Central Bank Digital Currency: The Future Direction for Monetary Policy?

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I. Introduction

The current proliferation of crypto currencies (bitcoin, ethereum, ripple etc) by the private sector has created a challenge to the world's central banks. Although they are touted as currencies they do not satisfy the three classic functions of money: a unit of account, medium of exchange and store of value. Indeed they present potential challenges to both the payments system and monetary control.

The present discussion over crypto (virtual) currencies is reminiscent of a debate over two centuries ago on free banking versus central banking. Key players in the nineteenth century debate included Thornton, Ricardo, Mill, Fullarton and Overstone. In the twentieth century the debate was between inter alia Vera Smith (1936) versus Charles Goodhart (1987).
The issue in the nineteenth century was that many countries had competing commercial banks that issued bank notes that were convertible into silver and gold coins of varying weights and fineness which impeded the efficient operation of the payments system. Each country went through a process of standardization and consolidation which ended up with the establishment of a central bank with a monopoly of the national currency. Famous examples include Great Britain, Switzerland and the U.S.

In this paper I revisit this issue with respect to virtual currencies based on my research with Andrew Levin of Dartmouth College. Bordo and Levin (2018) consider the key specifications of a central bank digital currency (CBDC) and formulate a set of overarching design principles. They conclude that CBDC can transform all aspects of the monetary system. It can provide a unit of account which delivers true price stability; a medium of exchange which is practically costless and a store of value which provides a safe asset with a secure rate of return. CBDC can also provide a monetary policy framework which is systematic and transparent.

II. Definitions and Framework

A digital currency is an asset stored in electronic form that serves the same functions as paper currency. Virtual currencies are digital currencies established by private entities (e.g. bitcoin, ethereum, ripple). Virtual currencies have been promoted as providing a safe and secure payments media which is strictly private. They have two serious disadvantages however. First, their real value fluctuates sharply due to changes in relative supply and demand. Second verification can be costly and relatively inefficient (e.g. bitcoin mining consumes 40 terawatt hours of electricity per year, similar to a large city).

In contrast to virtual currencies, the central bank can issue a digital currency that is fixed in nominal value and that serves as legal tender, like present day paper currency. Many central banks are actively exploring the launch of their own digital currencies and some have begun experiments with prototypical designs (eg. Bank of Canada, Bank of England, ECB, Norges Bank and Riksbank). Many recent studies have focused on the technical and logistical issues of implementing a CBDC, especially issues regarding payments. By contrast, this paper focuses on CBDC in its totality.

Several key questions are raised: 1) Should CBDC be account based, like debit cards or token based, like cash and stored value cards? 2) Should cash be abolished, or should transfers between CBDC and paper currency be subject to graduated fees? 3) Should CBDC be interest bearing like commercial bank reserves, or have a fixed nominal value like cash or be indexed to an aggregate price index like TIPS? 4) What are the implications of CBDC for monetary policy goals, strategy and operating procedures? What about interactions between monetary and fiscal policy?

III. Fundamental Design Principles

CBDC can fulfill the three basic functions of money:

A. Medium of Exchange

CBDC should serve as legal tender usable for all payment transactions, both public and private. In the case of fiduciary currency increasing returns and externalities provided a strong rationale for a government issued currency, as was emphasized by the Classical economists. The same argument holds for CBDC.

There are two ways that a central bank can provide digital currency: by account or by token. Under the account system anyone can hold an account at the central bank. Under this approach the central bank would process each payment transaction by simply debiting the payors CBDC account and crediting the payees CBDC account. This approach is reminiscent of an earlier era when some private individuals had accounts at the central bank (e.g. Bank of England). Alternatively, people could hold specially designated accounts at supervised designated depository institutions which would hold the corresponding amount of funds in segregated reserve accounts at the central bank. This approach is similar to the Federal Reserve's recent move to establish such accounts to protect customers funds at key financial market utilities.

Under a token system, central banks create tokens or value based digital systems like stored value debit cards. Under this system verification is non-instantaneous and relatively costly and there is a distinct possibility of hacking. Indeed, there is no limit on the size and scope of fraud, i.e. hackers could undermine the entire payments system.
With CBDC, as in the present monetary system, individuals and firms may hold funds at private financial institutions that make payments via private networks. Individuals and firms will remain free to engage in relatively anonymous transactions using virtual currencies or other private forms of payment.

CBDC accounts are practically instantaneous and cost-free because the Central bank simply debits the payers account and credits the payees account. Moreover, the scope and scale of fraudulent transactions can be mitigated as is the case now with debit and credit cards. Finally, once CBDC is widely used the demand for paper currency will

quickly diminish, especially if cash deposits and withdrawals are associated with substantial fees.

B. Store of Value

CBDC can enhance its role as a secure store of value. Following Friedman (1960) who argued that to have an efficient monetary system that government issued money should bear the same rate of return as other risk-free assets. Indeed currently central banks pay interest on the reserves of commercial banks and the Fed has begun paying interest to a much wider array of counterparties. In this framework the CBDC interest rate will be the central banks key monetary policy tool. With the obsolescence of cash, this rate can be cut below zero in response to a sever shock adverse shock (Goodfriend 2016). The presence of paper money poses a constraint on the central bank's ability to cut its policy rate below zero. This constraint could be removed by establishing a graduated schedule of fees on transfers between cash and CBDC.

Other approaches can be considered to facilitate CBDC as a secure store of value. First funds in CBDC accounts could have a constant nominal value just like paper currency. However, in this approach the central bank's ability to push nominal interest rates below zero would be tightly constrained, because depositors could readily move their funds into CBDC earning zero interest. Thus, in a situation of with weak aggregate demand the CB will need to rely on balance sheet measures like Quantitative Easing (QE). It also might be required to expand the inflation buffer to mitigate the severity of the zero lower bound on nominal interest rates.

A second alternative approach to having CBDC as a secure store of value is to preserve the real value of funds in CBDC accounts by indexing those funds to past changes in the price level. However, this approach would impose a zero bound on the real interest rate and hence act as an even more severe constraint on monetary policy. Consequently, the central bank would likely rely heavily on other monetary tools such as QE.

C. Unit of Account

Providing a stable unit of account facilitates the economic and financial decisions of individuals and firms. A CBDC would do this by adjusting the CBDC interest rate. Indeed, because the CBDC interest rate can be adjusted downward as needed, there will no longer be a compelling rationale for the CB to target a positive average rate of inflation rule. Therefore, the monetary policy framework could ensure true price stability, i.e. the real value of CBDC would remain stable over time as measured in terms of a general index of consumer prices.

This design for CBDC embeds the most appealing features of the classical gold standard while avoiding its pitfalls. Indeed, the general price level was not stable during that era (Bordo 1984). It also resonates with Alfred Marshall's tabular standard, Irving Fisher's

compensated dollar and Knut Wicksell's plan to use interest rate adjustments to foster price stability.

To ensure price stability the price level target should be specified in terms of a broad measure of consumer prices. The price level will inevitably fluctuate in response to exogenous shocks, but monetary policy should ensure that the price level returns to its target over time, thereby anchoring the expectations of households and firms.
Given the lags in the monetary transmission mechanism, monetary policy should avoid responding to transitory shocks and hence place greater emphasis on core measures.

Following Wicksell, the appropriate setting of the nominal interest rate involves assessments of the equilibrium real rate (r*). As in flexible inflation targeting the stance of monetary policy should be adjusted in response to measures of slack, i.e. the output gap. The framework considered for CBDC can be characterized as flexible price level targeting.

IV. The Monetary Policy Framework

The monetary policy framework should be systematic and transparent thereby facilitating the effectiveness of monetary policy and the central bank's accountability to elected officials and the public. CBDC can enhance this framework. We frame the central bank's policy strategy in terms of a simple benchmark, the Taylor rule adapted to price level targeting, seen in equation (1).

$$i_t = \tilde{\pi}_t + r_t^* + \alpha(\tilde{p}_t - p^*) + \beta(p_t - p^*) + \delta(y_t - y_t^*) \qquad (1)$$

In this formulation based on price level targeting (p^*), the central bank uses the CBDC interest rate (i_t) to stabilize the price level (p_t). The CBDC interest rate reacts to deviations in a core measure of the price level from the price level target and to deviations of real GDP from its potential level $(y_t - y_t^*)$.

As in the Taylor rule, this specification is a benchmark for adjusting the real interest rate in response to fluctuations in economic activity and prices. When the price level is at its target and output is at potential, then the ex post real interest rate equals its equilibrium value.

Under this framework the central bank will be able to respond to a severe output shock without resorting to QE or other measures aimed at modifying the size or composition of its balance sheet. The central bank's balance sheet will be highly transparent with assets of short–term government securities matching its liabilities of CBDC. The central bank will engage in purchases and sales of short-term government securities to equate the supply and demand for CBDC.

Monetary and Fiscal Interactions

Under CBDC the interest spread between CBDC and short-term government securities would be negligible, given the cashless arbitrage between these assets and hence the size of the central bank's balance sheet will have no fiscal consequences. With the obsolescence of paper currency, the central bank will no longer generate substantial seigniorage and will simply cover its expenses via miniscule fees on payment transactions. Under CBDC the maturity composition of government securities held by the public will be determined by the fiscal authority and not the central bank.

Lender of Last Resort

During a financial crisis, the central bank should be able to expand the stock of CBDC as needed to provide emergency liquidity to supervised financial institutions**.** Alternatively the central bank could extend such emergency safeguards to another public agency such as a bank regulator or the deposit insurance fund. Appropriate legal safeguards will be necessary to ensure that the lender of last resort actions do not undermine the central bank's ability to carry out its commitment to price stability.

Macroeconomic Benefits

By eliminating payment transactions costs, recent studies show that CBDC significantly increases productivity (Barrdear and Kumhof 2016). Other studies conclude that transparent and credible price level targets enhance macro stability.

V. Conclusion

Central banks have been renowned as conservative institutions. Yet there are good reasons for moving expeditiously in the direction of adopting some form of CBDC. Given the rapid pace of payments innovations, not moving ahead opens up the possibility of instability in the payments system with multiple issuers of crypto currencies, as occurred in the nineteenth century with bank notes. Alternatively, in the absence of a CBDC, the entire payment system could become quasi-monopolistic due to network externalities in the payments system. Under such circumstances, any significant operational problem with the payment network could pose substantial risks to the entire financial system.

A number of central banks around the world are seriously considering the issuance of digital cash in the near future. The Federal Reserve should actively investigate the possibility of launching a CBDC here in the United States.

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