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Foreign Exchange Market Pressure and Monetary Policy: Evidence from Afghanistan

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Abstract **– This paper implies the foreign exchange market pressure (EMP) model to Afghanistan's economy in the period (2004Q1- 2019Q4) under managed floating exchange rate. The study used threshold level to examine the currency signaling, the result identifies several spikes and dips at different levels. Likewise, the empirical evidence from the ARDL approach found that monetary policy intervention in the foreign exchange market strongly depends on foreign reserves to mitigate the pressure in the foreign exchange market through the contraction of the domestic credit providing in the short and long-run. Also, the speculative attack as a result of political uncertainty has a significant contribution to the foreign exchange market pressure in the long-run.**

Keywords **– Foreign Exchange Market Pressure, Foreign Exchange Rate, Monetary Policy, Afghanistan.**

I. Introduction

Exchange rate volatility is one of the significant policy subjects and is a critical iconic parameter in monetary economics. Quantification of the magnitude of the exchange rate movements has been a crucial policy implication almost all over countries, particularly in the small open economy, including Afghanistan. The erratic changes in exchange rate not only undermine the goal of price stability but as well as domestic output, capital flow, unemployment, investments, etc. [1]. In general, the exchange rate volatility refers to the money market disequilibrium arising from the excess demand or supply of national currency. The magnitude of disequilibrium is termed the exchange market pressure (Hereinafter) EMP. It is restored by the adjustment either in the foreign exchange rate or foreign currency reserves and or by some combination of both. Since the EMP is directly unobservable; therefore, the effective management of EMP is important for effective management of the macroeconomy. The seminal work of Girton and Ropper (1977) and Ropper and Turnvosky (1980) quantify the excess demand and supply in the foreign exchange market using a stochastic small open IS-LM model. Likewise, they devise a policy reaction function that describes the foreign exchange intervention as a function of the observed deviation of the exchange rate from its long-run equilibrium level. In this framework, they formulate the optimal stabilization policy in terms of the central bank's optimal response to subdue the ample volatility and change in exchange market pressure. The response of the monetary authority to change in the market pressure depends on the exchange rate regime; it means that in a free-floating the total pressure reflected by observed changes in the exchange rate, vice versa in a fixed exchange rate regime the pressure absorbed by foreign exchange, but in a managed float exchange rate regime the pressure is split into the change in the exchange rate and some to foreign reserves.

The novelty of this study is to develop an operational tool to examine the magnitude of exchange rate volatility, may help the Central Bank to monitor signal and volatility in the foreign exchange market, and adequate intervene in to restore the desire movements at minimum cost in the context of Afghanistan's economy, which is characterized by the underdeveloped financial system, crucial deficit in the balance of trade and reliance on foreign aids; which makes the foreign exchange rate as a viable monetary policy tool to stabilize the and control economic agents and individual inflation expectations [2]. Da Afghanistan Bank, as the Central Bank of Afghanistan, has been intervening in the foreign exchange market since the introduction of new denominations in 2003. Da Afghanistan Bank using an auction window as an instrument in the open market. The frequencies and amount of auctions have been increasing year to year, albeit at the cost of (% 62.5) depreciation of Afghani in 2019 against USD in primary (at the time of issuance of new banknotes) price at the time of the introduction of new bills.

This paper consists of a theoretical framework, reviews of empirical studies on foreign exchange market pressure; exchange rate stands in Afghanistan, measurement of EMP in Afghanistan, econometrics analysis and interpretation of results, and finally, the paper wrap up by conclusion and recommendation.

II. Theoretical Background and Literature Survey

This literature survey is a brief review of the theoretical and empirical background. The theoretical background is devised to some theoretical underpinning and determinants, and the empirical section consists of some empirical evidence.

1. *Theoretical Background*

The foreign exchange market pressure was coined by Lance Girton and Don Roper in (1977). The term has been flourishing by the large numbers of researchers, in different contexts. The Girton – Roper model was designed for Canadian float exchange during (1952-62) to assess the foreign exchange market pressure on foreign reserves or currency depreciation or a combination of both. Theoretically, this model is rooted in the monetary and balance of payment approaches. Girton and Roper quantified the foreign exchange market pressure through the forming of a statistical summary from changes in the exchange rate and foreign exchange reserves. The statistical output is then used as a dependent variable in estimations of the magnitude to which monetary policy can be formulated independently. Girton and Roper employ the asset market approach to measure the excess demand for a currency. It means that the disequilibrium in the money market should be subdued through the change in foreign exchange reserves or the exchange rate, without the changes in domestic credit impacting the exchange rate [3].

Girton and Roper developed the model by using the monetary approach to the exchange rate and monetary approach to the balance of payments [4].

$$M_{j\,t}^{d} = P_{j\,t}\, Y_{j\,t}^{\beta} exp^{(-\alpha i_{c\,t})} \tag{1}$$

$$M_{j\,t}^{S} = R_{j\,t} + D_{j\,t} \tag{2}$$

$$M_{j\,t}^{S} = M_{j\,t}^{d} \tag{3}$$

The money demand of country j at time t, is an increasing function of domestic real income Y and price P, unlike the demand for money is the decreasing function of interest i. On the other hand, the money supply in the country decomposed into domestic and foreign counterparts, D (domestic credit) and F (foreign reserve currency), respectively. The supply and demand function of money is for both countries in the same discretetime span. Money market equilibrium conditions imply that any change in the money supply must be equal to money demand. If we rewrite equation 1 and equation 2 in log-transformed yields:

$$ln\, M^{S}_{j\,t} = \, ln\, M^{d}_{j\,t} \quad (4)$$

$$\Delta\, ln\, R_{j\,t} + \Delta\, lnD_{j\,t} = \Delta\, ln\, P_{j\,t} + \Delta\, \beta Y_{j\,t} - \,\Delta\, \alpha i_{j\,t} \quad (5)$$

Also if we consider the same equations in counterpart economy, indicated by superscript c, giving:

$$\Delta\, ln\, R_{c\,t} + \Delta\, lnD_{c\,t} = \Delta\, ln\, P_{c\,t} + \Delta\, \beta Y_{c\,t} - \,\Delta\, \alpha i_{c\,t} \quad (6)$$

By taking the first difference (in line with Haache and Townend) to measure the changes in the money market, the changes in domestic credit ($\Delta \mathrm{d}_{j\,t} = \frac{\Delta \mathrm{D}_{j\,t}}{\Delta MB_{j\,t-1}}$) and the changes in foreign reserves currency ($\Delta \mathrm{r}_{t} = \frac{\Delta \mathrm{F}_{j\,t}}{\Delta MB_{j\,t-1}}$). MB shows the monetary base. The subtraction of corresponding equation from counterpart country yielding:

$$\Delta\, ln\, M^{S}_{j\,t} - \,\Delta\, ln\, M^{s}_{c\,t} = \Delta\, lnd_{j\,t} \, + \,\Delta\, lnr_{j\,t} - \Delta\, ln\, M^{s}_{c\,t} \, = \,\Delta ln\, P_{j\,t} - \,\Delta\, ln\, P_{c\,t} + \Delta\, \beta Y_{j\,t} - \Delta\, \beta_{c\,t}\, lnY_{c\,t} - \Delta\, \alpha_{j\,t} i_{j\,t} + \Delta \alpha_{c\,t} i_{c\,t} \quad (7)$$

Now, by the holding of relative PPP for monetary approach, because absolute purchasing power parity holds only if deviations from its absolute version are stationary. The non-stationary real exchange rate implies that the absolute version of PPP does not hold. The product of the difference between the inflation rate in corresponding countries $\left(\Delta \ln \mathrm{P}_{j\,t} - \Delta \ln \mathrm{P}_{c\,t}\right)$, significant for the sign of $\Delta \ln \mathrm{E}_{j\,t}$ nominal exchange rate (assuming that the movement of the exchange rate deviates from the inflation differential by a linear combination of the normalized rates of domestic credit expansion and foreign monetary growth). The depreciation of domestic currency reflects by the exchange rate ($-\Delta\, \mathrm{E}_{j\,t}$) (Haache and Townend, 1981).

$$\Delta ln\, E_{\,j\,t} = -\Delta\, lnd_{j\,t} - \Delta\, lnr_{j\,t} + \Delta\, ln\, M^{S}_{C\,t} + \,\Delta\, \beta Y_{j\,t} - \Delta \beta_{c\,t}\, lnY_{c\,t} - \Delta\, \alpha_{j\,t} i_{j\,t} + \Delta \alpha_{c\,t} i_{c\,t} \quad (8)$$

The relative PPP holding in the below equation

$$\Delta ln\, P_{j\,t} = ln\, \Delta\, P_{c\,t} + \Delta\, ln\, E_{\,j\,t} + \Delta\, ln\, Z_{j\,t} \quad (9)$$

Where $\Delta \ln \mathrm{E}_{j\,t}$ shows the lagged changes in the nominal exchange rate, and $\ln \mathrm{Z}_{j\,t}$ the real exchange rate. In the case of stationary $\Delta \ln \mathrm{Z}_{j\,t}$ (indicates deviation from absolute purchasing power parity. If the absolute version of purchasing power parity is assumed to hold, then $\Delta \ln \mathrm{Z}_{j\,t}$will automatically disappear), the changes in $\mathrm{E}_{j\,t}$ and $\mathrm{P}_{c\,t}$ fully translates in the domestic price $\mathrm{P}_{j\,t}$. Then

$$\Delta ln\, E_{\,j\,t} + \Delta\, ln\, Z_{j\,t} = \Delta\, ln\, P_{j\,t} - \Delta\, ln\, P_{c\,t} \quad (10)$$

Now, by substituting the above equation into equation 7 we get

$$\Delta\, lnd_{j\,t} + \Delta\, lnr_{j\,t} - \Delta\, ln\, M^{S}_{C\,t} = \Delta ln\, E_{\,j\,t} + \Delta\, ln\, Z_{j\,t} + \Delta\, \beta Y_{j\,t} - \Delta \beta_{c\,t}\, lnY_{c\,t} - \Delta\, \alpha_{j\,t} i_{j\,t} + \Delta \alpha_{c\,t} i_{c\,t} \quad (11)$$

Likewise, we can rewrite Equation 11

$$\Delta ln\, E_{\,j\,t} = \Delta\, ln\, Z_{j\,t} - \Delta\, lnd_{j\,t} - \Delta\, lnr_{j\,t} + \Delta\, \beta Y_{j\,t} - \Delta \beta_{c\,t}\, lnY_{c\,t} - \Delta\, \alpha_{j\,t} i_{j\,t} + \Delta \alpha_{c\,t} i_{c\,t} \quad (12)$$

As $\Delta \ln \mathrm{Z}_{j\,t}$ presents deviation from the absolute PPP. If we assume to hold the absolute PPP then the $\Delta \ln \mathrm{Z}_{j\,t}$

vanished automatically. Though, to hold the PPP and dismiss the deviation, Girton and Roper assuming that $\Delta \ln Z_{j\,t}$ is the linear function of the domestic credit and foreign money expansion.

$$\Delta ln\, Z_{j\,t} = \eta_1 \Delta ln\, d_{j\,t} + \eta_2\ \Delta ln\, M^S_{C\,t} \qquad \eta_1, \eta_2 \geq 0 \tag{13}$$

From equations 12 and 13 we can get

$$\Delta ln\, E_{\,j\,t} = \eta_1 \Delta ln\, d_{j\,t} + \eta_2\ \Delta\, ln\, M^S_{C\,t} - \Delta\, ln\, d_{j\,t} - \Delta\, lnr_{j\,t} + \Delta\, \beta Y_{j\,t} - \Delta\beta_{c\,t}\, lnY_{c\,t} - \Delta\, \alpha_{j\,t} i_{j\,t} + \Delta\alpha_{c\,t} i_{c\,t} \tag{14}$$

After rearranging equation 14 having

$$\Delta ln\, E_{\,j\,t} = -(1-\eta_1)\, \Delta\, ln\, d_{j\,t} + (1-\eta_2)\, \Delta\, ln\, M^S_{C\,t} - \Delta lnr_{j\,t} + \Delta\beta Y_{j\,t} - \Delta\beta_{c\,t}\, lnY_{c\,t} - \Delta\, \alpha_{j\,t} i_{j\,t} + \Delta\alpha_{c\,t} i_{c\,t} \tag{15}$$

If we compare equation 15 to 8 the coefficient of $\Delta\, \mathrm{lnd}_{j\,t}$ and $\Delta\, \mathrm{lnr}_{j\,t}$ are no longer -1 and +1 a priori. However, equation 13 excluded the $\Delta\, \mathrm{lnr}_{j\,t}$ the counterpart of money growth or in simple terms, the η is not in touch with money supply, and the coefficient is still -1. So that we rewrite the equation 16 in below

$$\Delta ln\, E_{\,j\,t} + \Delta\, lnr_{j\,t} = -(1-\eta_1)\, \Delta ln\, d_{j\,t} + (1-\eta_2) \Delta\, ln\, M^S_{C\,t} + \Delta\, \beta\, ln\, Y_{j\,t} - \Delta\beta_{c\,t}\, lnY_{c\,t} - \alpha_{j\,t}\, \Delta\, ln\, i_{j\,t} + \alpha_{c\,t}\, \Delta\, ln\, i_{c\,t} + \varepsilon_t \tag{16}$$

Now, the last equation presents the exchange rate and balance of payment (foreign reserve) on the left-hand side (exchange market pressure), and all others on the right-hand side. The exchange market pressure is the summation of changes in the exchange rate and foreign reserve.

Finally, if we jump to the last element of equation 1, which is the interest rate. Suppose if the perfect capital mobility comes to effect between two respective countries. Under the parity condition, we get

$$\Delta lnE^j_{t+1} = \Delta\, ln\, i_{j\,t} + \Delta\, ln\, i_{c\,t} = -\varphi\, ln\, d_{j\,t} + \varphi_c\, ln\, M^S_{C\,t} \tag{17}$$

Equation 17 indicates the parity condition. The deviate from parity in interest rate translated to the expected exchange rate (in arbitrage market).

Substitution of equation 17 in equation 16

$$\Delta ln\, E_{\,j\,t} + \Delta\, lnr_{j\,t} = -(1-\eta_1)\, \Delta ln\, d_{j\,t} + (1-\eta_2) \Delta\, ln\, M^S_{C\,t} + \Delta\, \beta Y_{j\,t} - \Delta\, \beta_{c\,t}\, lnY_{c\,t} + \alpha_{\,j} \varphi_j\, ln\, d_{j\,t} - \alpha_{\,c} \varphi_c\ \ ln\, M^S_{C\,t}\,) \tag{18}$$

After rearranging the equation 18 yielding

$$\Delta ln\, E_{\,j\,t} + \Delta\, lnr_{j\,t} = -\left(1 - \alpha_{\,j}\, \varphi_j - \eta_1\right) \Delta ln\, d_{j\,t} + (1 - \alpha_{\,c} \varphi_c - \eta_2) \Delta\, ln\, M^S_{C\,t} + \Delta\, \beta Y_{j\,t} - \Delta\beta_{c\,t}\, lnY_{c\,t} + \alpha\, \varphi\, ln\, d_{j\,t} - \alpha\, \varphi\, ln\, M^S_{C\,t}\,) \tag{19}$$

Suppose if: $(1 - \alpha_{\,j}\, \varphi_j - \eta_1) = \eta_{1\,j}$ and $(1 - \alpha_{\,c} \varphi_c - \eta_2) = \eta_{2\,c}$ then we will have the last equation of the model.

$$\Delta ln\, E_{j\,t} + \Delta lnr_{j\,t} = -\eta_{1\,j} \Delta ln\, d_{j\,t} + \eta_{2\,c} \Delta ln\, M^S_{C\,t} + \Delta\, \beta Y_{j\,t} - \Delta\beta_{c\,t}\, lnY_{c\,t} + \alpha\varphi\, ln\, d_{j\,t} - \alpha\varphi\, ln\, M^S_{C\,t} + \varepsilon_t \tag{20}$$

Equation 20 represents Girton and Roper’s foreign exchange market pressure. As the foreign exchange market pressure study under exchange rate systems: Under the floating exchange rate system, the $\Delta ln\, E_{\,j\,t} > 0$

and $\Delta\, lnr_{j\,t} = 0$. However, in a fixed exchange rate system, the disequilibrium in the foreign exchange market corrects by the change in foreign reserve rather than exchange rate it means the pressure absorbed by $\Delta\, lnr_{j\,t}$ holding the exchange rate fixed $\Delta ln\, E_{j\,t} = 0$. Likewise under the managed floating exchange rate system the market disequilibria correction pressure absorbed by a combination of exchange rate $\Delta ln\, E_{j\,t} > 0$ and $\Delta\, lnr_{j\,t} > 0$.

2. *Empirical Background*

Empirically, the EMP index is tested in the context of different countries. The following are the empirical studies about monetary policy response in various studies in chronological order.

Table 1. List of Empirical Studies by Chronological Order.

Research	Country	Empirical Model	Period	EMP Managing Tools			Findings
				Exchange Rate	**Foreign Reserves**	**Interest Rate**	
(Girton & Roper, 1977) [4]	Canada	Regression with Cochrane-Orcutt technique	1952-1974	*	*		They find out the exchange rate and foreign reserves as sensitive components against EMP, but not Q.
(Connolly & Silveira, 1979) [5]	Brazil	Regression with Cochrane-Orcutt technique	1955-1975	*	*		EMP is absorbed by the combination of reserve changes and exchange depreciation. They also suggested (r+e) instead (e/r).
(Kim, 1985) [6]	Korea	OLS	March 1980 to July 1983	*	*		EMP spread up to exchange rate and foreign reserve. They highlighted that pressure is strongly absorbed by the foreign reserve.
(Mah, 1991) [7]	Korea	OLS	1980-1987	*	*		The evidence supports the (G & R) 1977 model strongly.
(Gochoco-Bautista & Bautista, 2005) [8]	Philippines	VAR	January 1990-April 2004	*	*	*	The study evident a positive relationship of domestic credit and interest with EMP.
(Parlaktuna, 2005) [9]	Turkey	OLS	1993-2004	*	*		The study identifies negative relation between EMP and domestic credit. Meanwhile, they find out that most EMP was absorbed by foreign reserves.
(García & Malet, 2007) [10]	Argentina	VAR	1993-2004	*	*	*	The study finds out a double direction between EMP and domestic credit, likewise, they identify a strong role of output growth more than domestic credit and interest rate. Contrary to this, EMP negatively affected the growth.
(Jayaraman & Choong, 2008) [11]	Fiji	ARDL	1975 -2005	*	Budget deficit	External debt and political	This investigation highlighted that EMP is positively correlated to domestic credit, budget deficit, external debt, and

Research	Country	Empirical Model	Period	EMP Managing Tools			Findings
				Exchange Rate	Foreign Reserves	Interest Rate	
						un-certainty	speculative pressure due to political uncertainty.
(Lin, 2009) [12]	China	Cointegration system and OLS	Q1 2010-Q1 2017	*	*		The finding of this empirical study in favor of G&R model theoretical prepositions
(Kyin et al., 2013) [13]	Malaysia	VAR	January 1990 – Spetember 2008	*	*	*	The finding of the study rejected the prepositions of the traditional theory. The Central Bank of Malaysia responded in different ways under the different exchange rate regimes
(Guru & Sarma, 2017) [14]	India	Extreme Value Theory (EVT) based POT method	January 1992– August 2014	*	*	*	The study identifies 12 episodes of stress with a stress probability of 0.05, of which 3 episodes also classify as extreme stress episodes with stress probability 0.01.

III. Foreign Exchange Market Pressure Index Calculation for Afghanistan

In this study, we employed two variables EMP index (percentage depreciation of exchange rate and percentage loss in reserve in foreign reserves).

$$EMP_t = \left(\frac{E_t - E_{t-1}}{E_{t-1}}\right)100 + \left(\frac{R_{t-1} - R_t}{E_{t-1}}\right)100 \qquad (21)$$

EMP_t - Exchange Market Pressure, E_t for nominal exchange rate against USD and E_{t-1} one period back. Figures 1a and 1b indicate the calculated EMP.

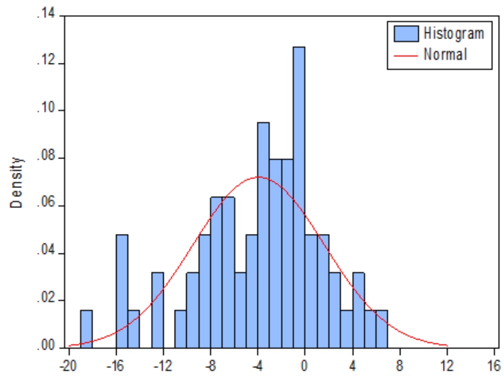

Fig. 1a. Distribution of calculated EMP, quarterly data.

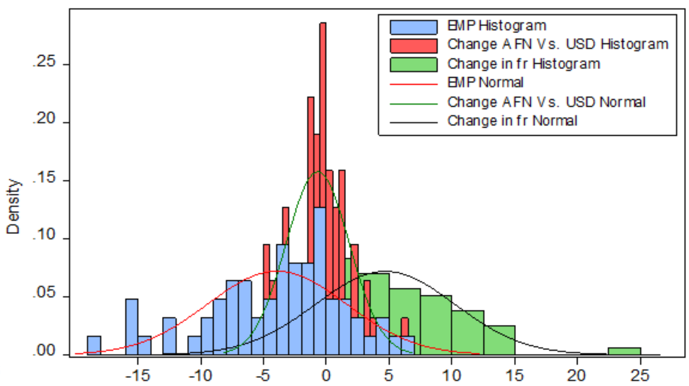

Fig. 1b. Distribution of calculated EMP, ΔE, and ΔR, quarterly data.

Source: Auther's Calculation and Drawings.

1. *Modeling Exchange Market Pressure*

The Girton and Roper (1977) model has been extensively used in many countries. It is a fitted model to study the EMP index in different unique senses [4], [5], [6]. The running of the Three Sigma Rule is a simple statistical way to detect the serious fall in the exchange rate. If the calculated EMP index larger than the mean of the EMP time series (μ EMP) plus the standard deviation of the EMP time series (σ EMP) multiplied by a weight (δ) (Wyplosz, 1997) [16]. Simply, a crisis is indicated if the following condition holds:

Crisis = $\begin{cases} 1, & if\ EMP_{it} > \mu_{EMP} + \delta . \sigma_{EMP} \\ 0, & otherwise \end{cases}$, Practically, the EMP index critical value takes the values between 1 and 3 standard deviation.

Table 2. Result of Currency Crisis.

Sigma	EMP	Signal	Date	Crisis or Not
1.5	4.38	3 times	2008Q2, 2013Q1, 2014Q3, 2015Q3	3/6 case (50%)
1.645	5.18	2 times	2013Q1, 2015Q3	(60%)
1.700	5.49	1 times	2013Q1	(70%)
2	7.15	-	-	-

Source: Author’s Calculation.

All of the detected signals are associated with a fall in foreign reserves and exchange rates.

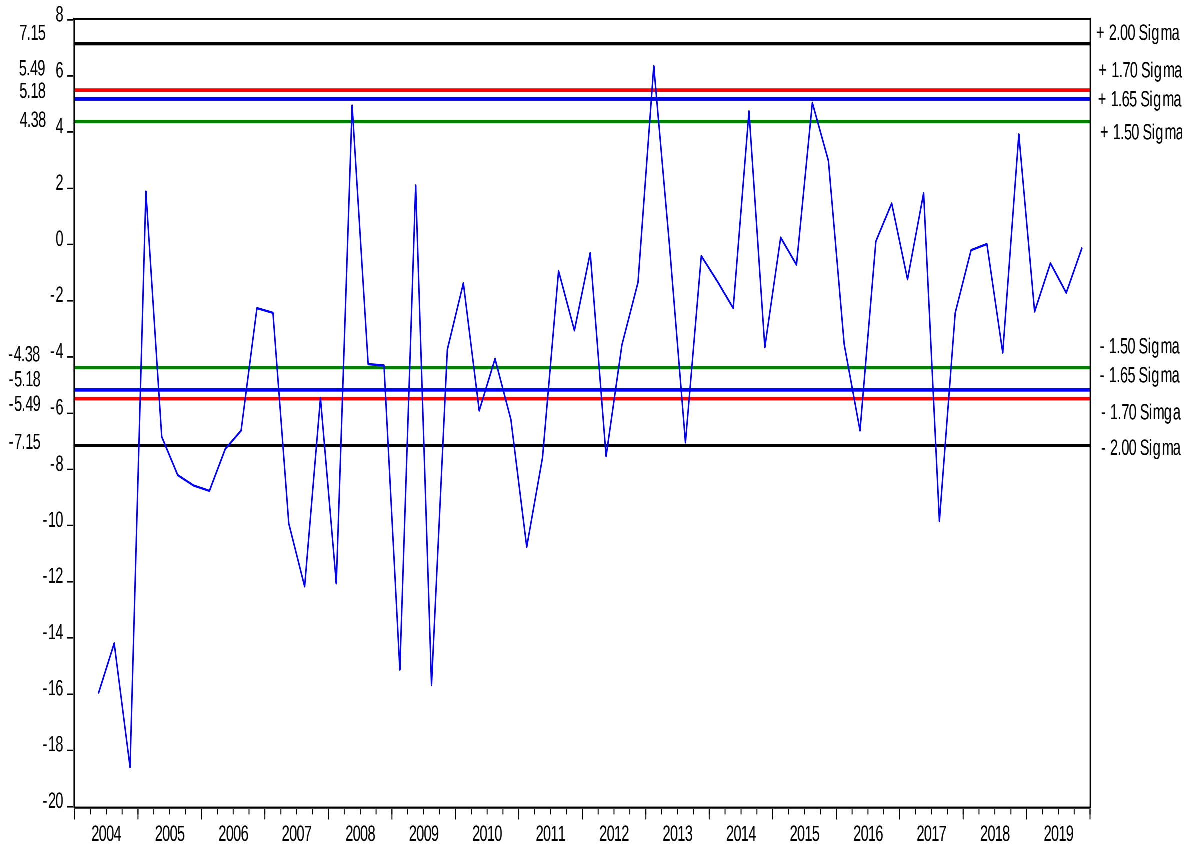

Fig. 3. The criterion of EMP index. Source: Threshold Calculation by Author.

Additionally, figure 3 presents the foreign exchange market disequilibria, which is seriously absorbed by the foreign exchange auction and partially by the exchange rate of Afghani against foreign currencies. It depicts that policy responses against the depreciation of Afghani are costly and not adequate.

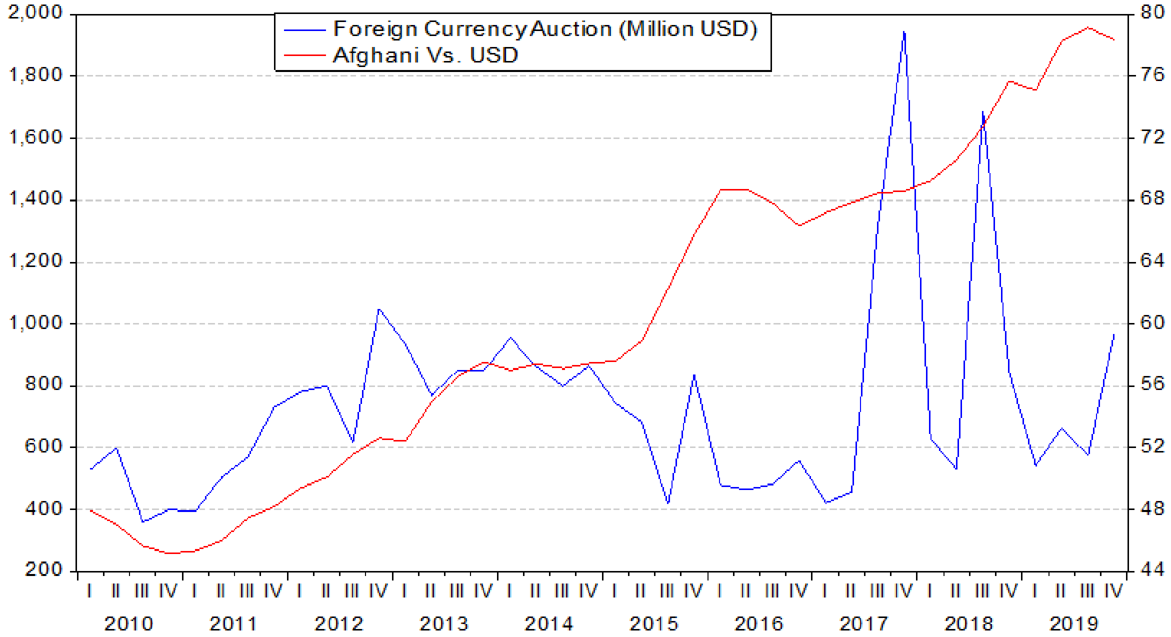

Fig. 4. Foreign currency auction and Afghani Vs. USD.Source: Da Afghanistan Bulletins.

IV. Empirical Methodology

1. *Data and Model*

To study the EMP index specification. We employ econometrics techniques regarding the properties of the variables. In this section, we field the question about the: main features of the EMP index in Afghanistan, the characteristics of monetary policy responses to foreign exchange market pressures, the magnitude of effective interventions in the foreign exchange market, and to check the asymmetry in monetary policy responses. Inline with other empirical studies the EMP is the function of;

$$EMP_t = f(FR, MB, MM, PS, Q)_t \quad (22)$$

Where:

Exchange market pressure (EMP), foreign reserves (FR), the monetary base (MB), money multiplier (MM), political stability (political uncertainty a measure of speculative attack) (PS) to measure the speculative attack, and variable $Q = (e - 1)/(r - 1)$. The variable Q identifies the measure in which the monetary authorities respond to the exchange market pressure, either loss of foreign reserves, depreciation of the currency, or both of them. The significant positive sign of the Q coefficient implies that Central Bank uses the depreciation of the currency.

In contrast, a significant negative sign of the Q coefficient implies that foreign reserve losses absorb pressure. The reference period of the study covered quarterly data from 2004 until 2019. The data are retrieved from IFS, IMF/ Integrated Monetary Database (IMD), and Da Afghanistan Bank's bulletins.

V. Empirical Result and Interpretation

1. *Stationary Test*

The products of the unite root test suggest that liable variables for our model are stationary in I(0) and I(1).

Table 3. Unit Root Test.

Variable	Level		First Difference		Order Integration
	Intercept	Trend & Intercept	Intercept	Trend & Intercept	
EMP	-1.800302 (0.3768)	-2.441746 (0.3550)	-6.921678 (0.0000)	-6.931313 (0.0000)	I(1)
FR	1.315940 (0.9985)	-2.642939 (0.2635)	-9.411479 (0.0000)	-7.062921 (0.0000)	I(1)
MB	0.164076 (0.9679)	--3.158181 (0.1030)	-3.720972 (0.0062)	-3.707250 (0.0298)	I(1)
MM	-2.492691 (0.1221)	-2.406030 (0.3730)	-6.967052 (0.0000)	-7.375069 (0.0000)	I(1)
PS	-2.706160 (0.0787)	-3.433305 (0.0562)	_	_	I(0)
Q	-6.862555 (0.0000)	-6.919790 (0.0000)	_	_	I(0)

2. *Lag Selection*

To identify the optimal lag lengths in the series, we can run normal unrestricted VAR. In this case, the optimal lag is suggested a lag length three, Akaike Information Criteria (30.16717), Schwartz Bayesian Criteria (31.01392), Hannan-Quinn (30.51119), and Final Prediction Error (509059.6).

3. *Model Selection*

According to the properties of the data, to capture the effects of EMP. We have employed the Autoregressive Distributed Lag ARDL(p, q) bounds testing approach [17].

$$\Delta EMP_t = \alpha_0 + \sum_{i=4}^{p} \delta_1 \Delta EMP_{t-i} + \sum_{i=1}^{p} \delta_2 \Delta FR_{t-i} + \sum_{i=4}^{p} \delta_3 \Delta MB_{t-i} + \sum_{i=2}^{p} \delta_4 \Delta MM_{t-i} + + \sum_{i=4}^{p} \delta_6 \Delta PS_{t-i} + \sum_{i=1}^{p} \delta_6 \Delta Q_{t-i} + \lambda_1 EMP_{t-1} + \lambda_2 R_{t-1} + \lambda_3 BM_{t-1} + \lambda_4 MM_{t-1} + \lambda_5 PS_{t-1} + \lambda_6 Q_{t-1} + \varepsilon_t \quad (23)$$

Where ε_t is the disturbance term. The null hypothesis of testing the long-run relationship of this model is $(\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6 = 0)$. On the other hand, the alternative hypothesis does not equal zero $(\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6 \neq 0)$.

Table 3. ARDL Bounds Tests.

Dependent Variable	AIC Lags	F-Statistic	Significance	Bound Tests (1% and 5%)	
				I(0)	I(1)
fEMP(EMP | FR, MB, MM, PS, Q)	4	9.237253	*Cointegration******	3.783	5.338
fFR(FR | EMP, MB, MM, PS, Q)	3	2.488876	No cointegration	2.817	4.097
fMB(MB | FR, EMP, MM, PS, Q)	4	2.346266	No cointegration	2.817	4.097
fMM(MM | FR, MB, EMP, PS Q)	4	1.421137	No cointegration	2.817	4.097
fPS(PS | FR, MB, MM, EMP, Q)	1	1.150050	No cointegration	2.835	4.09
fQ(EMP | FR, MB, MM, PS, EMP)	5	2.114111	No cointegration	2.86	4.01

Lower and upper bound tests indicate the long-run relationships at (1%) and (5%) levels of significance. *** indicates the significance at 1 percent level.

The computed value of F-statistic and T-statistic allows us to reject the null hypothesis and conclude that there is a long-run equilibrium relationship in the model. Since the calculated F-statistic (13.31282) of the above equation with EMP as the dependent variable greater than the critical value in line with [17] at one percent significance level, result in a long-run relationship between EMP, and R, MB, MM, SA, ACPI, and Q.

The long-run equation is given below:

$$EMP = -0.995793 - 0.000007\,FR + 0.000051\,BM^{**} + 7.3923MM^{***} + 7.20902PS^{***} + 0.11402Q \quad (24)$$

(0.8449) (0.4819) (0.0048) (0.0020) (0.0055) (0.4234)

Table 4. Diagnostic tests for Long- run equation (24).

Diagnostic Test	Null Hypothesis	Probability
Jarque-Bera test	H0. Normality of error term	x^2 = 0.00534 [0.9979]
Breusch-Godfrey serial correlation LM test	H0. No autocorrelation	F(2) = 1.546758 [0.2271]
ARCH test	H0. Homoskedasticity	F(1) = 0.220444 [0.6405]
Ramsey RESET test	H0. The model linearity is correctly specified	F(1) = 2.128648 [0.1532]

Note: *, **, and *** indicate significance at 10, 5, and 1 percent levels. Figures in parentheses are calculated "t" values. The goodness of fit of the estimated model is revealed in the high adjusted R-squared (0.9847).

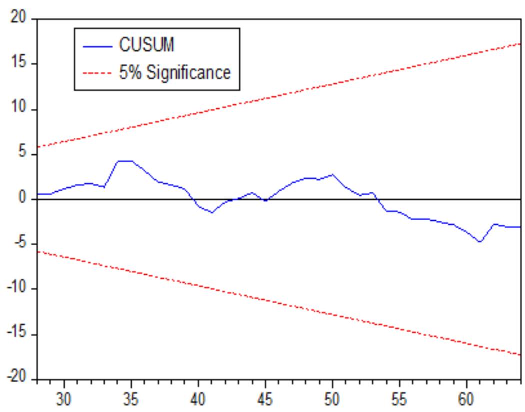

Fig. 5. The plot of CUSUM test.

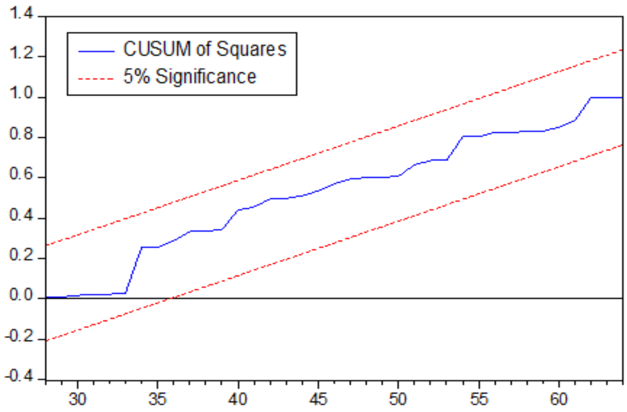

Fig. 6. The plot of CUSUM of squares test.

Table 5. Granger causality tests.

Dependent Variable	F-Statistic						ECT (t-Statistic)
	ΔEMP	ΔFR	ΔMB	ΔMM	ΔQ	ΔPS	
ΔEMP	-	0.2983	0.8448	0.5827	0.8657	0.0463**	−1.630415*** (-7.931783)
ΔFR	0.0022***	-	0.0710*	0.3229	0.6636	0.0800*	-0.079436***(-4.068960)
ΔMB	0.0030***	0.0111***	-	0.2068	0.3313	0.2327	0.002488*** (3.969068)
ΔMM	0.4042	0.6196	0.1297	-	0.6560	0.9084	-0.148202*** (-3.074679)
ΔQ	0.5256	0.9150	0.1062	0.5449	-	0.8293	-2.492046*** (-5.404185)
ΔPS	0.3894	0.1362	0.3546	0.2040	0.7773	-	0.030662***(2.745764)

Note: *, **, and *** indicate significance at 10, 5, and 1 percent levels. Figures in parentheses are calculated "t" values.

The existence of a long-run equilibrium relationship among the underlying variables reflects (in equation 24) that there must be Granger causality in at least one direction. The estimated short-run relationship among the

EMP and explanatory variables reported in (Table 5). Meanwhile, the long-run equilibrium maintains with a speed of 163.04 percent. The adjustment speed reflects the dynamic of the model, which means that any deviation from the long-run equilibrium corrected at high speed in the preceding period (quarter). Our findings indicate the substantial long-run relationship between the EMP and underlying variables. Furthermore, the result reveals the uni-direction causality between the foreign reserves and EMP and monetary base; unidirectional causality between monetary base and EMP, and bi-direction causality between the monetary base and foreign reserves.

In equation 24 the signs of explanatory variables are found in accordance with theoretical expectations, accepting hypothesized association with EMP. Additionally, we observed that (MM) has the leading statistically significant impact, in other words in the term of magnitude the coefficient is (7.3923) on EMP, followed by (PS) and (MB) with magnitudes of (7.2090) and (0.000051) respectively statistically significant. But the coefficients of (Fr) and (Q) are statistically insignificant, the positive sign of (Q) indicates that the EMP is observed by the exchange rate. The positive sign and significant role of (PS) imply that increases in uncertainty cause attack on the currency which in turn the loss of foreign reserves. Conversely, the negative sign of (FR) proves that EMP and foreign reserves are negatively correlated. Furthermore, the small magnitude coefficient of domestic credit is not a shocking amount, because in recent years domestic credit providing has a downward trend after the 2010 year. The significant coefficient of (MM) indicates that the change in the money multiplier influences the EMP because the MM is almost has been getting up during the period under the study. On the other hand, the estimated error correction term is statistically significant reported a stable long-run relationship between variables. The Long-run convergence is at the high speed.

VI. Conclusion

This paper is an attempt to calculate the EMP index under the managed floating exchange rate system in Afghanistan in the period of (2004Q1-2019Q4). We estimated the threshold level to identify the swift depreciation of Afghani using three sigma rules. The calculated EMP index identifies a pressure (+5.49) period during the (2013 Q1) in 1.70 standard deviations and several times pressure below 1.70 standard deviations at different points of time. Contrary to this the dip point of the EMP index (-18.8) occurred in (2004 Q04).

Additionally, to analyze the macro-economic factors which determine the EMP index based on the Girton & Roppen (1997) procedure we used the ARDL model. The output of the model revealed that the Central Bank of Afghanistan/Da Afghanistan Bank is strongly reliant on foreign reserves to mitigate the pressure, which can be seen by the negative sign of (FR) and significant direction among the EMP and (MB) and (FR) in the short-run. Moreover, the positive sign of (Q) statistically insignificant in both the short and long-run but reflect that in the long-run the pressure is absorbed by the currency depreciation. Meanwhile empirically we found the political uncertainty has the greatest magnitude coefficient, statistically significant in the short and long run. It means that the mitigation of the impact of speculative attacks results in a huge loss of foreign reserves. Conversely, the monetary base (MB) magnitude coefficient is the smallest but statistically significant, it shows the decline in domestic credit provision.

Da Afghanistan Bank policy toward exchange rate and monetary policy has been short-sighted and ill-conceived for decades. It means that the Da Afghanistan Bank keeps the current policy at the cost of foreign reserves loss which comes from foreign aids. The result of the study offers several policy recommendations:

first, diversification of monetary policy tools particularly using the policy rate as a powerful and economic policy tool via enabling the financial sector and fostering the relations with organized financial institutions in order to implement sustainable policies at minimum cost. Second, the formulation of a step-by-step exit strategy from foreign aid dollars depends on monetary strategy toward contemporary functional central bank operative strategy. Third, to develop the EMP index and apply it in policy proposals.

REFERENCES

[1] IMF, 1984. The exchange rate system: Lessons of the past and options for the future a Study by the research department. International Standard Serial Number: ISSN 0251-6365

[2] A. Arian and A.U., "Transmission mechanism of exchange rate pass-through to domestic prices: the case of Afghanistan," *ASS*, vol. 16, no. 4, p. 1, Mar. 2020, doi: 10.5539/ass.v16n4p1.

[3] M. Spolander, *Measuring exchange market pressure and central bank intervention*. Helsinki: Suomen Pankki, 1999.

[4] L. Girton and D. Roper, 1977. "A monetary model of exchange market pressure applied to the postwar canadian experience,"

[5] M. Connolly and J.D. da Silveira, "Exchange market pressure in postwar Brazil: an application of the Girton-Roper Monetary Model," *The American Economic Review*, vol. 69, no. 3, pp. 448–454, 1979.

[6] I. Kim, "Exchange Market Pressure in Korean: An Application of the Girton-Roper Monetary Model: Note," *Journal of Money, Credit and Banking*, vol. 17, no. 2, p. 258, May 1985, doi: 10.2307/1992339.

[7] J.S. Mah, "A note on the exchange market pressure: the Korean experience, 1980–1987," *Applied Economics*, vol. 23, no. 4, pp. 587–590, Apr. 1991, doi: 10.1080/00036849108841012.

[8] M.S. Gochoco-Bautista and C. C. Bautista, "Monetary policy and exchange market pressure: The case of the Philippines," *Journal of Macroeconomics*, vol. 27, no. 1, pp. 153–168, Mar. 2005, doi: 10.1016/j.jmacro.2003.09.006.

[9] I. Parlaktuna, "Exchange market pressure in Turkey 1993–2004: an application of the girton–roper monetary model," *International Economic Journal*, vol. 19, no. 1, pp. 51–62, Mar. 2005, doi: 10.1080/1351161042000320371.

[10] C. García and N. Malet, "Exchange market pressure, Monetary policy, and economic growth: Argentina, 1993-2004: EMP, Monetary policy, and Growth," *The Developing Economies*, vol. 45, no. 3, pp. 253–282, Sep. 2007, doi: 10.1111/j.1746-1049.2007.00043.x.

[11] T.K. Jayaraman and C. Choong, "Exchange market pressure in a small Pacific Island country: a study of Fiji: 1975-2005," *Int J of Social Economics*, vol. 35, no. 12, pp. 985–1004, Oct. 2008, doi: 10.1108/03068290810911507.

[12] L. Lin, "Foreign exchange market Pressure and monetary policy: an empirical study based on China's Data," p. 23, 2009.

[13] T.S. Kyin, L. Chin, and M.S. Habibullah, "Monetary policy and exchange market pressure in Malaysia," p. 18, 2013.

[14] A. Guru and M. Sarma, "Exchange market pressure in India," *Macroeconomics and Finance in Emerging Market Economies*, vol. 10, no. 1, pp. 68–87, Jan. 2017, doi: 10.1080/17520843.2016.1176583.

[15] Wyplosz. Contagious Currency Crises. 1997.

[16] T. Knedlik, "Signaling currency crises in South Africa," *Halle Institute for Economic Research*, p. 36, 2006[17] M. H. Pesaran, Y. Shin, and R. J. Smith, "Bounds testing approaches to the analysis of level relationships," *J. Appl. Econ.*, vol. 16, no. 3, pp. 289–326, May 2001, doi: 10.1002/jae.616.

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