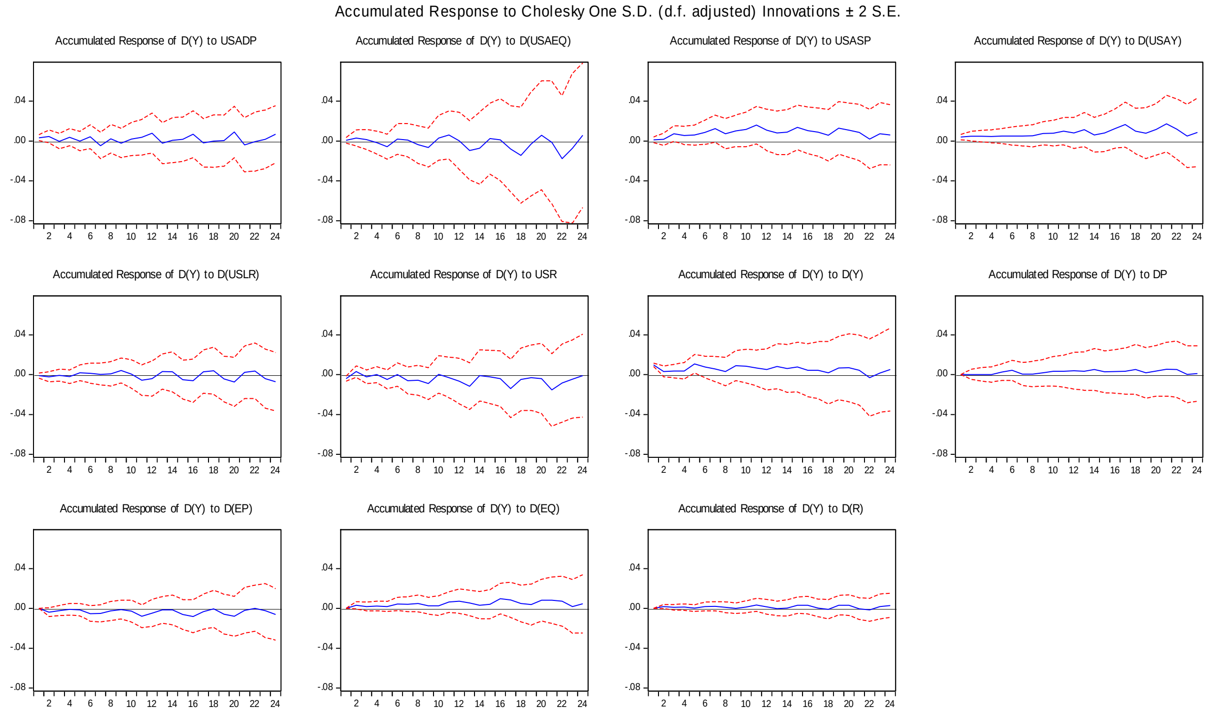

Figure 1. Impulse responses of Egypt D(Y)

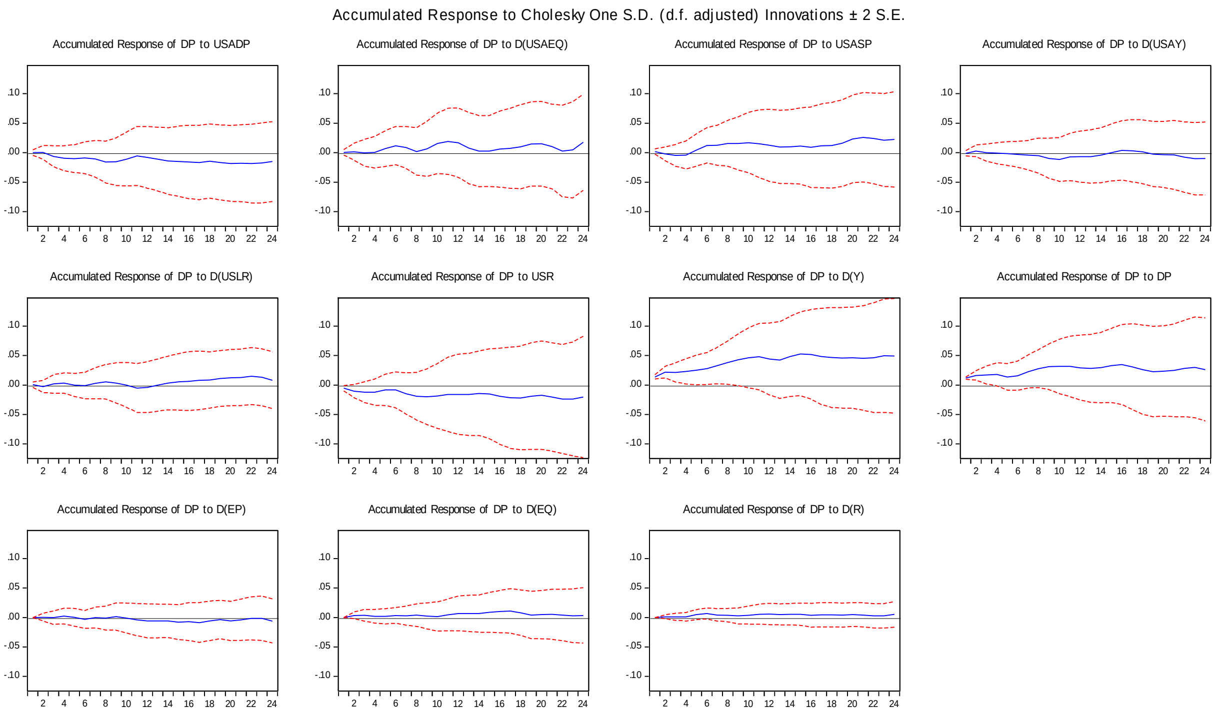

Figure 2. Impulse responses on Egypt DP

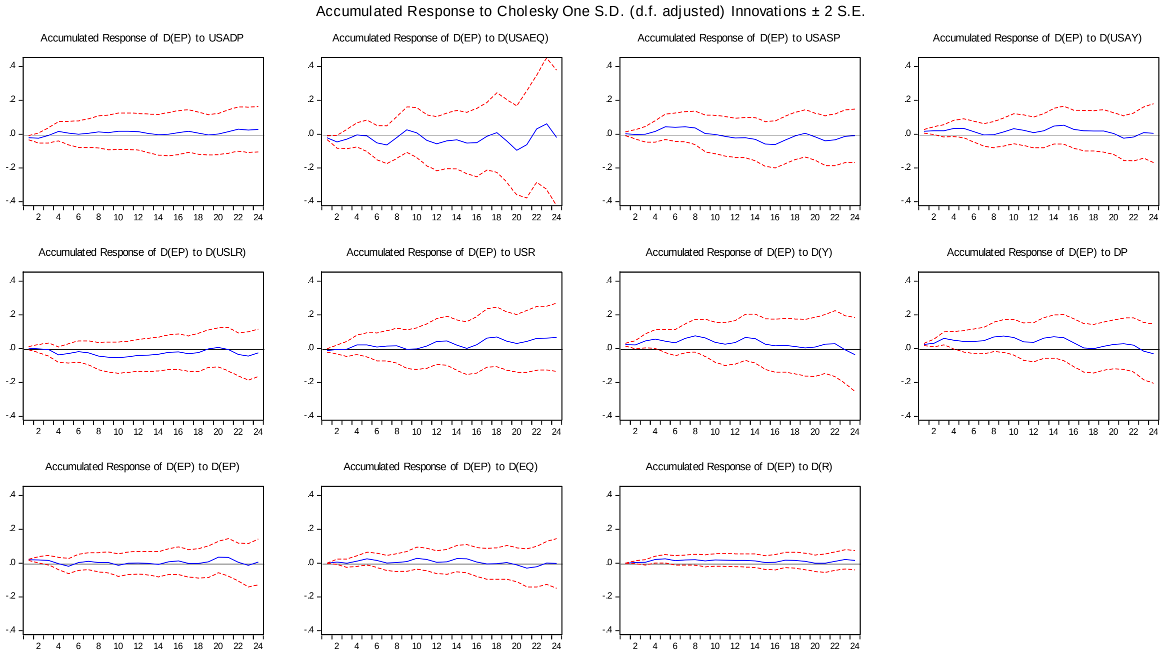

Figure 3. Impulse responses of Egypt D(ep)

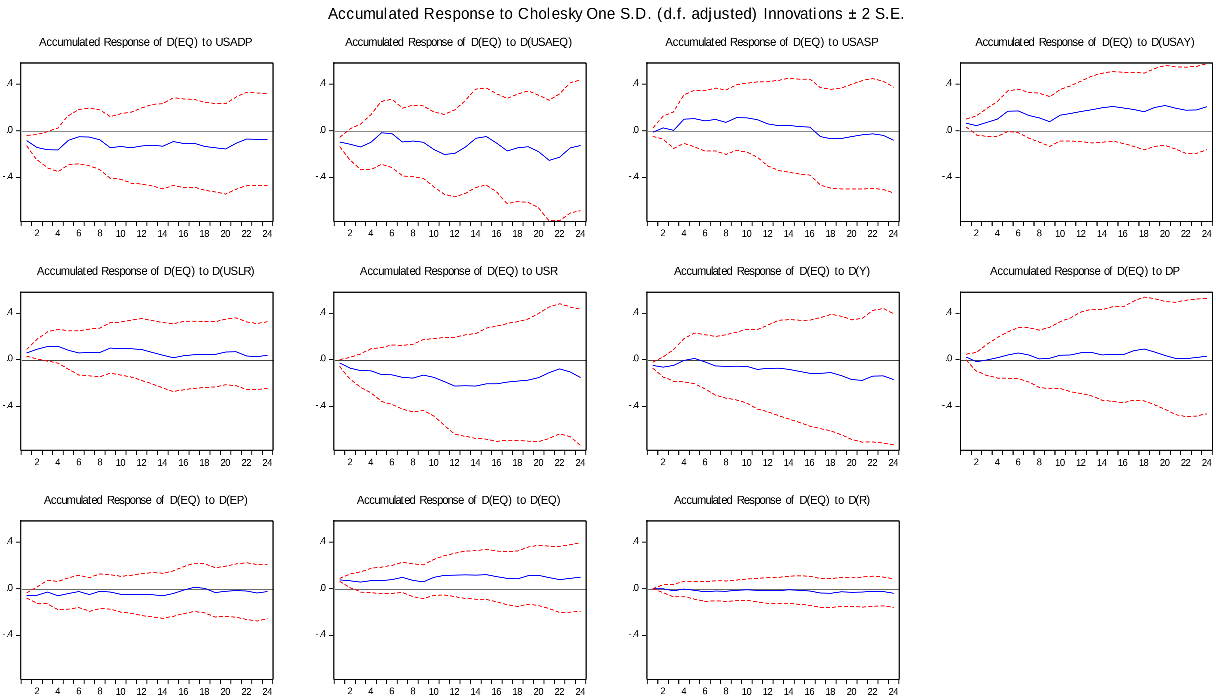

Figure 4. Impulse responses of Egypt D(eq)

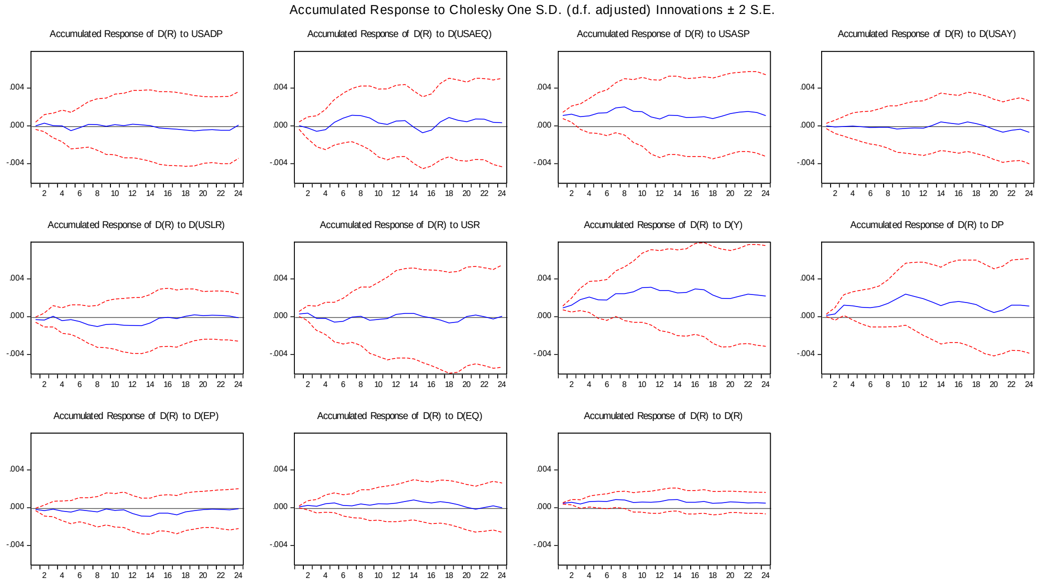

Figure 5. Impulse responses of Egypt D(r)

4.2.3 Variance Decomposition

In this section, we measure the effect of each shock in the USA to explain the variance of the Egyptian variables. Table2 to 6 show Variance Decomposition of Egyptian variables in terms of the shocks identified for the U.S and Egyptian shocks.

Table 2 shows that the change in D(Y) is explained by its own shock by 68% of the variability, while less than0.9% is explained by USASP shock in the first quarter but from third quarter this percent is increased to 9% this means that Egypt GDP do not respond quickly to the UMP.

Table 3 shows the highest effect which is that the shadow interest rate in the USA explains 16.9% from the change in the inflation in Egypt after 6 quarters, before the 6 quarters and after them the effect of USA shadow interest rate on inflation in Egypt is weak.

Table 4 shows the highest effect which is that the shadow interest rate in the USA explains 9% from the change in the Egyptian exchange rate after 5 quarters, before the 5 quarters and after them the effect of USA shadow interest rate on the Egyptian exchange rate is weak.

Table 5 shows the highest effect which is that the shadow interest rate in the USA explains 16.5% from the change in the Egyptian equity prices after 4 quarters, before the 4 quarters the effect of USA shadow interest rate on the Egyptian equity prices is weak and after them the effect is declining.

Table 6 shows the highest effect which is that the shadow interest rate in the USA explains 48.2% from the change in the Egyptian interest rate from the 1st quarter, after that the effect is still high but declining in the next quarters till it is the lowest effect after 12 quarters.

Table 2. Variance Decomposition of Egyptian D(Y)

Period	S.E.	USADP	D(USAEQ)	USASP	D(USAY)	D(Y)	DP	D(EP)	D(EQ)	D(R)
1	0.004305	8.009883	0.301901	0.935930	11.08146	68.11177	0.000000	0.000000	0.000000	0.000000
2	0.005260	4.667842	2.116673	0.635093	6.030657	51.95265	0.013332	5.236838	3.514586	1.190765
3	0.006086	9.530968	2.202174	9.261609	4.529456	39.02563	0.010168	4.690615	3.012760	0.997552
4	0.007137	12.73693	4.249172	9.212027	4.112260	35.33526	0.012010	4.587573	2.783644	0.909138
5	0.007750	12.63138	6.293955	7.012371	3.140651	36.33741	1.142699	3.506022	2.155763	0.889384
6	0.008414	12.68885	13.60625	6.631315	2.472882	30.13120	1.369039	4.928880	2.616699	1.016502
7	0.009242	19.76086	11.33177	7.044794	2.035809	25.26458	2.757002	4.052820	2.153269	0.859204
8	0.009597	22.45667	12.28580	9.011512	1.800336	23.03139	2.438378	4.222186	1.951890	0.892826
9	0.009978	21.86758	11.78041	8.873950	2.194343	24.07596	2.320767	3.974225	2.233109	0.887031
10	0.010398	19.41817	17.10974	7.529781	1.823583	19.96473	2.128101	3.506898	1.849471	0.875446
11	0.010850	17.84806	16.14043	8.153628	1.901791	18.37663	1.933444	5.047151	2.669475	1.103301
12	0.011466	17.70744	17.23067	9.137520	1.956655	17.14741	1.808207	5.372537	2.525445	1.261603

Table 3. Variance Decomposition of DP

Period	S.E.	USADP	D(USAEQ)	USASP	D(USAY)	D(Y)	DP	D(EP)	D(EQ)	D(R)
1	0.047057	0.006115	0.056518	1.099989	0.304611	52.07949	38.15621	0.000000	0.000000	0.000000
2	0.055801	0.008776	0.265268	3.768595	2.895817	48.07053	29.89242	0.041272	2.204330	0.221941
3	0.066724	6.895526	0.806457	4.365928	3.733310	41.40765	25.78467	0.113777	1.920360	0.193094
4	0.079750	8.175857	0.909384	4.222487	3.693179	40.03367	24.80585	1.140469	2.402164	0.184323
5	0.087941	6.536537	5.350699	11.58050	2.943251	32.08040	21.90908	1.445395	1.893147	1.802365
6	0.104367	5.922719	7.392074	16.85721	2.765115	28.51526	19.47623	2.609338	1.811924	1.960331
7	0.107770	5.304548	7.157573	14.35464	2.557591	26.70822	21.11510	3.055681	1.547315	2.285448
8	0.114539	7.046372	9.876196	13.40423	2.275978	25.21342	20.20937	2.698616	1.432832	1.999846
9	0.122650	6.614411	10.66967	12.53319	3.608663	25.20333	19.75234	2.944334	1.528856	1.972197
10	0.124246	7.276028	15.25476	11.49983	3.544009	23.55022	17.86999	3.012800	1.443102	1.872635
11	0.128057	8.458335	14.85402	10.90268	4.459539	22.02094	16.54373	3.404594	1.845313	1.921459
12	0.133884	8.534558	14.74644	10.99605	4.347055	22.25864	16.38833	3.466206	2.166390	1.868320

Table 4. Variance Decomposition of D(EP)

Period	S.E.	USADP	D(USAEQ)	USASP	D(USAY)	D(Y)	DP	D(EP)	D(EQ)	D(R)
1	0.001104	14.93891	15.78338	0.177311	10.11985	19.09862	21.00154	14.00602	0.000000	0.000000
2	0.001658	12.02957	28.55498	0.527507	8.157029	15.03051	18.02552	11.01573	1.135953	0.478148
3	0.002474	12.52278	22.94428	0.343491	5.246713	19.51913	26.32313	7.228524	1.570079	0.308069
4	0.003177	12.98979	19.33417	3.190255	5.030958	12.43896	16.35659	7.747246	2.461670	2.924757
5	0.003816	12.14518	16.91503	9.030186	4.340488	12.03099	14.52964	8.737604	3.877770	2.693889
6	0.004454	9.830603	24.83369	7.113777	5.892310	10.11960	11.39051	10.23169	3.778288	2.818235
7	0.005008	9.065723	23.31454	6.422310	7.690812	13.14030	10.35612	9.493101	4.835305	2.586900
8	0.005526	7.918544	29.27083	5.624126	6.466737	12.29871	11.04258	8.219808	4.085466	2.182224
9	0.006169	6.570388	33.02111	9.099776	6.413821	10.78775	9.202403	6.747028	3.543338	1.966160
10	0.006811	6.279551	31.51490	8.472250	7.284762	12.43803	8.642429	7.198714	4.612741	1.898129
11	0.007435	5.543019	34.63058	7.854287	6.741561	11.39263	9.939028	6.813757	4.255644	1.676142
12	0.007863	5.233820	33.83889	7.655408	6.864385	11.02107	9.383580	6.427610	4.809020	1.581300

Table 5. Variance Decomposition of D(EQ)

Period	S.E.	USADP	D(USAEQ)	USASP	D(USAY)	D(Y)	DP	D(EP)	D(EQ)	D(R)
1	0.003456	18.54745	24.97746	0.511615	11.81074	6.165933	1.545020	9.313031	15.66479	0.000000
2	0.006264	21.69152	20.11234	3.591411	10.03105	5.239465	4.721793	7.178505	12.22482	0.000921
3	0.006607	20.52728	19.34510	4.109434	10.45979	5.156272	4.804271	7.910455	11.32062	0.520205
4	0.006903	15.93215	17.56787	16.47976	9.361949	6.844601	4.224333	7.521927	9.032291	0.735915
5	0.007566	19.93312	20.50479	12.57964	12.24617	5.513080	3.833926	6.138013	6.883040	0.720728
6	0.007839	20.11219	19.72967	12.51033	11.77250	6.282267	3.995799	6.211533	6.682831	0.840905
7	0.008459	18.16491	23.10645	11.44438	12.01348	6.750233	3.874747	6.306643	6.342653	0.805483
8	0.008759	17.95180	22.25940	11.52604	11.91992	6.505738	4.754841	6.850340	6.659854	0.784161
9	0.009126	20.39104	20.48676	11.87949	11.84892	5.961096	4.386924	6.311589	6.227057	0.773660
10	0.009256	18.89385	21.91036	10.95164	13.29056	5.496135	4.582769	6.125627	6.851401	0.739027
11	0.010250	18.28108	22.48429	10.74459	13.02041	5.847150	4.417638	5.902765	6.830294	0.729607
12	0.010362	17.90796	21.91554	11.42529	12.85673	5.735279	4.556142	5.745255	6.644928	0.711544

Table 6. Variance Decomposition of D(R)

Period	S.E.	USADP	D(USAEQ)	USASP	D(USAY)	D(Y)	DP	D(EP)	D(EQ)	D(R)
1	0.000718	0.000205	0.021456	48.24250	0.000839	34.19752	0.742329	1.349422	0.243790	8.141631
2	0.001130	2.741469	1.994019	43.24772	0.366632	33.08982	1.470008	1.724099	1.155295	7.656235
3	0.001259	2.911212	3.971557	26.98552	0.264372	26.80743	18.36970	1.528567	0.837132	5.201921
4	0.001432	2.656488	4.306916	24.57678	0.279457	25.52881	16.70350	2.071034	2.110516	5.954141
5	0.001529	5.951103	12.29659	21.23515	0.317352	22.11834	13.97907	1.942521	1.843456	4.884115
6	0.001563	6.791213	14.29053	19.78938	0.426634	20.60514	13.04501	2.636750	2.764458	4.551605
7	0.001611	7.286492	13.22889	19.91379	0.378526	22.67609	11.24274	2.372048	2.366270	4.307216
8	0.001672	7.106783	12.92239	19.55844	0.369017	22.10394	12.19423	2.429414	2.806685	4.207894
9	0.001787	6.664460	12.17058	19.73433	0.703728	20.19037	13.27632	3.106786	2.707718	4.504405
10	0.001975	6.449248	14.03196	18.22845	0.712259	20.41971	14.49495	3.056602	2.754343	4.167524
11	0.001995	6.326936	13.69800	20.25312	0.697039	19.66499	14.44862	2.973439	2.652760	4.013625
12	0.002083	6.132023	13.85750	19.32197	0.655945	19.51724	14.04401	4.118049	2.537639	3.804750

5. Discussion

This study analyses the Spillover effect of US unconventional monetary policy (UMP) on Egypt as a case study of an emerging market and a small open economy. We have used the Wu and Xia (2016)'s shadow interest rate as a measure of U.S. monetary policy. To check the Spillover effect of US UMP on Egypt Economy, we used structural vector autoregressive (SVAR) model with variable lag structure. Our results show strong relationship between US monetary policy and Egypt policy rate. The variance decomposition indicates that 48% of changes in policy rate in Egypt return to US UMP. Other variables of Egypt economy such as GDP and inflation responds less and lagged more than 2 quarters. In addition, Egypt GDP do not respond quickly to the UMP, and the effect of USA shadow interest rate on inflation in Egypt is weak, and the effect of USA shadow interest rate on the Egyptian exchange rate is weak.

The monetary policy in Egypt as we concluded is highly affected by the federal funds rate. When the Egyptian authority takes an expansionary policy or vice versa, it goes in line with the federal authority, which means that Egypt as an emerging country is a case study of how the USA affects the emerging countries by applying the quantitative easing policies which is created in the USA to overcome the invalid conventional monetary policy.

The main recommendation of the paper is that monetary authority in Egypt should take into consideration the conflict effect of US monetary policy on Egyptian economic indicators, and at the same time it should put the suitable policies coincide with it to achieve the economic stability and targeting inflation.

References

Acharya, V. V., Eisert, T., Eufinger, C., & Hirsch, C. (2019). Whatever it takes: The real effects of unconventional monetary policy. *The Review of Financial Studies, 32*(9), 3366-3411. https://doi.org/10.1093/rfs/hhz005

Anaya, P., Hachula, M., & Offermanns, C. J. (2017). Spillovers of US unconventional monetary policy to emerging markets: The role of capital flows. *Journal of International Money and Finance, 73*, 275-295. https://doi.org/10.1016/j.jimonfin.2017.02.008

Auer, R. A., & Menzie, D. C. (2016). Editor's introduction to the special issue on spillovers of conventional and unconventional monetary policy: The role of real and financial linkages. *Journal of International Money and Finance*. https://doi.org/10.1016/j.jimonfin.2016.02.004

Bauer, M. D., & Christopher, J. N. (2014). International channels of the Fed's unconventional monetary policy. *Journal of International Money and Finance, 44*, 24-46. https://doi.org/10.1016/j.jimonfin.2013.12.007

Bowman, D., Juan, M. L., & Horacio, S. (2015). US unconventional monetary policy and transmission to emerging market economies. *Journal of International Money and Finance, 55*, 27-59. https://doi.org/10.1016/j.jimonfin.2015.02.016

Buiter, W. H. (2008). Quantitative easing and qualitative easing: A terminological and taxonomic proposal. *Financial Times*, December 9.

Carrillo, J. A., Elizondo, R., & Hernández-Román, L. G. (2020). Inquiry on the transmission of US aggregate shocks to Mexico: A SVAR approach. *Journal of International Money and Finance, 104*, 102148. https://doi.org/10.1016/j.jimonfin.2020.102148

Chen, J., Tommaso, M. G., & Ratna, S. (2014). Spillovers from United States Monetary Policy on Emerging Markets: Different This Time?

Chen, Q. et al. (2014). Financial crisis, unconventional monetary policy and international spillovers. *HKIMR Working Paper*, no 23/2014, September. https://doi.org/10.2139/ssrn.2497922

Chen, Q. et al. (2015). Financial crisis, US unconventional monetary policy and international spillovers. *BIS Working Papers*, no 494, March. https://doi.org/10.5089/9781475520668.001

Chen, Q. et al. (2015). Global Impact of US and Euro Area Unconventional Monetary Policies: A Comparison. Paper presented at *the 16th Jacques Polak Annual Research Conference* Hosted by the International Monetary Fund Washington, DC─November 5–6.

Cheung, W., Scott, F., and Shih-Chuan, T. (2010). Global capital market interdependence and spillover effect of credit risk: Evidence from the 2007-2009 global financial crisis. *Applied Financial Economics, 20*(1-2), 85-103. https://doi.org/10.1080/09603100903262962

Chudik, A., & Marcel, F. (2011). Identifying the global transmission of the 2007-2009 financial crisis in a GVAR model. *European Economic Review, 55*(3), 325-339.

Chudik, A., & Vanessa, S. (2013). The GVAR approach and the dominance of the US economy. *Federal Reserve Bank of Dallas, No. 136.*

Claessens, S., Livio, S., & Francis, E. W. (2015). International dimensions of conventional and unconventional monetary policy. *Journal of International Money and Finance.* https://doi.org/10.1016/j.jimonfin.2015.06.006

Ekeocha, P. C., & Udeaja, E. A. (2020). Spillover effect of United States monetary policy on Nigeria's financial and macro fundamentals. *CBN Journal of Applied Statistics, 11*(1), 111-145. https://doi.org/10.33429/cjas.11120.5/5

Engen, E. M., Laubach, T., & Reifschneider, D. (2015). The macroeconomic effects of the Federal Reserve's unconventional monetary policies. https://doi.org/10.2139/ssrn.2561522

Eser, F., & Bernd, S. (2016). Evaluating the impact of unconventional monetary policy measures: Empirical evidence from the ECB′ s Securities Markets Programme. *Journal of Financial Economics, 119*(1), 147-167.

Frank, N., & Heiko, H. (2009). Financial spillovers to emerging markets during the global financial crisis. *International Monetary Fund, No. 9-104.*

Gambacorta, L., Hofmann, B., & Peersman, G. (2012). The effectiveness of unconventional monetary policy at the zero lower bound: A cross-country analysis. *BIS Working Papers, no 268,* August.

Gertler, M., & Peter, K. (2011). A model of unconventional monetary policy. *Journal of Monetary Economics, 58*(1). https://doi.org/10.1016/j.jmoneco.2010.10.004

Gilchrist, S., Vivian, Y., & Egon, Z. (2014). *US Monetary Policy and Foreign Bond Yields*. Mimeo, Federal Reserve Board of Governors.

Glick, R., & Sylvain, L. (2012). Central bank announcements of asset purchases and the impact on global financial and commodity markets. *Journal of International Money and Finance, 31*(8), 2078-2101.

Inoue, Tomoo, and TatsuyoshiOkimoto. (2020). International Spillover Effects of Unconventional Monetary Policies of Major Central Banks. https://doi.org/10.1016/j.irfa.2021.101968

Joyce, M. et al. (2012). Quantitative Easing and Unconventional Monetary Policy–an Introduction. *The Economic Journal, 122,* 564.

Kimura, T., & Jouchi, N. (2016). Identifying conventional and unconventional monetary policy shocks: A latent threshold approach. *The BE Journal of Macroeconomics, 16*(1), 277-300. https://doi.org/10.1515/bejm-2015-0074

Kuroda, H. (2015). *How Unconventional Monetary Policy Stimulates Demand: Theory and Practice*. Remarks for the Panel Discussion at the Bank for International Settlements Annual General Meeting. Bank of Japan, June 28.

Lakdawala, A. (2021). The growing impact of US monetary policy on emerging financial markets: Evidence from India. *Journal of International Money and Finance, 119,* 102478. https://doi.org/10.1016/j.jimonfin.2021.102478

Lubys, J., & Panda, P. (2021). US and EU unconventional monetary policy spillover on BRICS financial markets: An event study. *Empirica, 48,* 353-371. https://doi.org/10.1007/s10663-020-09480-8

Mohaddes, K., & Raissi, M. (2020). Compilation, Revision and Updating of the Global VAR (GVAR) Database, 1979Q2-2019Q4.

Neely, C. J. (2010). Unconventional monetary policy had large international effects. *Federal Reserve Bank of St. Louis Working Paper*. https://doi.org/10.20955/wp.2010.018

Obstfeld, M., &Adler, G. (2015). *Top Researchers Debate Unconventional Monetary Policies*. IMF Research Department, November 20.

Ono, S. (2020). Impacts of conventional and unconventional US monetary policies on global financial markets. *International Economics and Economic Policy, 17*(1), 1-24. https://doi.org/10.1007/s10368-019-00456-z

Peersman, G. (2011). Macroeconomic effects of unconventional monetary policy in the euro area.

Ramos-Francia, M., & García-Verdú, S. (2014). The transmission of US monetary policy shocks to EMEs: An empirical analysis. *BIS Papers No 78,* August, 363-397.

Rogers, J. H., Chiara, S., & Jonathan, H. W. (2014). Evaluating asset-market effects of unconventional monetary policy: A multi-country review. *Economic Policy, 29*(80), 749-799. https://doi.org/10.1111/1468-0327.12042

Tran, T. B. N., & Pham, H. C. H. (2020). The spillover effects of the us unconventional monetary policy: New evidence from asian developing countries. *Journal of Risk and Financial Management*, *13*(8), 165. https://doi.org/10.3390/jrfm13080165

Wu, J. C., & Xia, F. D. (2016). Measuring the macroeconomic impact of monetary policy at the zero lower bound. *Journal of Money, Credit and Banking*, *48*(2-3), 253-291. https://doi.org/10.1111/jmcb.12300

Yildirim, Z., & Ivrendi, M. (2021). Spillovers of US unconventional monetary policy: Quantitative easing, spreads, and international financial markets. *Financial Innovation*, *7*(1), 1-38. https://doi.org/10.1186/s40854-021-00299-1

Appendix A. Unit root test

Null Hypothesis: Series has a unit root

Exogenous: Constant, Linear Trend

Table A1. Y unit root test

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.655759	0.7601
Test critical values:	1% level	-4.096614	
	5% level	-3.476275	
	10% level	-3.165610	

Table A2. D(Y) unit root test

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.610349	0.0362
Test critical values:	1% level	-4.096614	
	5% level	-3.476275	
	10% level	-3.165610	

Table A3. EP unit root test

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.895648	0.7844
Test critical values:	1% level	-3.522887	
	5% level	-2.901779	
	10% level	-2.588280	

Table A4. D(EP) unit root test

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.224774	0.0000
Test critical values:	1% level	-3.524233	
	5% level	-2.902358	
	10% level	-2.588587	

Table A5. EQ unit root test

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.836173	0.3604
Test critical values:	1% level	-3.524233	
	5% level	-2.902358	
	10% level	-2.588587	

Table A6. D(EQ) unit root test

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.153803	0.0000
Test critical values:	1% level	-3.524233	
	5% level	-2.902358	
	10% level	-2.588587	

Table A7. R has a unit root

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.584996	0.8667
Test critical values:	1% level	-3.524233	
	5% level	-2.902358	
	10% level	-2.588587	

Table A8. D(R) unit root test

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.395752	0.0000
Test critical values:	1% level	-3.524233	
	5% level	-2.902358	
	10% level	-2.588587	

Table A9. USADP unit root test

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.548185	0.0000
Test critical values:	1% level	-3.522887	
	5% level	-2.901779	
	10% level	-2.588280	

Table A10. USAEQ unit root test

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.710304	0.2358
Test critical values:	1% level	-4.090602	
	5% level	-3.473447	
	10% level	-3.163967	

Table A11. D(USAEQ) unit root test

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.868120	0.0000
Test critical values:	1% level	-4.090602	
	5% level	-3.473447	
	10% level	-3.163967	

Table A12. USASP unit root test

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.679969	0.0877
Test critical values:	1% level	-2.598416	
	5% level	-1.945525	
	10% level	-1.613760	

Table A13. USAY unit root test

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.877539	0.6558
Test critical values:	1% level	-4.090602	
	5% level	-3.473447	
	10% level	-3.163967	

Table A14. D(USAY) unit root test

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.176616	0.0003
Test critical values:	1% level	-4.090602	
	5% level	-3.473447	
	10% level	-3.163967	

Table A15. USLR unit root test

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.930336	0.1594
Test critical values:	1% level	-4.090602	
	5% level	-3.473447	
	10% level	-3.163967	

Table A16. D(USLR) unit root test

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.253890	0.0000
Test critical values:	1% level	-4.092547	
	5% level	-3.474363	
	10% level	-3.164499	