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Does Monetary Policy Solely Correct Disequilibrium in the Balance of Payment? Evidence From the Developing World

Abstract: Monetary policy and balance of payments (BoP) are the key parameters in any country's economy performance. This study is an attempt to re-explore the impact of domestic credit provided by the financial sector, real interest rate, real GDP growth, inflation rate, and exchange rate on the balance of payments by net foreign assets (NFA) in 17 developing countries over 1982–2019. The most appropriate empirical strategy has been implemented to obtain robust empirical results. The results indicate that domestic credit, interest rate, inflation and exchange rate have a significantly negative, while real GDP growth has a significantly positive impact on NFA. The results of Granger causality test reveals a bidirectional causality between domestic credit and NFA, between exchange rate and NFA. Furthermore, in the case of individual country analysis, overall empirical estimates of three estimators are acceptable for 17 individual countries although some dissimilarities are found between the countries in the magnitude of estimated coefficients of variables and level of significance . Empirical findings suggest that to correct the disequilibrium in BoP, central banks (monetary authorities) need to give equal consideration to other policy measures along with the monetary instruments to accomplish stability in a country's BoP account.

Keywords: Domestic credit; inflation; income; balance of payments; monetary policy; developing economies.

JEL Classification: E4, E5, E31, O4.

1. Introduction

The prime objectives of every country are to maintain price stability, decrease unemployment, adjust disequilibrium of balance of payments (BoP), and to achieve the higher level of sustained economic growth and thereby boost public welfare. The monetary policy of every country is aimed at maintaining price stability in the economy. Monetary Policy (MP) and the BoP are the important parameters in a country's economy performance. The monetary approach to balance of payments (MABP) makes a linkage between foreign reserve assets and money aggregates. This linkage is essential for managing disequilibrium in the balance of payments through effective monetary policy. The seminal work of Johnson (1972) and Mundell (1968) on the MABP proclaimed that the BoP is largely a monetary phenomenon and achieving the desirable economic growth is not viable in the absence of stable BoP. Although, BoP effectiveness may be acheived through capital inflows in the short run, , while, in the long run, the trade balance is conclusive. Economic growth itself influences the BoP via aggregate domestic spending. Thus, there exists an interdependency between the economic growth and the BoP. Monetary policy of any country must recognize this interdependency. Furthermore, it is imprudent to treat the BoP as a secondary policy goal;the attention must rather be taken in working out the policy trade-offs between economic growth aims and BoP aims (Bourne, 1989).

Monetary policy may be formulated to adjust a deficit in the BoP of a country alongwith other objectives. The shortfall in BoP arises due to the high imports and lower exports. In this situation, the country may implement a deflationary policy by increasing the bank rate in order to reduce credit, where the general prices levels fall which, in turn, makes exports cheap and imports relatively pricier. Consequently, the volume of exports will increase, and imports will fall[1]. The aforementioned policy tool would correct the balance of payments deficit and will help the country achieve its sustainable development goals. Furthermore, the usefulness of monetary policy has to be evaluated based on its capability to influence the eventual aims of the management authorities, i.e. predominantly prices, the balance of payments, and the aggregate output. Regarding monetary policy and balance of payments of a country, in their study, Omankhanlen, Ilori, Isibor and Okoye (2021) documented that "Increased productivity, which is, increase in output per unit of labour and favourable balance of payments in equilibrium. This means having more foreign income through exports and less expenses through imports".

[1] Contractionary monetary policy, however, is not always beneficial for the developing countries compared to expansionary monetary policy.

Wilford and Wilford (1978) noted that "Since balance of payments often acts as an especially critical constraint in the economic activity of small, open economies it is useful to examine the monetary approach to the balance of payments in the context of such nations. Such an examination is doubly important since monetary approach theory suggests that, while small nations with fixed exchange rates can influence the composition of their money stock, they cannot control its level."

The worldwide financial crisis and the successive decline in the global economic growth has drawn the focus for a greater importance upon the need to maintain sufficient money supply in the economy in the face of persistent deficits in the BoP. The available statistics of several developing countries demonstrates a deficit BoP and causing numerous difficulties in monetary actions which pose serious challenges for monetary authorities (Umer, Muhammad, Abro, Sheikh and Ghazali, 2010). Moreover, there is a pervasiveness of continious current account deficit which is a matter of great concern because a stable BoP, stimulating trade, and promoting aggregate output seem difficult in the situation. Undeniably, addressing disequilibrium in the BoP is of great significance for all developing countries.

Different approaches have been developed to bring stability in the BoP disequilibria, namely the elasticity approach, the monetary approach, and the absorption approach (Du Plessis, Smith and McCarthy, 1998; Boateng & Ayentimi, 2013). In their studies, Salvatore (1998) and Fleermuys (2005) mentioned that the monetary approach to the BoP is a "monetary phenomenon". They further added that the monetary approach emphasize how the demand and supply of money influence the BoP and the exchange rate. They expound that since the exchange rate is the price of a currency, the movement in this exchange rate is thus fundamentally a monetary phenomenon and can be described by focusing on the money market.

Aghevli, Khan, Narvekar and Short (1979) pointed out that according to the Keynesian school of thought, the key cause of economic instability is variations in the aggregate demand (AD). They explained that changes in AD lead to fluctuations in the interest rate which, consequently, leads to a surfeit ?supply of money. Although an upsurge in AD leads to a surfeit demand of money and to increase in prices[2], while a decline in AD leads to a nimiety demand for liquidity that, given the main postulation of the downward strictness of wages and prices, causes a reduction in production and employment. Ultimately, as a result of intervallic demand disturbance, the economy fluctuates between eruptions of inflation and

[2] As per the monetarist views

unemployment. As per the assumptions of a little marginal propensity to save, a little interest elasticity of investment, and a high-interest elasticity of demand for money, Keynesians prefer the relative efficiency of fiscal policy for the stabilization of an economy yet accept the use of the monetary policy.

In his study, Johnson (1977) mentioned that "If the natural processes of adjustment to a deficit cannot be allowed to work themselves out, because of the inadequacy of international reserves, the policy indicated to speed the natural adjustment process is deliberate monetary contraction." Mundell (1968) noted that "It is not meant to question the validity of the three approaches. The terms can be defined so that they are correct and assert identical propositions, even if capital movements are included ……. The identity of the three approaches, when they are properly interpreted, does not mean that each approach is not in itself useful. Each approach provides additional checks on the logic of balance-of-payments policies."

In their study, Varlik and Berument (2020) noted that perpetual oil price disturbances do not have a perpetual influence on the current account deficit. In the case of Turkey, empirical pieces of the evidence discloses that, in the long-term, a managing deficit in the current account is offered by an everlasting rise in the net exports of agrarian production, travel, maintenance, overhaul services, financial services, compensation of employees, and goods under merchanting (non-tradable items of the current account balance); and an everlasting reduction in the net exports of fishery, mining, manufacturing services on physical inputs possessed by others, alongwith transportation balances generally in sectors that consume energy deeply in production.

The aim of the MABP is on the BoP as a whole (the current and the capital account) so that a disequilibrium in the BoP is equal to a change in the level of international reserves. The crux of the debate is that the disequilibrium in the BoP must be treated as the consequence of stock disequilibrium between the demand for and supply of money. The BoP difficulties are a "monetary phenomenon" that can be rectified by monetary adjustment (Thirlwall, 1980), while Howard and Mamingi (2002) expounded that the monetary approach suffers from flaw. Most of the criticisms emanate from the view that the monetary approach concentrates deeply on the demand for and supply of money and lend little attention to the role of fiscal and real economic variables which can lead to the balance of payments deterioration.

The developing regions exhibit substantial variances in their individual trade compared with the developed countries. The data show that during 2019, only

some of the developing economies from the Asia-Oceania region documented an excess in commodity trade of around 8 percent of extra-regional exports. This is all due to the large exports of assembled goods and was moderately outweigh by a shortfall in other goods groups. In Africa, the trade pattern was totally unique, with imports of manufactured goods amounting three times bigger than exports. The developing American economies had a much lesser trade shortfall than Africa (1 percent) and documented comparatively high net-exports of food. The reduction of global merchandise trade in 2019 was greatly driven by fuels, the exports of which decreased by 9%. Agrarian raw materials exports reduced by 7 percent exports of manufactured goods and metals, ores, valuable gems, and non-monetary gold by less than 2 percent (UNCTAD, 2021).

The motivation of this study is based on the role of monetary policy in maintaining equilibrium in the BoP of developing economies. A major challenge to the most developing economies is the persistent disequilibrium in the BoP. Thus, this study aims to re-investigate the monetary approach to the balance of payments (MABP) for developing countries (from Asia, Africa, Latin America the Caribbean, and the Middle East & North Africa) for the period 1982–2019. For empirical examination, BoP is measured by net foreign assets/international reserves (hereafter NFA)[3] as a regressand, whereas domestic credit provided by the financial sector, real interest rate, inflation, income, and exchange rate are regressors. Though, the monetary approach has been explored for many developing and developed countries, whereas the results have been inconclusive. This study used a longer period and updated data. Secondly, unlike the previous studies of Aghevli and Khan (1977)[4], this study uses annual balanced panel data, and implements after required tests the three estimators, namely, random-effect, Fully Modified Least Squares (FMOLS), and robust least squares are used to confirm the impacts of all selected regressors on the balance of payment measured by net foreign assets. Alongside, this study accomplishes empirical analysis for individual counties and implements the FMOLS, robust least squares, and Canonical Cointegrating Regression (CCR) estimators. Thus, this is an enhancement of the estimation strategy by providing relatively more robust parameter empirical estimates.

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[3] According to the World Bank (2021) "net foreign assets (NFA)" are "the sum of foreign assets held by monetary authorities and deposit money banks, minus their foreign liabilities. 'Or it is the collective change in its current account, which is the aggregate of the balance of trade, net income over time, and net current transfers over time. Or it is the value of overseas assets owned by a nation, less the value of its domestic assets that are owned by foreigners, adjusted for changes in valuation and exchange rates."

[4] They used three-year averages .

The rest of the paper is structured as follows. Section 2 deals with theoretical and empirical studies of monetary approach to BoP. Section 3 deals with the data, its sources, and empirical procedure. Section 4 presents empirical findings and discussion and Section 5 provides the concluding remarks.

2. Review of Literature

There is a vast literature available on fnding the determinants of BoP for different countries, using a different set of variables for different data periods, and using different empirical strategies, for example, Aghevli and Khan (1977) for 39 countries; Wilford and Wilford (1978) for Honduras; Bilquees (1989) for Pakistan; Bourne (1989) for Jamaica, Barbados, Guyana, and Trinidad & Tobago; Raghavan and Saggar (1989) for India; Watson (1990) for Trinidad and Tobago; Dhliwayo (1996) for Zimbabwe; Howard and Mamingi (2002) for Barbodas; Umer et al. (2010) for Pakistan; Boateng and Ayentimi (2013) for Ghana; Imoughele and Ismaila (2015) for Nigeria; Eita, Manuel and Naimhwaka (2019) for Namibia, and Victor (2020) for Nigeria worked on the determinants of BoP.

2.1. Theoretical Literature

The extant literature shows that there are three key theories of BoP adjustments (i.e. the elasticities and absorption (both linked with the Keynesian theory), and the monetary approach and are discussed below.

2.1.1. Elasticity Approach

The elasticity approach was pioneered by Bickerdike (1920)[5] and further explored by Robinson (1947). This approach is concerned with the influence of changes in the exchange rate on trade (exports & imports) of a country and, therefore, on the trade account balance, while overlooking all the other factors, including national income. This approach applies the Marshall-Lerner condition, which exposes that the totality of the elasticities of demand for exports and imports shall be greater than one in absolute terms for a devaluation to enhance the BoP (Du Plessis et al., 1998). The Marshallian partial equilibrium approach demonstrates that currency devaluation does correct the current account deficit but this approach was criticized for not considering other important variables (Negishit, 1968). The

[5] Chipman (1993)

elasticities approach leads to the "J-curve effect", which is related to the pattern of the "balance of trade" following a currency devaluation. The elasticity approach is largely criticized for being a partial equilibrium approach which does consider the macroeconomic impact rising from the price changes and production oscillations as a result of currency devaluation (Kim, 2009; Ali, Johari and Alias, 2014).

2.1.2. Absorption Approach

The absorption approach was formally modeled in the early 1950s and it was pioneered by Meade (1951), Alexander (1952), and others. It explores how devaluation may change the association between income (spending) or between absorption and income – in both real and nominal terms. In this approach, much emphasis is given to the current account balance (Melvin, 1992). The main criticism on the absorption approach is that it entirely overlooks the capital account component of BoP. Ali et al. (2014) mentioned that, in brief, trade balance under the 'absorption approach' is a function of absorption (domestic consumption) and real income (output). Trade balance can be augmented if there is an upsurge in real income or a reduction in domestic consumption or both.

2.2.3. Monetary Approach

The MABP which is about the BoP as a- "monetary phenomenon", reveals the association between a country's BoP and its money supply (Chacholiades, 1990). This approach to the BoP assumes an inverse relationship between the rate of economic growth of domestic credit and the rate of change of foreign reserves. The monetary approach was introduced by Polak (1957); and Mundell, (1968) and then extended by Frenkel and Johnson (1976). The theoretical framework is centered on the principle that disequilibrium in BoP can be adjusted via an adjustment of monetary variables, particularly domestic credit (Akpansung, 2013). Johnson (1977) expounded that a causal association runs from changes in the domestic credit to changes in net foreign assets—that is, inequities in the domestic monetary sector leads to inequities in a country's BoP, denoted by the change in net foreign assets (Blejer, 1979)[6].

In their study, Rabin and Yeager (1982) noted that "The weak version of the MABP raises certain questions about balances of payments under fixed exchange

[6] See (Johnson, 1977; Thirlwall, 1980; Frenkel & Johnson, 1976; Watson, 1990)

rates; it focuses attention on certain aspects of reality. Instead of being a theory, however, it is a framework for analysis."

This study considers the monetary approach regarding the BoP disequilibrium; however, the other approaches are also cursory explained to understand their insufficiencies and support for the use of the monetary approach.

2.2. Empirical Evidence

Numerous erstwhile studies empirically examined the association between domestic credit, inflation, money supply, exchange rate, and trade, and the like to BoP (net foreign reserve). For example, the empirical findings of Lachman (1975) study supported that monetarists' approach for South African economy from 1960–1973 and recommended the monetary institution to be liable for managing the money supply for augmenting imports. Aghevli and Khan (1977) observed evidence in favour of MABP for 39 developing countries over 1957–1966. Using the least-squares method, Bourne (1989) carried out a study on Jamaica, Barbados, Guyana, and Trinidad and Tobago during 1966–1982. The results revealed that only in the case of Barbados interest rates appeared to impact the BoP, whilst the estimated coefficient sign of the income variable was opposing to the prediction of the monetary approach in the other three countries. Raghavan and Saggar (1989) concluded that the impact of domestic credit on international reserves was found to have been very weak over 1960-61 to 1985, thus, empirical findings on the applicability of MBOP in case of the Indian economy were unsatisfying. Watson (1990) regressed different equations and found mixed results for Trinidad and Tobago over 1965–1985. Moreover, in conclusion, Watson mentioned that the monetary approach provides a useful cautious elucidation of the BoP of Trinidad and Tobago, stating that "The components approach certainly matches the performance of the monetary approach as an explanation of the balance of Trinidad & Tobago and, given the greater policy details that it is capable of providing, may even appeare to many as being preferable to the latter. It means, in particular, that some advantage is to be gained in exchange rate policies."

In their study, Umer et al. (2010) found a significantly positive link between GDP growth and net foreign assets, and negative impacts of interest rate and domestic credit on net foreign assets for Pakistan over 1980–2008. The study supported the monetary approach to correct the BoP disequilibrium. Boateng and Ayentimi (2013) study revealed that out of total of four monetary regressors, three were found to be statistically significant (i.e., GDP growth, domestic credit, and interest rate). The GDP growth was positive, while domestic credit and interest

rate were adversely related to the net foreign assets in Ghana during 1980–2010, whereas the inflation rate had a insignificant link with NFA. The authors further added that public spending and public debt may affect the BoP in Ghana. Danjuma (2013) found that money supply is not the sole correcting mechanism for the imbalance in Nigeria's BoP during 1986–2010. Likewise, Imoughele and Ismaila (2015) observed that monetary policy variables, namely, broad money supply, exchange rate, and credit to the private sectors were the key monetary factors that determined Nigerian BoP over 1986–2013. Krušković (2017) expounds that exchange rate is a vital transmission mechanism of monetary policy since, depending on the nature of shock, it influences inflation and aggregate demand, particularly in a small open economy. The author empirically vindicates that the exchange rate is a more substantial transmission mechanism over interest rate in the emerging markets and Serbia. Awdeh (2019) observed that monetary policy transmission channels through bank credit and capital played a useful role in promoting Lebanon's GDP growth over 2002– 2017. Eita et al. (2019) found that an upsurge in capital flows and real GDP per capita contributed to the deterioration of the current account of Namibia from 1980-2016, while raise in the commodity prices, interest rate, and population affected the current account balance to expand. The authors suggested that contractionary monetary policy plays a vital role in the reduction of unproductive imports and enhanced the current account balance. Kalhara (2020) observed that interest rate, exchange rate, and inflation rate had negative impacts on the BoP of Sri Lanka over 1995–2018. A summary of relevant empirical studies is given in Table 1.

Table 1: Selected previous studies on monetary approach to the BoP

Author(s)	Data, country(s), estimator (s)	Regressand	Regressors	Findings
Oluwole and Oloyede (2020)	1970–2016 West Africa Monetary Zone, Fixed-effects, ARDL	NFA	Exports, domestic credits, income, interest rate, inflation, and exchange rate.	Domestic credit, interest rate and exports have significant positive, while exchange rate has a negative, and inflation has an insignificant impact on FNA.
Victor (2020)	2007:Q1–2018: Q4, Nigeria, TSLS	NFA	Domestic credit export, and capital inflows	Domestic credit has a significant and negative impact on NFA
Osisanwo, Tella & Adesoye (2019)	1980–2015 Nigeria, ARDL	BoP	Domestic credit, money supply, GDP, trade balance, exchange rate; inflation rate and	Domestic credit, inflation GDP, and exchange rate have negative, while money supply and trade balance have positive impact of BoP
Iyoboyi and Muftau (2014)	1961–2012 Nigeria, VECM	BoP	Public spending, exchange rate, openness, real GDP, money supply, and interest rate	Public spending, money supply, and interest rate have positive, while exchange rate, GDP, and openness have negative impact on BoP
Boateng and Ayentimi (2013)	1980–2010, Ghana, OLS	NFP	Domestic credit, inflation, GDP growth, and interest rate	Inflation, domestic credit, and interest rate have negative, while GDP growth has positive impact on NFA

Adamu and Itsede (2010)	1975–2008, West African Monetary Zone, OLS, GMM	NFA	Domestic credit, real GDP, inflation rate, and interest rate.	Domestic credit, and interest rate have negative, while real income and inflation rate have positive impact on NFA
Howard and Mamingi (2002)	1973–1998 Barbodas, ECM	International reserves	Domestic credit, income, money supply, nominal interest rate, price level, and money multiplier	Domestic credit, money supply, interest rate, money multiplier, inflation, interest rate has negative, while real income has positive impact on foreign reserve.
Dhliwayo (1996)	1980–1991, Zimbabwe, ECM	NFA	Domestic credit, inflation, real income, and interest rate	Domestic credit, and interest rate have negative, while real income and inflation rate have positive impact on NFA
Qureshi (1993)	1973Q–1981Q, Pakistan, OLS	International reserve	domestic credit, income, interest rate, money multiplier, and price	Money multiplier and domestic' credit have negative impact on foreign reserve
Watson (1990)	1965–1985 Trinidad & Tobago, OLS, IV	International reserve	domestic credit, price level, income, and rate of interest	Domestic credit and rate of interest have negative, while price level and income have positive impact on foreign reserve.
Bilquees (1989)	1959–60 - 1981–82, Pakistan, OLS	BoP	GNP deflator (inflation), real income, interest rate, money multiplier, and net domestic credit	Inflation, real income, and domestic credit have positive, while interest rate has negative impact on BoP
Wilford and Wilford (1978)	1950–1974 Honduras	International reserves	Domestic credit, inflation, real income, and interest rate	Domestic credit and interest rate have negative, while inflation and real income have positive impact on foreign reserve
Aghevli and Khan (1977)	39 countries 1957–1966	International reserves	Rate of inflation, domestic price level, real income, and interest rate	Rate of inflation and interest rate have negative, while real income and domestic price have positive impact on foreign reserve

Source: Author`s compilation

3. Data and Empirical Methodology

3.1 Empirical model

To examine the impact of domestic credit provided by the financial sector, real interest rate, inflation, income, and exchange rate on the BoP, this study adopts the standard of MABP model used by many prior studies, including Mundell (1968), Johnson (1973;1977), Zecher (1974), Kemp (1975), Bean (1976), Aghevli and Khan (1977), Wilford and Wilford (1978), Bilquees (1989), Watson (1990), Qureshi (1993), Dhliwayo (1996), Howard and Mamingi (2002), Osisanwo et al. (2019), Victor (2020) and many others. Moreover, the model is based on the monetary approach of Howard and Mamingi (2002) which postulates the association between the change in reserves and other variables which explain the demand for money. Following, the study of Bean (1976), the model is written as follows:

$$M_d = P.L(Y, i) \quad \text{Eq. (1)}$$

$$M_s = m(R + D) \quad \text{Eq. (2)}$$

$$M_d = M_s \quad \text{Eq. (3)}$$

$$P.L(Y, i) = m(R + D) \quad \text{Eq. (4)}$$

where P, Y, I, m, R, D, MS, Md represent the price level; real income; interest rate; money multiplier; international reserves of monetary authorities; domestic credit; money supply and money demand, respectively.

Equation (4) converted into logarithm can be written as follows:

$$dlogP + a_y dlogY + a_i dlogi = dlogm + \frac{R}{R+D} dlogR + \frac{R}{R+D} dlogD \quad \text{Eq. (5)}$$

Eq. (5) can be rearranged for estimation purpose and substitute the differential by the 1st difference operator (Δ) as follows:

$$\frac{R}{R+D} \Delta log\ R = a_1\ \Delta log\ P + a_2 \Delta log\ Y + a_3 \Delta log\ i + a_4 \Delta log\ m + a_5\ \frac{D}{R+D} \Delta log\ D \quad \text{Eq. (6)}$$

Though Eq. (6) is the standard reserve flow equation obtained from the model, some researchers, however, used a number of alternative formulations, as shown below:

$$NFA_{i,t} = \beta_0 + \beta_1 DC_{i,t} + \beta_2 r_{i,t} + \beta_3 OER_{i,t} + \beta_4 CPI_{i,t} + \beta_5 Y_{i,t} + \varepsilon_{i,t} \quad \text{Eq. (7)}$$

$$\beta_1 < 0;\ \beta_2 < 0;\ \beta_3 < 0; \beta_4 < 0;\ \beta_5 > 0$$

In Eq. (7), $\beta_1 - \beta_5$ are the coefficients, and *i* and *t* are the i^{th} country and t^{th} time period respectively ($i = 1, 2, \ldots, N = 17;\ t = 1, 2, \ldots, T = 39$). NFA shows the BoP measured by net foreign assets/international reserves, DC is domestic credit provided by the financial sector, Y depicts real GDP growth, CPI is the inflation rate, OER represent the official exchange rate, r is the real interest rate, and ε_{it} is the error term. The term β_0 in Eq. (7) shows the intercept term that changes across countries but not overtime. Furthermore, each individual constant controls country-specific differences, though the error terms (ε_{it}) are presumed to be independent with the zero mean (0) and constant variance (σ_ε^2) for all the countries and throughout the sample period under study. The study hypothesized that estimating a net foreign asset equation consists of domestic credit, interest rate, inflation, income, and exchange rate if the estimated partial coefficient of changes in interest rate, domestic credit with respect to net foreign asset are found significantly negative, it will imply that the monetary policy plays a role in the determination of BoP of the developing economies.

H1: This study postulates, a negative relationship between domestic credit and net foreign assets, a priori, $\beta_1 < 0$ (Eq. 7)

H2: An increase in the real rate of interest reduces the demand for liquidity, consequently generating overflow supply for money, causing outflows of reserves in the form of BoP deficit, thus, a priori, $\beta_2 < 0$

H3: Exchange rate fluctuations may also have a substantial influence on the BoP. Currency appreciation against that of other nation's currency will reduce the value of both foreign currency-denominated assets and liabilities, whereas currency depreciation will boost the value of these foreign assets and liabilities, thus, a priori, $\beta_3 < 0$

H4: Ceteris paribus, a rise in inflation rate boosts the demand for money, causes dampens the demand for real balances, thus resulting in reserve outflows. The expected coefficient is negatively related to the dependent variable, thus, a priori, $\beta_4 < 0$

H5: The higher (lower) the real GDP growth, the more favorable (unfavorable) would be the net foreign assets. Thus, the effect of real GDP growth on net foreign assets is hypothesized to be positive, a priori, $\beta_4 > 0$.

3.2. Data and its sources

Balanced panel data over the period 1982–2019 are used. The details of data and variables used in this study are given in Table 2.

Table 2: Variables, their definitions, and data sources

Variables	Label	Definition	Sources
Net foreign assets (US$) as % of GDP	NFA	NFAs are the total of foreign reserve held by monetary authorities & deposit money banks, minus their foreign liabilities.	WDI (2021)
Official exchange rate (LCU per US$, period average)	OER	OER refers to the exchange rate explained by national authorities. It is computed as an annual average based on monthly averages (local currency units relative to the US$).	WDI (2021)
Real interest rate (%)	r	It is the lending interest rate adjusted for price level as measured by the GDP deflator.	WDI (2021)
Inflation, consumer prices (annual %)	CPI	CPI reflects the annual % change in the cost to the average consumer of obtaining a basket of goods and services that may be fixed or changed at specific intervals, such as yearly. Generally, Laspeyres formula is employed.	WDI (2021)

GDP (constant 2010 US$) growth	Y	Real GDP at purchaser's prices is the total of gross value added by all dweller producers in the economy along with any product taxes and less any subsidies not contained in the value of the products.	WDI (2021)
Domestic credit provided by financial sector (% of GDP)	CD	It includes all credit to different sectors on a gross basis, with the exclusion of credit to the central government. Monetary authorities, deposit money banks, and other financial corporations where data are available (comprising corporations that do not receive transferable deposits but do incur such liabilities as time and savings deposits) refer to the financial sector.	WDI (2021)

Source: Author`s compilation

3.3. Empirical Strategy

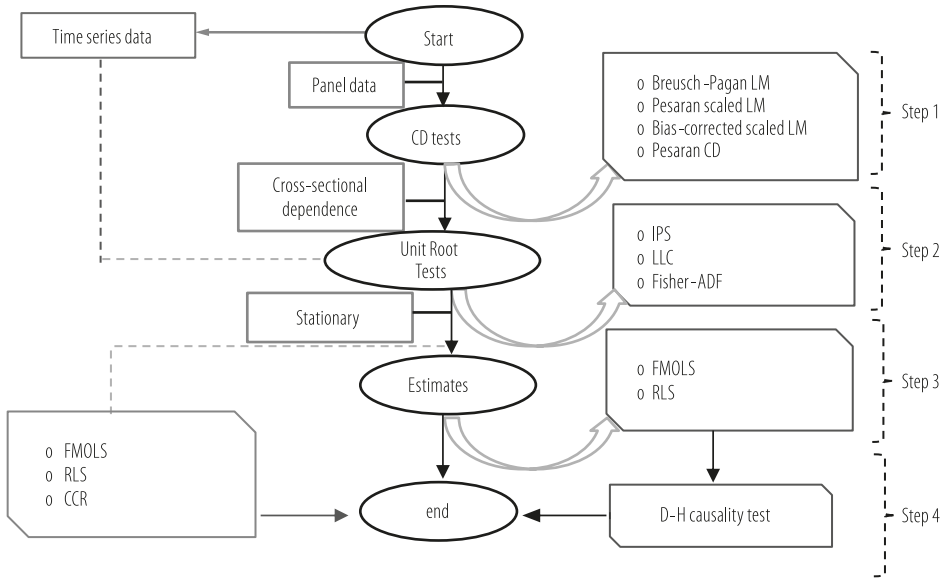
The study implemented a four-step empirical strategy to achieve the objective. First, cross-section dependence (CD) of the data is tested using the CD-Pesaran scaled LM (Pesaran, 2004); CDLM (Breusch and Pagan, 1980); CD-Bias-corrected scaled LM (Pesaran, 2004); and CD-LMadj (Pesaran, Ullah and Yamagata, 2008) CD test. These results help to employ apposite panel unit root tests. Second, to check the stationarities properties of the panel data, the widely used panel unit root tests namely Levin-Lin-Chu (LLC) (2002), Im-Pesaran-Shin (IPS) (2003), and ADF - Fisher Chi-square are adopted. The third step is to implement the FMOLS estimator, and also a robustness test, so this study also adopts the robust least squares (RLS) to confirm the FMOLS estimates. The fourth step is to employ the Pairwise Dumitrescu Hurlin panel causality tests to find the direction of causality in series. In addition, for the individual country analysis, after checking data for stationarity purposes, the methods of FMOLS and Canonical Cointegrating Regression (CCR) are implemented. Moreover, the method of RLS is employed in addition to the robustness test to confirm the results of FMOLS and CRR.

The fully modified OLS approach introduced by Pedroni (1999) is employed. The main feature of this estimator over the least square estimator is that the FMOLS method is corrected for the endogeneity and serial correlation problems in regressors.

Furthermore, the CCR estimator introduced by Park (1992) exhibits a smaller bias than the least square estimator. The method of CCR is based on a conversion of the variables in the cointegrating regression that eliminates the 2nd-order bias of the least square estimator (Montalvo, 1995).

Robust regression is a substitute solution to overcome outlier problem, which brings robust results (Huber, 1973). The robust least squares estimator (MM-estimators) proposed by Yohai (1987) is employed because the weakness of the classical sample estimation techniques is that they are sensitive to the existence of outliers in the data (Pitselis, 2013). Figure 1 is an analytical framework that shows the overall estimation procedure of the study.

Figure 1: Analytical Framework



Source: Author's construction

4. Empirical Results and Analysis

The results of the data analysis and all other empirical estimates are given in Tables 3-8. The descriptive statistics and correlation matrix results are reported in Table 3 which demonstrates considerable variables in all variables used for the 17 developing countries across the sample period. The correlation matrix shows no obvious serial correlation problem, and correlation between variables is in accordance with the hypotheses of the study.

The CD tests are adopted in order to circumvent the issue of cross-sectional dependence which may lead to biased results and results are presented in Table

3. These results have a sufficient evidence to reject the null hypothesis of cross-sectional dependence as the relevant p-values are statistically significant. These results establish the presence of cross-sectional dependence for domestic credit, real GDP growth, inflation rate, official exchange rate, real interest rate, and net foreign assets. These results are implying that the disturbance in one country transmits across the entire sample under examination. Thus, the individual countries are vastly unified economies of the developing world.

A summary of the panel unit root analysis is reported in Table 5. The PURTs results reveal that the domestic credit, official exchange rate, and net foreign assets variables are stationary at the level, while real GDP growth, inflation rate, and real interest rate variables are found to be non-stationary at the level and become stationary after its 1st difference with individual constant and trend in a panel.

Empirical estimates of the FMOLS are given in Table 6. All the estimated coefficients are substantially different from zero and not substantially different from their postulated values, at least at the 1 percent level of significance. The empirical estimates of FMOLS estimator on the impact of domestic credit on BoP by net foreign assets are found negative and statistically significant at the one percent level, indicating that the specified null hypothesis cannot be rejected. The estimated coefficient for the domestic credit is found -0.169[7], which implies that a one percent change will bring almost a 17% change in the net foreign assets. This empirical finding indicates that excessive creation of domestic credit creates the situation where international reserves might be lost. Empirical findings supports the monetary approach regarding the correction of disequilibrium in BoP of the developing world. The finding of this study on the inverse association between domestic credit and NFA are consistent with the findings of Aghevli and Khan (1977, p. 283) "The estimated coefficient of the rate of growth in domestic assets is significantly different from unity. This would imply that the increases in this variable would not leak out in the balance of payments." These results are consistent with many others such as Qureshi (1993), Howard and Mamingi (2002), Boateng and Ayentimi (2013) Osisanwo et al. (2019), and Victor (2020), while contradictory to the findings by Bilquees (1989) and Oluwole and Oloyede (2020).

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[7] However, the estimated coefficient value for domestic credit variable found is different from -1 and does not suggest one-to-one association. In their study, Wilford and Wilford (1978) conclude that "Perhaps most important from the policy standpoint is the fact that the coefficients of (D/ H)gD are very close to the predicted value of - 1 in both Tables 1 and 2." In case of European creditor nation, Grove (1965) mentions that "No one has come up with any better alternative. A restrictive monetary policy is not a practical alternative to specific measures, even though monetary policy does have a role to play. It is an important role, and, by any reasonable standards, it has been played well thus far."

It is evident from table 6 that the impact of real interest rate on NFA is found significantly negative at one level of significance and thereby the coefficient has the expected sign. The estimated coefficient for real interest is found as -0.164, indicating that a 1% increase in the interest rate reduces international reserves by almost 16%. This result cosistent with the findings of Aghevli and Khan (1977), Wilford and Wilford (1978), Dhliwayo (1996), Howard and Mamingi (2002) and Kalhara (2020), while unconsistent with the findings by Iyoboyi and Muftau (2014), and Oluwole and Oloyede (2020).

Other thing remaining same, a rise in the general price level expands the demand for money, resulting in reduction for the demand in real balances and thereby boosting reserve outflows. The estimated coefficient for the inflation rate variable is found as -0.006, and statistically significant at the 1% level, implying that 1% change in the inflation variable will bring a -0.06% change in the NFA. This result is in line with the results presented in prior studies by Aghevli and Khan (1977), Howard and Mamingi (2002), Osisanwo et al. (2019), and Kalhara (2020), while contradictory with the results obtained by Wilford and Wilford (1978), Bilquees (1989), Dhliwayo (1996), and Adamu and Itsede (2010).

The empirical result regarding the linkage between the exchange rate and NFA is found to be significantly negative at the 1% level. The estimated coefficient for the exchange rate variable is found as 0.019, implying that the variable positively contributes to the BoP of the developing economies. This result is in accordance with the economic theory that depreciation in the exchange rate will boost BoP position due to the upsurge in net export balance, and vice versa. The result suggests that BoP is expected to be enhanced using exchange rate devaluation. The result is in line with the findings by Kalhara (2020) and Oluwole and Oloyede (2020).

Furthermore, the results exhibit that real GDP growth has a positive and significant effect on the net foreign assets. The coefficient for the real GDP variable is found as 0.014, suggesting that a 1% increase in the real GDP growth of the developing world economies causes almost a 1% increase in the net foreign assets. This finding is consistent with the findings of Aghevli and Khan (1977), Wilford and Wilford (1978), Qureshi (1993), Howard and Mamingi (2002), and Boateng and Ayentimi (2013), and contrary to the findings of Iyoboyi and Muftau (2014), and Osisanwo et al. (2019).

For robust check, the study implemented the method of robust least squares (MM-estimation) and the results are given in Table 6. Overall, the robust least-squares strongly supports and confirms the empirical estimates of the FMOLS estimator in terms of estimated coefficients and level of significance. The empiri-

cal results of the present study are in accord with those of other empirical studies exploring the same for the developed economies.

The Pairwise Dumitrescu Hurlin test is employed to explore the direction of causality in the series and results are presented in Table 7. The Granger causality results reveals that there is a bidirectional causality between domestic credit and NFA, between exchange rate and NFA, while a unidirectional causality running from NFA, and real interest rate to real GDP growth, from NFA, to inflation, and real interest rate, from real GDP, and interest rate to inflation rate, from real GDP to exchange rate, and similarly unidirectional causality is running from exchange rate to interest rate and domestic credit.

The regression analysis has been carried out by considering the individual country to verify the impact of domestic credit, official exchange rate, real GDP growth, inflation rate, and the real interest rate variables on the net foreign assets using the methods of FMOLS, CRR, and RLS. The empirical estimates of all three estimators are given in Table 8. Results given in the table reveal that certain accepted results appear from the three estimators of the model for 17 individual countries. In spite of some apparent variations between countries, most of the estimated coefficients of variables in the present study seem to be of the same order of size.

Table 3: Basic statistics and correlation matrix

Statistics/variables	NFA_{it}	Y_{it}	CPI_{it}	OER_{it}	r_{it}	DC_{it}
Mean	9.994	4.540916	33.30566	143.9833	6.522037	34.46222
Median	7.021	4.650190	8.005723	42.36676	6.500000	28.62835
Maximum	70.336	29.05432	11749.64	1782.877	44.40763	119.6001
Minimum	-34.946	-11.35244	-18.10863	-8.009867	-41.79024	-18.42229
Std. Dev.	15.544	3.858331	471.1529	266.6480	9.093661	24.78673
Skewness	1.075	0.115882	24.53619	3.135444	-0.685489	0.741291
Kurtosis	5.029	7.721143	609.9679	14.58837	8.525379	3.014938
Jarque-Bera	229.100	585.5703	9718525.	4550.142	849.3963	57.61300
NFA_{it}	1.000					
Y_{it}	0.019	1.0000				
CPI_{it}	-0.089	-0.01668	1.0000			
OER_{it}	0.262	-0.10685	-0.02792	1.0000		
r_{it}	0.1198	-0.05701	0.03605	0.20583	1.0000	
DC_{it}	-0.125634	0.30829	-0.03962	0.18741	-0.06968	1.0000

Source: Author`s calculations

Table 4: Results of cross-sectional dependence tests

Tests	Y_{it}	CPI_{it}	r_{it}	OER_{it}	DC_{it}
Breusch-Pagan LM	4692.774*	352.2571*	384.2617*	2788.711*	1221.876*
Pesaran scaled LM	275.2643*	12.08174*	14.02230*	159.8135*	64.81014*
Bias-corrected scaled LM	275.0281*	11.84562*	13.78619*	159.5774*	64.57403*
Pesaran CD	68.42605*	12.07013*	1.996815*	48.94624*	12.55765*

Note: Null hypothesis: No cross-section dependence. d.f.=136. Asterisk * shows 1% level of significance

Table 5: Summary of panel unit roots results

Tests	Variables	C	$C\&T$
Levin Lin & Chu (LLC)	NFA_{it}	-7.237* (0.000)	-5.728* (0.000)
	Y_{it}	-5.665* (0.000)	-5.013* (0.000)
	CPI_{it}	-7.073* (0.000)	-7.060* (0.000)
	r_{it}	-3.447* (0.000)	-3.439* (0.000)
	OER_{it}	-8.634* (0.000)	-7.475* (0.000)
	DC_{it}	-7.983* (0.000)	-6.526* (0.000)
Im, Pesaran and Shin W-stat (IPS)	NFA_{it}	-9.870* (0.000)	-7.489* (0.000)
	Y_{it}	-7.591* (0.000)	-7.187* (0.000)
	CPI_{it}	-7.511* (0.000)	-7.501* (0.000)
	r_{it}	-5.300* (0.000)	-5.287* (0.000)
	OER_{it}	-11.491* (0.000)	-10.375* (0.000)
	DC_{it}	-10.777* (0.000)	-9.242* (0.000)
ADF - Fisher Chi-square	NFA_{it}	163.652* (0.000)	117.261* (0.000)
	Y_{it}	130.191* (0.000)	120.168* (0.000)
	CPI_{it}	123.884* (0.000)	120.831* (0.000)
	r_{it}	92.049* (0.000)	79.138* (0.000)-
	OER_{it}	196.791* (0.000)	164.418* (0.000)
	DC_{it}	182.697* (0.000)	148.797* (0.000)

Note: The unit root tests are carried out with a specification of constant and time trend.

Where, asterisk * indicates statistically significant at the 1% level of significance at the 1st difference.

Table 6: Empirical estimates

Estimators/ Regressors	FMOLS Coefficient	Robust Least Squares (Method: MM-estimation) Coefficient
Intercept	-	12.843* [0.728]
Domestic credit provided by financial sector (DC_{it})	-0.169* [0.060]	-0.072* [0.017]
Lending interest rate (r_{it})	-0.164** [0.098]	-0.210* [0.043]
Inflation, consumer prices (CPI_{it})	-0.006* [0.002]	-0.341* [0.0008]
Official exchange rate (OER_{it})	-0.019* [0.005]	-0.013* [0.002]
Gross domestic product (Y_{it})	0.014* [0.005]	0.005* [0.001]
Adj. R^2	0.535	0.369

Note: Regressand: Net foreign assets as %age of GDP. Standard error are in [ ].
Asterisks * and ** shows significant at the 1% and 10% levels.

Table 7: Pairwise Dumitrescu Hurlin panel causality tests

Statistics/ variables	NFA_{it}	Y_{it}	CPI_{it}	r_{it}	OER_{it}	DC_{it}
NFA_{it}	-	4.05731* (0.0006)	5.25797* (0.0000)	0.4165* (0.0000)	3.83569* (0.0024)	5.14399* (0.0000)
Y_{it}	2.8848 (0.1842)	-	4.75818* (0.0000)	3.02967*** (0.1022)	5.34922* (0.0000)	5.27795* (0.0000)
CPI_{it}	2.20920 (0.9054)	2.90802 (0.1705)	-	3.37919** (0.0268)	1.55706 (0.2940)	2.32803 (0.7401)
r_{it}	1.68926 (0.4165)	3.20795*** (0.0564)	3.99807* (0.0009)	-	1.55154 (0.2895)	3.20263** (0.0577)
OER_{it}	3.27149*** (0.0432)	2.40466 (0.6391)	4.60750* (0.0000)	4.70188* (0.0000)	-	4.34369* (0.0000)
DC_{it}	5.41839* (0.0000)	3.17602*** (0.0642)	4.13743* (0.0004)	4.60701* (0.0000)	2.69463 (0.3230)	-

Note: Asterisks *, ** and *** shows significant at the 1%, 5% and 10% levels. Lags: 2

Table 8: Empirical estimates (Individual countries analysis)

Countries/ Estimators	Bangladesh			Bhutan			India		
	FMOLS	CRR	RLS	FMOLS	CRR	RLS	FMOLS	CRR	RLS
Y_{it}	0.155*	0.146*	0.225*	26.972*	26.614**	29.44*	-0.007*	-0.006	-0.005*
	[0.015]	[0.019]	[0.009]	[9.235]	[9.950]	[7.211]	[0.002]	[0.002]	[0.001]
	(0.000)	(0.000)	(0.000)	(0.006)	(0.012)	(0.000)	(0.003)	(0.023)	(0.004)
CPI_{it}	-0.003	0.015	-0.145**	-0.220	-0.210	-0.235	0.157	0.177	0.126
	[0.107]	[0.132]	[0.065]	[0.365]	[0.482]	[0.293]	[0.185]	[0.275]	[0.152]
	(0.976)	(0.913)	(0.026)	(0.551)	(0.666)	(0.421)	(0.403)	(0.523)	(0.405)
OER_{it}	0.018	0.020	0.123*	-0.052*	-0.054*	-0.036*	-0.417*	-0.404*	-0.319*
	[0.072]	[0.079]	[0.045]	[0.016]	[0.017]	[0.013]	[0.080]	[0.098]	[0.065]
	(0.804)	(0.801)	(0.006)	(0.003)	(0.004)	(0.004)	(0.000)	(0.000)	(0.000)
r_{it}	0.081	0.096	0.046	-0.354	-0.678	-0.224	-0.346	-0.379	-0.279
	[0.068]	[0.095]	[0.042]	[0.614]	[0.973]	[0.491]	[0.227]	[0.348]	[0.186]
	(0.248)	(0.320)	(0.284)	(0.568)	(0.491)	(0.647)	(0.138)	(0.285)	(0.134)
DC_{it}	-0.18**	-0.17***	-0.162*	-0.641**	-0.652**	-0.648*	0.308*	0.295*	0.332*
	[0.081]	[0.094]	[0.051]	[0.277]	[0.302]	[0.218]	[0.080]	[0.091]	[0.065]
	(0.037)	(0.090)	(0.001)	(0.028)	(0.039)	(0.003)	(0.000)	(0.003)	(0.000)
Intercept	-2.65***	-2.803	-0.089	3.421	5.354	8.836	-12.56**	-12.06***	-13.71*
	[1.478]	[1.665]	[0.916]	[10.077]	[12.425]	[7.998]	[4.914]	[6.540]	[3.995]
	(0.083)	(0.103)	(0.922)	(0.736)	(0.669)	(0.269)	(0.015)	(0.075)	(0.000)
Adj. R^2	0.904	0.900	0.981	0.649	0.631	0.646	0.905	0.905	0.772

Note: Asterisks *, ** and *** shows significant at the 1%, 5% and 10% levels.

Table 8 (continued): Empirical estimates (Individual countries analysis)

Countries/ Estimators	Myanmar			Philippine		
	FMOLS	CRR	RLS	FMOLS	CRR	RLS
Y_{it}	0.515*	0.488*	0.566*	0.141*	0.125*	0.288*
	[0.110]	[0.116]	[0.110]	[0.030]	[0.037]	[0.013]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)
CPI_{it}	0.166	0.200***	0.135	-0.654***	-0.935***	-0.049
	[0.086]	[0.113]	[0.086]	[0.324]	[0.492]	[0.147]
	(0.061)	(0.087)	(0.116)	(0.052)	(0.067)	(0.735)
OER_{it}	-0.02***	-0.021***	-0.023**	0.120	0.084	0.020
	[0.010]	[0.011]	[0.010]	[0.172]	[0.173]	[0.074]
	(0.052)	(0.066)	(0.034)	(0.489)	(0.627)	(0.779)
r_{it}	0.494*	0.620*	0.365*	-0.887	-1.548	-0.036
	[0.119]	[0.178]	[0.120]	[0.508]	[1.023]	[0.231]
	(0.000)	(0.001)	(0.002)	(0.091)	(0.1409)	(0.873)
DC_{it}	-0.010	-0.000	0.022	-0.143	-0.219	-0.050
	[0.062]	[0.065]	[0.062]	[0.120]	[0.150]	[0.054]
	(0.861)	(0.997)	(0.715)	(0.2427)	(0.156)	(0.349)
Intercept	-19.82*	-20.027*	-21.83*	1.973	14.161	-27.51*
	[4.371]	[4.956]	[4.377]	[11.921]	[19.172]	[5.415]
	(0.000)	(0.000)	(0.000)	(0.869)	(0.465)	(0.000)
Adj. R^2	0.906	0.889	0.751	0.851	0.822	0.664

Note: Asterisks *, ** and *** shows significant at the 1%, 5% and 10% levels.

Table 8 (continued): Empirical estimates (Individual countries analysis)

Countries/ Estimators	Egypt			Benin			Bolivia		
	FMOLS	CRR	RLS	FMOLS	CRR	RLS	FMOLS	CRR	RLS
Y_{it}	0.020	0.015	0.009	-1.842	-2.292	-0.149	1.163	1.164	1.216**
	[0.020]	[0.023]	[0.010]	[1.558]	[1.752]	[1.327]	[0.901]	[0.995]	[0.573]
	(0.333)	(0.513)	(0.345)	(0.246)	(0.200)	(0.910)	(0.207)	(0.251)	(0.034)
CPI_{it}	-0.259	-0.409	0.179	0.169	0.209	0.129	-0.001	-0.002	-0.001**
	[0.231]	[0.270]	[0.115]	[0.108]	[0.169]	[0.094]	[0.000]	[0.001]	[0.000]
	(0.271)	(0.140)	(0.120)	(0.128)	(0.225)	(0.171)	(0.045)	(0.117)	(0.016)
OER_{it}	-0.161	-0.201	-0.033	0.753	0.789	0.561	-1.729*	1.573*	-1.872*
	[0.120]	[0.162]	[0.065]	[0.202]	[0.209]	[0.170]	[0.373]	[0.327]	[0.208]
	(0.190)	(0.224)	(0.612)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
r_{it}	0.352	0.335	0.385**	0.112	0.080	0.124	0.102	0.003	0.305*
	[0.381]	[0.457]	[0.177]	[0.235]	[0.242]	[0.203]	[0.183]	[0.184]	[0.112]
	(0.362)	(0.469)	(0.029)	(0.635)	(0.742)	(0.539)	(0.581)	(0.986)	(0.006)
DC_{it}	-0.478*	-0.461*	-0.525*	-0.104	-0.081	-0.18**	-1.178*	-1.084*	-1.248*
	[0.102]	[0.109]	[0.053]	[0.103]	[0.108]	[0.089]	[0.175]	[0.132]	[0.093]
	(0.000)	(0.000	(0.000)	(0.318)	(0.460)	(0.043)	(0.000)	(0.000)	(0.000)
Intercept	63.088*	66.932*	50.697*	-19.27*	-19.34*	-16.61*	-17.71**	-14.04	-24.37*
	[9.646]	[10.170]	[5.180]	[5.652]	[5.475]	[4.788]	[7.736]	[9.086]	[5.049]
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.029)	(0.132)	(0.000)
Adj. R^2	0.628	0.578	0.491	0.922	0.915	0.822	0.952	0.947	0.681

Note: Asterisks *, ** and *** shows significant at the 1%, 5% and 10% levels.

Table 8 (continued): Empirical estimates (Individual countries analysis)

Countries/ Estimators	Burundi			Nigeria		
	FMOLS	CRR	RLS	FMOLS	CRR	RLS
Y_{it}	10.714*	11.155*	7.522*	0.059*	0.060*	0.047*
	[3.626]	[3.445]	[2.495]	[0.015]	[0.016]	[0.008]
	(0.006)	(0.002)	(0.002)	(0.000)	(0.000)	(0.000)
CPI_{it}	0.202***	0.25***	0.201**	-0.025	-0.031	-0.035
	[0.108]	[0.141]	[0.080]	[0.063]	[0.078]	[0.034]
	(0.072)	(0.088)	(0.012)	(0.692)	(0.693)	(0.303)
OER_{it}	0.004	0.007	-0.004	-0.030	-0.032	-0.023**
	[0.010]	[0.011]	[0.007]	[0.019]	[0.021]	[0.011]
	(0.680)	(0.540)	(0.598)	(0.131)	(0.148)	(0.032)
r_{it}	1.030**	0.997**	1.027*	0.017	-0.003	-0.036
	[0.468]	[0.458]	[0.345]	[0.106]	[0.1522]	[0.058]
	(0.035)	(0.037)	(0.002)	(0.868)	(0.980)	(0.526)
DC_{it}	-0.800*	-0.916*	-0.578*	-0.629*	-0.627*	-0.440*
	[0.239]	[0.284]	[0.170]	[0.142]	[0.151]	[0.080]
	(0.002)	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)
Intercept	-15.80**	-15.404**	-11.510**	5.737**	5.636**	4.179*
	[7.134]	[6.600]	[4.880]	[2.235]	[2.165]	[1.242]
	(0.034)	(0.026)	(0.018)	(0.015)	(0.014)	(0.000)
Adj. R^2	0.447	0.368	0.487	0.596	0.596	0.542

Note: Asterisks *, ** and *** shows significant at the 1%, 5% and 10% levels.

Table 8 (continued): Empirical estimates (Individual countries analysis)

Countries/ Estimators	Burkina Faso			Cabo Verde			Kenya		
	FMOLS	CRR	RLS	FMOLS	CRR	RLS	FMOLS	CRR	RLS
Y_{it}	3.201*	3.451*	2.761*	-5.514	-4.739	-4.032	0.034	-0.026	0.077
	[0.790]	[0.958]	[0.678]	[15.557]	[15.089]	[11.303]	[0.072]	[0.091]	[0.059]
	(0.000)	(0.001)	(0.000)	(0.725)	(0.755)	(0.721)	(0.636)	(0.774)	(0.193)
CPI_{it}	-0.157	-0.148	-0.148	-0.057	0.112	-0.196	-0.048	-0.060	-0.044
	[0.128]	[0.179]	[0.105]	[0.574]	[0.916]	[0.420]	[0.044]	[0.053]	[0.036]
	(0.228)	(0.412)	(0.160)	(0.920)	(0.902)	(0.640)	(0.284)	(0.262)	(0.225)
OER_{it}	-0.83***	-0.91***	-0.74***	0.023	0.024	0.017	-0.217*	-0.246*	-0.181*
	[0.491]	[0.514]	[0.420]	[0.014]	[0.015]	[0.010]	[0.049]	[0.052]	[0.039]
	(0.099)	(0.086)	(0.078)	(0.131)	(0.112)	(0.109)	(0.000)	(0.000)	(0.000)
r_{it}	0.030	0.054	-0.070	-1.008	-0.867	-0.990	-0.16**	-0.24**	-0.11**
	[0.196]	[0.235]	[0.168]	[0.865]	[1.205]	[0.619]	[0.065]	[0.099]	[0.053]
	(0.876)	(0.819)	(0.676)	(0.253)	(0.476)	(0.109)	(0.025)	(0.024)	(0.047)
DC_{it}	-0.85*	-0.920*	-0.746*	-0.407	-0.440	-0.328*	-0.176	-0.122	-0.085
	[0.273]	[0.326]	[0.233]	[0.245]	[0.311]	[0.180]	[0.131]	[0.153]	[0.103]
	(0.004)	(0.008)	(0.001)	(0.108)	(0.167)	(0.069)	(0.189)	(0.429)	(0.410)
Intercept	7.072**	6.916***	8.314*	42.004*	40.196*	39.802*	3.578	3.023	-0.332
	[3.447]	[4.026]	[2.967]	[11.179]	[14.034]	[7.706]	[4.283]	[4.751]	[3.436]
	(0.049)	(0.096)	(0.005)	(0.000)	(0.007)	(0.000)	(0.410)	(0.529)	(0.923)
Adj. R^2	0.658	0.648	0.651	0.467	0.441	0.448	0.862	0.832	0.7114

Note: Asterisks *, ** and *** shows significant at the 1%, 5% and 10% levels.

Table 8 (continued): Empirical estimates (Individual countries analysis)

Countries/ Estimators	Lesotho			Malawi		
	FMOLS	CRR	RLS	FMOLS	CRR	RLS
Y_{it}	7.748*	6.944**	8.788*	1.074*	1.067*	0.967*
	[2.374]	[2.823]	[1.935]	[0.322]	[0.304]	[0.296]
	(0.002)	(0.019)	(0.000)	(0.002)	(0.001)	(0.001)
CPI_{it}	-0.283	-0.213	-0.277	0.019	0.021	0.026
	[0.235]	[0.413]	[0.192]	[0.022]	[0.030]	[0.020]
	(0.238)	(0.608)	(0.148)	(0.383)	(0.483)	(0.206)
OER_{it}	-0.453**	-0.59**	-0.224	0.001	0.001	0.002
	[0.209]	[0.263]	[0.170]	[0.003]	[0.003]	[0.002]
	(0.038)	(0.031)	(0.188)	(0.681)	(0.764)	(0.456)
r_{it}	-0.247	-0.300	-0.091	0.025	0.034	0.029
	[0.305]	[0.348]	[0.199]	[0.029]	[0.054]	[0.026]
	(0.423)	(0.395)	(0.647)	(0.381)	(0.525)	(0.267)
DC_{it}	-0.658*	-0.681*	-0.543*	-0.242*	-0.244*	-0.261*
	[0.101]	[0.105]	[0.076]	[0.031]	[0.033]	[0.028]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Intercept	29.024*	31.280*	24.435*	-0.751	-0.811	-0.087
	[6.646]	[8.883]	[5.404]	[1.713]	[1.849]	[1.587]
	(0.000)	(0.001)	(0.000)	(0.664)	(0.663)	(0.955)
Adj. R^2	0.868	0.850	0.699	0.901	0.901	0.709

Note: Asterisks *, ** and *** shows significant at the 1%, 5% and 10% levels.

Table 8 (continued): Empirical estimates (Individual countries analysis)

Countries/ Estimators	Swaziland			Zambia		
	FMOLS	CRR	RLS	FMOLS	CRR	RLS
Y_{it}	7.886*	8.202*	6.381*	1.125*	1.129*	1.276*
	[1.946]	[2.052]	[1.320]	[0.321]	[0.329]	[0.360]
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)
CPI_{it}	0.695**	0.820***	0.519**	-0.033	-0.026	-0.040
	[0.305]	[0.406]	[0.206]	[0.028]	[0.033]	[0.032]
	(0.030)	(0.052)	(0.012)	(0.244)	(0.426)	(0.209)
OER_{it}	-1.559**	-1.594**	-1.149*	-1.278***	-1.350***	-1.455***
	[0.582]	[0.599]	[0.406]	[0.715]	[0.738]	[0.806]
	(0.011)	(0.012)	(0.004)	(0.084)	(0.077)	(0.071)
r_{it}	0.195	0.202	0.153	0.395*	0.408*	0.364*
	[0.160]	[0.243]	[0.109]	[0.071]	[0.082]	[0.080]
	(0.233)	(0.413)	(0.161)	(0.000)	(0.000)	(0.000)
DC_{it}	-0.127	-0.122	-0.236**	-0.100***	-0.107***	-0.097***
	[0.163]	[0.175]	[0.111]	[0.051]	[0.056]	[0.055]
	(0.441)	(0.490)	(0.033)	(0.059)	(0.065)	(0.079)
Intercept	-11.566***	-13.645	-5.768	-9.354***	-9.309***	-11.076**
	[6.752]	[8.040]	[4.566]	[4.725]	[5.150]	[5.271]
	(0.097)	(0.100)	(0.206)	(0.057)	(0.080)	(0.035)
Adj. R^2	0.620	0.604	0.510	0.873	0.8710	0.798

Note *, ** and *** show significance at the 1%, 5%, and 10% levels. respectively.

5. Conclusion and Policy Options

Most central banks' monetary policies aim at maintaining price stability, whereas the MP and the BoP are the central parameters in an economy performance. The MABP makes an association between foreign reserve assets and monetary aggregates, which is indispensable for managing disequilibrium in the BoP through effective monetary policy. The purpose of this study is to provide empirical estimates to the monetary approach for the determination of the BoP by net foreign assets for 17 developing economies over the period 1982–2019. After applying the appropriate tests, the FMOLS, RLS, and the granger causality approaches are employed on panel data, while in the case of individual country, the FMOLS, CCR, and RLS estimators are employed as analytical techniques for estimating the unknown parameters. The results confirm? expectations of this study, as all the estimated coefficients are significantly different from zero, have the postulated signs, and all are statistically significant, almost at the 1% level. Empirical estimates exhibit that domestic credit, real interest rate, inflation rate, and official exchange rate have significantly negative impacts, while real GDP growth has a significantly positive impact on NFA for the selected developing countries. These estimates are in accordance with those of other empirical studies conducted for

the developed economies. The analysis of Dumitrescu Hurlin causality test reveals that there is a bidirectional causality between domestic credit and NFA, and exchange rate and NFA. Moreover, in the case of individual country analysis, the empirical estimate of three estimators reveals understandably accepted results of the model for 17 individual countries. Regardless of some apparent variations between countries, most of the estimated coefficients of variables in the present study seem to be of the same order of size.

Empirical findings of the study suggest policy implication that the monetary approach to the BoP holds in the developing countries, as domestic credit is a key determinant of BoP, and thereby suggest adopting stringent monetary control to limit the expansion in domestic credit. However, for policymakers when looking for policy tools to correct the disequilibrium in BoP, the monetary authorities (central banks) need to give equal consideration to other policy levels in despite of dependence on exclusively on monetary instruments to acheive stability in country's BoP account.

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