THE DOLLARIZATION OF LESS DEVELOPED COUNTRIES: A NOTE ON THE COMPUTATION OF A HARD CURRENCY INDEX
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Abstract
Numerous studies have investigated the impact of dollarization on the wider economy. In measuring dollarization, many studies use the ratio of foreign currency deposits to broad money. However, such an approach only focuses on one aspect of dollarization. This paper advocates an alternative approach that is holistic in nature. Using this new index, we reflect on the dollarization experienced in the Eritrean economy.
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1. Introduction
Studies such as Girton and Roper (1981), Bahmani-Oskooee and Domac (2003) and Levy Yeyati, (2004), have argued that the extent of relying on hard currency or dollarization can have significant consequences for the economy with respect to the volatility of the exchange rate, inflation and the effectiveness of monetary policy. Measuring the degree to which any given economy relies on hard currency is crucial before identifying any potential impact that this might have. An important issue arises as to whether dollarization should be measured in one particular form or in a more holistic way. The standard measure of dollarization, which is commonly used by IMF and others, is the ratio of foreign currency deposits to broad money in the economy [see, for example, Agenor & Khan (1996), Yinusa (2008), Clements & Schwartz (1992), Viseth, (2001), Komarek & Martin (2001), Akacay et al., (1997), Melvin & Peiers (1996) and Balino et al., (2000) among others].

This method, however, captures only one form of dollarization, namely financial dollarization. Such a measure neglects other forms of dollarization that can exist. Although this measure aims to capture financial dollarization, it only considers onshore dollar deposits and fails to incorporate offshore dollar deposits as well as dollar loans issued by domestic banks either to domestic firms and households or to foreign financial institutions and firms. Likewise, the studies by Levy Yeyati (2006), Rennhack & Nozaki (2006) and Nicolo et al. (2005) use the ratio of foreign currency deposits to total bank deposits rather than broad money. The study of Fuentes (2007) employs the ratio of firms' dollar denominated debt to firms' total asset in analyzing the causes and effects of dollarization on Chilean firms at micro level. In identifying the determinants of dollarization, the study by Honig (2009) uses the sum of firm liabilities and bank liabilities to measure dollarization.

In contrast to these studies, Hausmann et al., (2001) and Reinhart et al., (2003) respectively develop the original sin index (based on the extent of liabilities contracted in foreign currencies) and composite indices (based on sum total of the ratios of foreign currency deposits to broad money, total external debt to GDP and domestic government debt denominated in dollars to total domestic government debt). Despite the differences in their methods of measuring dollarization, these studies have focused on limited
aspects of the process. While the sin index is useful only in capturing the liability dollarization, the composite index puts emphasis on dollar loans issued to the government with no inclusion of dollar loans issued to the private sector. Moreover, this method neglects the offshore dollar deposits of domestic investors. It also fails to include underground dollarization, or the dollarization of the black market, which is most common in the economies of third world countries.

Bearing in mind the importance of including as many aspects of dollarization as possible, this paper constructs the holistic approach in measuring Eritrean dollarization. Unlike the above-mentioned studies, we do not confine measurement to the dollar loans issued to the government. We also capture dollar loans issued to the private sector. In addition to this, our measure also incorporates the dollarization of the black market. This paper is organised as follows. The following section provides a review of the literature and discusses the computation of the hard currency index. The final section concludes.

2. Constructing a Hard Currency Index

Dollarization has different meanings according to different researchers. The studies of Ortiz (1983), Melvin & Peiers (1996), Clements & Schwartz (1993) and Melvin & de la Parra (1989) denote dollarization as the use of dollars within domestic economy. Other studies such as Wessels (2004), Viseth (2001) and Zoryan (2005) interpret dollarization as the use of foreign currency in the domestic economy. Dollarization has also been defined as official or full (de jure), unofficial or partial (de facto), financial, real and liability dollarization. According to Gulde et al., (2004), Minda (2005), Ize & Yeyati (2003), Reinhart et al., (2003) Berkmen & A., (2009) and Wessels (2004) de jure dollarization is defined as the adoption of another country’s currency as a legal tender. De facto dollarization, however, is another form of dollarization where the domestic currency stays as an official legal tender but foreign currency can also be used for some transactions with or without legal approval. Financial dollarization on the other hand refers to the holdings of foreign currency denominated financial assets and liabilities by the residents. Real dollarization is also another form of dollarization that refers to the indexing of prices and wages to the dollar. Liability dollarization refers to foreign currency denominated debt held by residents as well as the government. The dollarization of the black market economy has been termed as underground dollarization.

Potentially there are elements of financial, liability, real and underground dollarization in the Eritrean economy. Since real dollarization is in its infant stage, as reflected by the selling and buying of houses in US dollars starting from 2006, this paper incorporates the three types of dollarization. In doing so, it is necessary to measure the extent of underground dollarization present. We first consider the foreign exchange reserves in the Eritrean economy used to finance the import of goods from abroad and service the external debt. Let

\[ M_i^E = \alpha_i FR_i^T \]  

where \( M_i^E \) is import expenditure, \( FR_i^T \) is total foreign exchange reserves, and \( 0 \leq \alpha_i \leq 1 \) is the proportion of total foreign exchange reserves used for financing the expenditure for imported goods. \( M_i^F \) is used to express import expenditure if there is no other source of financing import expenditure such as dollars from the black market. The remaining proportion of \( FR_i^T \) can be used to service debt \( DS_i \) or carry foreign exchange reserves forward \( FR_i^R \) as follows

\[ (FR_i^R + DS_i) = (1 - \alpha_i)FR_i^T \]
Adding equations (1) and (2) provides
\[ M^E_t = FR^T_t - FR^R_t - DS_t \]  
(3)

Equation (3) provides a number of scenarios
(i) If \( FR^R_t = 0 \) and \( DS_t > 0 \) then \( M^E_t = FR^T_t - DS_t \)
(ii) If \( FR^R_t > 0 \) and \( DS_t > 0 \) then \( M^E_t = FR^T_t - FR^R_t - DS_t \)
(iii) If \( FR^R_t = 0 \) and \( DS_t = 0 \) then \( M^E_t = FR^T_t \)

Of these three cases, (i) and (iii) reflect the Eritrean economy more realistically than (ii). With the exception of 1996, Eritrea has been servicing its debt each year since 1995. It can be noted, therefore, that DS is greater than zero except during 1996 which is equal to zero. Information on the foreign exchange reserves of Eritrea indicate that there are no remaining foreign exchange reserves carried forward to the next period since there is shortage of hard currency earnings and high demand for foreign currency to finance the importation of goods.

The next step is for us to identify the amount of hard currency in the Eritrean black market which is also used to finance the import of goods. Therefore, the actual imported goods are not only financed by the \( \alpha \), share of the total foreign exchange reserve as determined above, but also by the hard currency supplied by the black market. The difference between the actual imports of goods \( M_t^A \) and the imports of goods financed by total foreign exchange reserves can be written as
\[ B_t = M_t^A - M_t^E \]  
(4)

where \( B_t \) denotes the amount of hard currency obtained from the black market to finance import expenditure. Substituting equation (3) into (4) provides the following three scenarios
(i) \( B_t = M_t^A - (FR^T_t - DS_t) \), if \( FR^R_t = 0 \) and \( DS_t > 0 \)
(ii) \( B_t = M_t^A - (FR^T_t - FR^R_t - DS_t) \), if \( FR^R_t > 0 \) and \( DS_t > 0 \)
(iii) \( B_t = M_t^A - (FR^T_t) \), if \( FR^R_t > 0 \) and \( DS_t = 0 \)

As discussed above, case one and case three are the most appropriate cases in determining the amount of hard currency used to finance imported goods through the black market. We now measure the overall Eritrean dollarization. Incorporating the three types of dollarization discussed above- claims on foreign commercial banks, external debt and hard currency supplied by the black market- we have the following index
\[ HCI_t = \frac{DL_t + B_t + FB_t}{M2_t - DCC_t} \]  
(5)

where \( HCI_t \) is the hard currency index, \( DL_t \) is dollar loans issued by the Eritrean banks, \( B_t \) is the amount of hard currency supplied by the black market, \( FB_t \) is foreign borrowing, \( M2_t \) is the money supply and \( DCC_t \) is domestic currency in circulation. The data appendix discusses the data sources. Using quarterly data on all these variables, Figure 1 plots the \( HCI \) series.

While there has been a general upward trend in the \( HCI \) over the study period, there was a sharp fall in 1997. This fall was driven by the lower dollar loans issued by the banks. There are number of factors that accompanied this. Namely the introduction of a new currency in the Eritrean economy towards the end of 1997, and increased military expenditure driven by the purchase of weapons from abroad in connection with the second war with Ethiopia.

The \( HCI \) has continued to rise especially from 2002 onwards. This could also be explained by the issuance of new currency and the second war with Ethiopia. Prior to these events, goods were mainly imported from Ethiopia. Transactions for these imports were settled in Birr, which was former local currency unit for both countries. After the introduction of new currency and the second war, however, imports needed to be sourced from other countries as Eritrea lost access to the Ethiopian market. The transactions of imports also needed to be settled in hard currency. In addition to this, the Eritrean...
The economy lost an equivalent amount of 43.02 million U.S. dollars from export earnings to Ethiopia. Moreover, the growth of Eritrean GDP declined from an average of 10.8% to an average of 0.2%. The loss in export earnings coupled with the fall in GDP made the economy more reliant on foreign borrowing and imported goods. The rise in the demand for imported goods and the need to settle transaction in hard currency for imported goods therefore increased the reliance on hard currency as reflected in the $HCI$.

3. Conclusion

Measuring the degree to which an economy relies on hard currency or dollarization is vital before assessing its effect in the economy. In finding the extent of dollarization it is also vital to identify and incorporate the different forms of dollarization that might exist in the economy. However, this has been a main shortcoming of the existing literature. The majority of the studies have focused on some limited aspect of dollarization in their studies. The most commonly used measurement of dollarization, which is the ratio of foreign currency deposit to the broad money, for example tend to neglect other forms of dollarization by focusing on financial dollarization. It also fails to incorporate offshore dollar deposit by including only onshore dollar deposit even though it measures financial dollarization.

In sharp contrast to this, this paper adopts a holistic approach to measuring the dollarization based on the incorporation of all major forms of dollarization that exist in the Eritrean economy. Most importantly it has captured the extent of dollarization in the black market economy. The index demonstrates that dollarization has increased in the Eritrean economy. This new approach has significant potential with regard to the study of other less developed economies.

Figure 1. The Hard Currency Index for Appendix:Data

To measure the hard currency index, quarterly data on foreign exchange reserves are obtained from the IMF International Financial Statistics (IFS). M2 was considered in lieu of a measurement of broad money. However, quarterly data on M2 was also not available for the full study period. Therefore, broad money was calculated as the sum total of M1 and quasi money. Domestic currency in circulation was deducted from this measure of broad money in order not to understatement the weight of dollar loans issued by the banks. Quarterly data on domestic currency in circulation were also obtained from the IFS database.

In computing the dollar loans issued by the banks, quarterly data on total foreign assets, foreign exchange reserves and gold reserves are required as the data for dollar loans were not fully available. The sum total of foreign exchange reserves and gold reserves then were subtracted from total foreign assets to obtain the dollar loans. Quarterly data on total foreign assets, gold reserves and foreign exchange reserves are obtained from Balance of Payments of Eritrea IMF file number 643 as well as from IFS.

The amount of foreign borrowing was obtained by adding total multilateral loans, cross-border loans from BIS reporting banks and cross-border loans from BIS banks to non-banks. Quarterly
data on these variables are obtained from the Joint External Hub. The data on the import of goods and services as well as debt service are available in the form of annual frequency. This data were collected from World Development Indicators of the World Bank and then interpolated.

References
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