

# The Benefits and Costs of a Central Bank Digital Currency for Monetary Policy

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This note evaluates the monetary policy benefits and costs of a U.S. central bank digital currency. A recently released BPI working paper, "[Central Bank Digital Currencies: Costs, Benefits and Major Implications for the U.S. Economic System](#)," describes what a CBDC is and how it would function. That background knowledge is assumed rather than replicated here. That paper also examined a host of serious policy issues raised by a dollar CBDC but explicitly left monetary policy issues for another time, which has now arrived.

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Adopting a CBDC would have two potential monetary policy benefits. The most significant is the potential for interest rates to no longer be constrained by the zero-lower bound (ZLB), assuming that a CBDC could pay negative interest and paper currency were eliminated. As a consequence, the Federal Reserve could reduce interest rates as far as needed in the event of a deflationary spiral. In addition, a CBDC that paid interest could increase Fed control of interest rates, especially when the FOMC eventually decides to tighten monetary policy by lifting interest rates above zero: If everyone had access to the CBDC, no one would lend at less than the CBDC interest rate.

On the monetary-policy cost side, a CBDC could lead to rapid and huge reductions in reserve balances (the deposits of commercial banks and other depository institutions at the Federal Reserve) when there is a flight to quality, driving up money-market interest rates and potentially destabilizing financial markets. To prepare for such swings in reserve balances, and to accommodate the potential demand for CBDC, the Federal Reserve would have to maintain a much larger balance sheet in normal times than it does now, possibly more than one-third of GDP. If investors in banks and other corporations shifted into CBDC in stress periods, the Fed would also need to replace the lost funding by lending potentially huge sums to banks and nonbank financial institutions, while purchasing correspondingly huge amounts of government and private securities. Also on the cost side, negative interest rates on cash may also result in a public backlash.

If the CBDC did not pay negative interest and so did not enable a central bank to break through the ZLB, the monetary policy benefits would be modest, while the costs could still be considerable. If households were given a limited tranche of CBDC that paid an interest rate that could not go below zero, some of the monetary policy benefits of CBDC could potentially be achieved, and some of the costs lessened; however, the significant costs associated with flights to quality would remain.

## Background and Assumptions

There are two candidate types of CBDC. First, the Fed could give everyone an account, just as they offer accounts now for banks and GSEs. Access to the accounts could be direct or intermediated by third parties, which could hold customer CBDC in trust and take care of Know-Your-Customer and Anti-Money-Laundering screening requirements. The other candidate type of CBDC is for the CBDC to take the form of a digital token that can be held and transferred, perhaps anonymously, just like currency. Because the CBDC would, in either case, be a liability of the Fed, it doesn't matter for the purposes of this note which form is adopted.

Either variant of CBDC could pay interest, including negative interest. If the interest rate were negative, the holders of the CBDC would automatically pay a fraction of the CBDC to the Fed continuously, and the amounts in their digital wallets would slowly decline; they would thus be heavily incentivized to purchase other assets. In the case of CBDC that pays significantly negative interest, paper currency would need to be eliminated. Bindseil and Panetta (2020) propose establishing two tiers of CBDC and remunerating each tier differently.<sup>1</sup> The first tier, which could equal a per capita amount of €3,000, would have an interest rate that never went below zero but would be relatively low when positive, to discourage disintermediation. For businesses, the Tier 1 amount could be set to zero or could be calculated based on size. The second tier, which would be unlimited and would start above the first-tier provision, would have an interest rate that could be negative but would be higher than the rate on Tier 1 CBDC when positive.

It *does* matter for the costs and benefits discussed next whether the CBDC pays interest and whether the interest rate can be negative.

## Benefits

### ***Breaking through the zero-lower bound***

The primary potential benefit for monetary policy of an interest-bearing CBDC with an interest rate that could be negative would be allowing the Federal Reserve to engineer nominal interest rates that were as negative as necessary to stimulate the economy by whatever amount was needed.<sup>2</sup> The Fed would do so by paying a large and negative rate of interest on CBDC. Mechanically, the amounts of CBDC in everyone's digital wallets would be reduced each day (or each second) by a payment to the Fed. For such a strategy to work, paper currency would need to be eliminated.

Currently, the Federal Reserve can reduce short-term interest rates only a bit below zero, in large part because the "interest rate" on paper currency is zero. Thus, if the interest rates on other financial instruments (including, importantly, reserve balances) were driven very far below zero, then everyone would switch to holding paper currency. While stockpiling currency is expensive and unwieldy, those costs become bearable if market interest rates move below zero sufficiently. A staff paper presented to the FOMC in August 2010 estimated that depository institutions could start switching from holding reserve balances to holding currency if the Interest on Reserve Balances (IORB) rate fell to –35 basis points or below.<sup>3</sup> However, central banks have subsequently set the interest they pay on reserve balances lower than that. Current consensus is that the lower bound imposed by currency—and thus the tipping point for a move to cash—is about –1 percent.

The ZLB on nominal interest rates is a serious threat to economic prosperity. The Fed stimulates the economy by reducing the *real* interest rate, which economists define as the difference between the nominal interest rate (that is, the actual interest rate) and the expected rate of inflation over the term of the contract. The equilibrium real interest rate (the real interest rate that neither stimulates nor slows economic activity) has been declining over time. The reasons for this decline are not completely understood but may include slower population growth,

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<sup>1</sup> Ulrich Bindseil and Fabio Panetta, "Central bank digital currency remuneration in a world with low or negative nominal interest rates," VOX<sup>EU</sup>, October 5, 2020; [CBDC remuneration in a world with low or negative nominal interest rates | VOX, CEPR Policy Portal \(vox.eu.org\)](#)

<sup>2</sup> See Michael D. Bordo and Andrew T. Levin, "[Improving the Monetary Regime: The Case for U.S. Digital Cash](#)," *Cato Journal*, Spring/Summer 2019; and Bordo and Levin, "Central bank digital currency and the future of monetary policy," VOX<sup>EU</sup>, September 23, 2017; [The benefits of central bank digital currency | VOX, CEPR Policy Portal \(vox.eu.org\)](#)

<sup>3</sup> Chris Burke, Spence Hilton, Ruth Judson, Kurt Lewis, and David Skeie, "Reducing the IOER Rate: An Analysis of Options," Memo Presented to the FOMC, August 5, 2010; [Reducing the IOER Rate: An Analysis of Options \(federalreserve.gov\)](#). See, in particular, pages 7–9. The memo also lists the many other practical complications that would be associated with negative interest rates.

slower productivity growth, a reduction in the rate of return on physical capital, or even income inequality.<sup>4</sup> The FOMC currently estimates the equilibrium real short-term federal funds rate (the interest rate the FOMC targets to implement monetary policy) to be about 0.5 percent. Adding back the FOMC's target for inflation leaves an equilibrium nominal federal funds rate of 2.5 percent. If the federal funds rate is normally 2.5 percent, economists estimate that the FOMC's target federal funds rate will be zero about one-third of the time.<sup>5</sup>

Because the FOMC cannot currently decrease its target for the federal funds rate more than a bit below zero, when the U.S. economy is in a serious recession, the Federal Reserve cannot offer as much stimulus as would be optimal using its short-term interest rate tool. The Fed can and has used alternative mechanisms to stimulate the economy when short-term rates are at the ZLB, most notably forward guidance and large-scale asset purchases. But those alternative tools are less effective.<sup>6</sup>

The existential threat, and a key reason why the Fed's reaction to the financial turmoil caused by the pandemic was so massive, is the risk of a deflationary spiral. If the Fed cannot give sufficient stimulus, inflation will fall. As inflation falls, real interest rates rise. With nominal interest rates stuck at zero, the Fed cannot offset that increase in real rates. In other words, at that point Fed policy is effectively *tightening* at the worst possible time. The economy would weaken further, inflation would fall even more, real interest rates would rise, monetary policy would get tighter and tighter, and the economic situation would spiral down.

There are several ways to reduce the risk of a deflationary spiral. Last year, for example, the FOMC switched to average inflation rather than just instantaneous inflation in large part so that shortfalls in inflation below target would be less likely to reduce inflation expectations and precipitate a downward spiral.<sup>7</sup> Alternatively, the FOMC could increase its inflation target, raising the normal level of nominal interest rates so that the Committee has more room to cut rates when needed.<sup>8</sup>

Another way a deflationary spiral could be avoided is if the FOMC could make short-term nominal interest rates as negative as necessary to foster the needed economic stimulus. The Fed would do so by paying a negative interest rate on CBDC and on reserve balances.<sup>9</sup> Because no one could avoid those negative interest rates by holding paper currency, all short-term interest rates would follow the IORB and CBDC rates down. The resulting deeply negative real interest rate would stimulate the economy, as necessary.

How negative would the nominal interest rate be? In June 2009, Fed staff indicated that the FOMC should optimally reduce its target for the federal funds rate to -8 percent if that were possible (see the exhibit copied from the staff briefing documents for the FOMC at the time).<sup>10</sup> Such a deeply negative interest rate would boost

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<sup>4</sup> See Lukasz Rachel and Lawrence Summers, "On falling neutral real rates, fiscal policy, and the risk of secular stagnation," March 4, 2019; <https://www.brookings.edu/wp-content/uploads/2019/03/On-Falling-Neutral-Real-Rates-Fiscal-Policy-and-the-Risk-of-Secular-Stagnation.pdf>; and Lukasz Rachel and Thomas D. Smith, "Secular drivers of the global real interest rate," Bank of England, December 11, 2015; <https://www.bankofengland.co.uk/working-paper/2015/secular-drivers-of-the-global-real-interest-rate>

<sup>5</sup> Duarte, Fernando, Benjamin K. Johannsen, Leonardo Melosi, and Taisuke Nakata (2020). "Strengthening the FOMC's Framework in View of the Effective Lower Bound and Some Considerations Related to Time-Inconsistent Strategies," Finance and Economics Discussion Series 2020-067. Washington: Board of Governors of the Federal Reserve System; <https://doi.org/10.17016/FEDS.2020.067>.

<sup>6</sup> Chung, Hess, Etienne Gagnon, Taisuke Nakata, Matthias Paustian, Bernd Schlusche, James Trevino, Diego Vilán, and Wei Zheng (2019). "Monetary Policy Options at the Effective Lower Bound: Assessing the Federal Reserve's Current Policy Toolkit," Finance and Economics Discussion Series 2019-003. Washington: Board of Governors of the Federal Reserve System; <https://www.federalreserve.gov/econres/feds/files/2019003pap.pdf>.

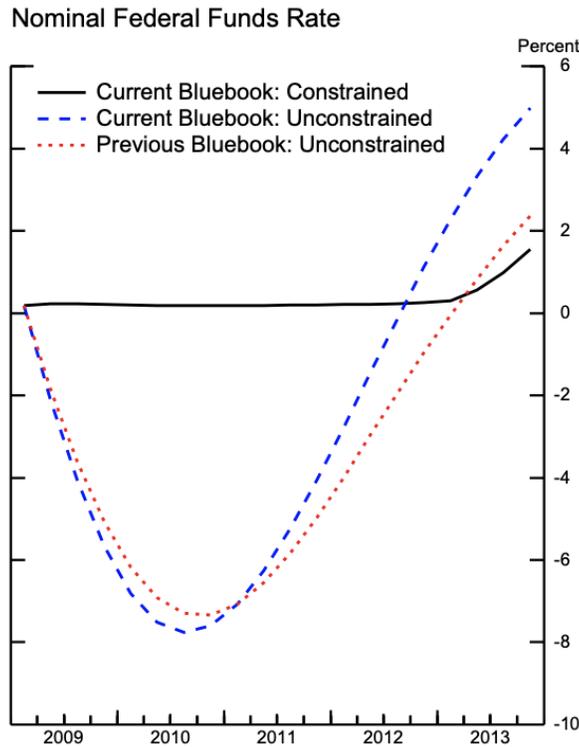
<sup>7</sup> Jerome Powell, "New Economic Challenges and the Fed's Monetary Policy Review," August 27, 2020; [Speech by Chair Powell on new economic challenges and the Fed's monetary policy review - Federal Reserve Board](#); and Richard Clarida, "The Federal Reserve's New Monetary Policy Framework: A Robust Evolution," August 31, 2020; [Speech by Vice Chair Clarida on the Federal Reserve's new monetary policy framework - Federal Reserve Board](#).

<sup>8</sup> Laurence Ball, "The case for 4% inflation," VOXEU, May 24, 2013; <https://voxeu.org/article/case-4-inflation>

<sup>9</sup> The IORB rate and the CBDC rate could be different, but there is no obvious reason why they would be. I assume here that both would be set equal to the FOMC's target for the federal funds rate.

<sup>10</sup> See "Monetary Policy Alternative," Board of Governors of the Federal Reserve, June 18, 2009, p. 35; [Bluebook \(federalreserve.gov\)](#)

aggregate demand, because households and businesses would have a strong incentive to spend now rather than invest for later.<sup>11</sup> If the interest rate on CBDC were –8 percent and you kept \$10,000 in your digital wallet, then over a year the Fed would remove \$800 and pay it to Treasury (Fed profits are remitted to Treasury). While you might think that in such circumstances you would simply move your cash elsewhere, keep in mind that the Fed’s policy would have resulted in all short-term interest rates being about –8 percent, and paper currency would have been eliminated.



Obviously, a CBDC that did not pay interest would not have the benefit of allowing the Fed to reduce interest rates significantly below the ZLB. However, the Fed could drive interest rates below zero if it offered a CBDC with a hybrid remuneration approach that gave households a modest safe haven of a few thousand dollars with an interest rate that did not go below zero. All institutions would still only have access to accounts with rates that could go negative, and the household zero-interest-rate tranches would be too small to affect financial market outcomes.

<sup>11</sup> In an extreme version of a negative interest rate’s effect on digital currency, China’s new digital currency can be given an expiration date to encourage people to spend it quickly as a way to stimulate the economy. “China Creates Its Own Digital Currency, a First for Major Economy,” *Wall Street Journal*, April 5, 2021; [China Creates Its Own Digital Currency, a First for Major Economy - WSJ](#)

## ***Strengthening the policy floor***

The Federal Reserve implements monetary policy by oversupplying reserve balances, driving market interest rates down to the interest rate that the Fed pays on those balances (the IORB rate). The IORB rate is thus intended to act as floor on short-term interest rates. Why lend funds overnight for less than you can receive by simply leaving them on deposit at the Fed?

But in practice, the IORB rate is a squishy floor. Only commercial banks and other depository institutions earn interest on deposits at the Fed, and so, in practice, overnight money market rates tend to be a bit below the IORB rate. Currently, for example, the IORB rate is 10 bp; the fed funds rate is 7 bp; and the repo rate is 1 bp, with some transactions at negative rates.

Although these spreads are modest, they in part reflect that all interest rates are near the zero-lower bound. When the Federal Reserve eventually begins to increase its target for the federal funds rate, the spreads could widen, requiring the Fed to set the IORB rate to a level more significantly above market rates.<sup>12</sup>

It is precisely for this reason that the Fed implemented its overnight reverse repurchase (ON RRP) facility, where nonbanks can effectively maintain deposits at the Fed and earn interest. The facility essentially expands the Fed's authority to pay interest on deposits beyond depository institutions to include everyone with access to the ON RRP facility. Most importantly, GSEs, FHLBs, and money market mutual funds have access. The facility was implemented in 2014 as a temporary tool to help the Fed with liftoff by expanding the range of institutions that would receive an above-zero interest rate from the Fed. In a working paper published in 2015, the Fed discussed the benefits and costs of the ON RRP facility (which it adopted in 2014 when the FOMC's target range for the federal funds rate was 0–25 basis points) to facilitate liftoff once the Committee decided to raise rates. Many of those same benefits and costs apply to CBDC.<sup>13</sup> The ON RRP facility, which pays zero interest, is currently an important reason why repo rates have not moved far below zero.

Interest-paying CBDC would strengthen the monetary policy floor significantly more because everyone would have access to CBDC. Presumably no one would extend an overnight loan for less than they are earning on the CBDC they hold in their digital wallets.

Nevertheless, in the Fed's judgment, this benefit appears to be modest at best, at least according to the Fed's assessment in 2019 of a similar claimed benefit by promoters of Pass-Through Investment Entities (PTIEs) (also referred to as "narrow banks"). PTIEs are special-purpose banks that accept only wholesale, uninsured deposits and invest only in reserve balances. Proponents of PTIEs argue that they will help monetary transmission by passing the IORB rate (or just a bit below) on to all depositors. The Fed, however, has argued that any support by PTIEs for monetary transmission is not needed:

The Board believes that monetary policy implementation has been very successful in maintaining the federal funds rate within the target range established by the Federal Open Market Committee (FOMC). The movements of other short-term money market interest rates have also tracked closely the changes in the target range for the federal funds rate. Accordingly, the potential benefits of PTIEs in enhancing monetary policy implementation appear to be quite modest. <https://www.federalregister.gov/d/2019-04348/p-19>

<sup>12</sup> When the Federal Reserve began to raise interest rates starting in December 2015, it paid an interest rate on reserve balances 13–16 bp above the effective federal funds rate. At that time, reserve balances were about \$2.4 trillion; currently, they are about \$3.8 trillion and growing. As a result, presumably, when the FOMC seeks to raise the federal funds rate, it will have to pay a higher IORB rate to achieve any given effective federal funds rate now than it did in 2016.

<sup>13</sup> Frost, Josh, Lorie Logan, Antoine Martin, Patrick McCabe, Fabio Natalucci, and Julie Remache (2015). "Overnight RRP Operations as a Monetary Policy Tool: Some Design Considerations," Finance and Economics Discussion Series 2015-010. Washington: Board of Governors of the Federal Reserve System; <http://dx.doi.org/10.17016/FEDS.2015.010>.

Non-interest paying CBDC would obviously not help strengthen the floor of the monetary policy corridor except where the Fed’s monetary policy floor is zero.

## Costs

### *Instability in reserve balances*

On Sept. 16, 2019, the simultaneous settlement of recently auctioned Treasury debt and Corporate Tax Day led to roughly a \$90 billion increase in the Treasury’s General Account at the Fed, with a corresponding reduction in reserve balances. Even though the reduction was foreseeable and signs of scarcity of reserve balances had been evident for a year and a half, the Fed did not take steps to offset that decline using open market operations. As a consequence, by the end of the day, repo rates rose to 10 percent, financial markets were unsettled for a week, and the Fed dramatically revised its views upward on how large its balance sheet needed to be to conduct policy in a floor system.<sup>14</sup>

That was just \$90 billion. As the scope of the pandemic became clear in early 2020, there was a global “dash for cash” as investors sought the safety and liquidity of dollar deposits, fleeing even from Treasury securities. Between the end of February and the beginning of May, commercial bank deposits grew over \$1.8 trillion and the net assets of government-only money market mutual funds grew \$1.2 trillion.<sup>15</sup> Over the four weeks ending April 9, 2020, the Federal Reserve bought an extraordinary \$1 trillion in securities to relieve pressures on asset markets.<sup>16</sup>

If everyone had the ability to switch to CBDC, that dash for cash would have been a dash for CBDC. If investors had shifted into CBDC rather than commercial bank deposits or government-only money market mutual funds, investors would have shifted \$3 trillion into CBDC. That increase would have reduced reserve balances one-for-one.<sup>17</sup> Instead of rising rapidly, reserve balances, which equaled \$1.8 trillion at the beginning of the period, could have collapsed. To avoid that outcome, the Federal Reserve would have needed to acquire \$3 trillion in assets rather than \$1 trillion.<sup>18</sup> Fully offsetting the increase would have been difficult, however, and money market interest rates may have skyrocketed as reserve balances became scarce. Alternatively, the Federal Reserve could have set the interest rate on CBDC—essentially, the deposits at the Federal Reserve of households and businesses—very sharply negative to discourage inflows (assuming that the CBDC could pay a negative interest rate) while keeping the interest rate on reserve balances—the deposits of financial institutions at the Federal Reserve—at its current level of 10 bp.

Flight-to-quality implications of a hybrid CBDC that offered households a safe tranche of zero-interest-paying cash would be marginally worse, since households could not be discouraged from shifting their savings into CBDC by paying a negative interest rate, at least up to the safe-haven amount. Flight-to-quality into a CBDC that did not pay interest would be worse still, at least when interest rates were at or below the ZLB.

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<sup>14</sup> In addition to a sharp decline in reserve balances, there was a significant mismatch between the supply of and demand for repo financing. The newly settled Treasuries needed financing, but tax payments shifted funds out of money funds which therefore cutback on repo lending. See Bill Nelson, “What Just Happened in Money Markets and Why it Matters”, Bank Policy Institute, September 18, 2019. [What Just Happened in Money Markets, and Why it Matters. - Bank Policy Institute \(bpi.com\)](#)

<sup>15</sup> Investment Company Institute and Federal Reserve statistical release H.8.

<sup>16</sup> Federal Reserve statistical release H.4.1.

<sup>17</sup> Because CBDC and reserves are both liabilities of the Federal Reserve, and other assets and liabilities of the Fed would be unchanged, when CBDC goes up, reserve balances go down. The same process reduces reserve balances when the Treasury’s general account at the Fed rises, as happened on September 16, 2019.

<sup>18</sup> As discussed below, some of those assets would likely have taken the form of discount window lending, but most probably would have been securities.

### ***A need for an ever-larger Fed balance sheet***

In the wake of the September 2019 episode of repo market volatility, the Fed decided that it needed to maintain reserve balances of at least \$1.7 trillion to implement a floor-based monetary policy system. That level equals \$1.4 trillion to reach the Fed's estimate of the underlying structural demand for reserve balances, plus a \$300 billion buffer to ensure that reserve balances would remain above structural demand, despite volatility in reserve balances.<sup>19</sup> In light of the potential inflows into CBDC and corresponding reductions in reserve balances during flights-to-quality that could reasonably be expected to occur, the Federal Reserve would need to increase that buffer considerably. As noted, the reduction in March 2020 could easily have been \$3 trillion, so a buffer of at least \$1.3 trillion seems conservative.

In total, the Fed's normal-times balance sheet could be massive. Adding together the buffer and the Fed's estimate of structural demand, steady-state reserve balances could average \$3.7 trillion. Add to that a steady-state level of CBDC of \$6 trillion and a TGA of \$600 billion, while subtracting paper currency (replaced by CBDC), and Fed liabilities could easily exceed \$8.3 trillion, more than one-third of nominal GDP.

Moreover, that steady-state size might increase over time. As discussed in Nelson (2019), bankers, bank supervisors and bank investors tend to get used to whatever level of reserve balances is provided.<sup>20</sup> If the Fed has \$3.7 trillion in reserve balances in normal times, then changing preferences and expectations will steadily drive up the underlying "structural" demand for reserve balances. The structural demand for reserve balances would not necessarily increase to \$3.6 trillion, but it would increase above \$1.4 trillion. To maintain a constant buffer above structural demand, normal-times reserve balances, and the size of the Fed's balance sheet, would also have to grow.

On the other hand, the Fed balance sheet in severe recessions would not need to be as large as currently, because QE would no longer be necessary to stimulate the economy. Moreover, if the steady-state level of structural demand ratchets up in response to higher emergency levels, lower peak levels could also help reduce the steady-state level.

Because flights to quality would be at least as large in the case of CBDC that did not pay interest, or a hybrid CBDC that offers households some zero-interest currency, the Fed's balance sheet would need to be at least as large under those alternatives.

### ***The Fed lending more to banks and nonbanks in a crisis***

The other side of the potentially massive flights to quality into CBDC includes flights out of commercial paper, repurchase agreements, bank deposits and even Treasury bills.<sup>21</sup> As we experienced in the fall of 2008 and the spring of 2020, such loss of funding can cascade through the financial system, driving sharp declines in economic activity and employment. Rather than acquiesce to that outcome, the Federal Reserve lent to banks (in 2008) and to nonbanks (in both periods) and purchased federal, municipal and private securities.

Currently, banks experience deposit inflows during such episodes, providing funding for draws on lines of credit by financial and nonfinancial corporations shut out from market sources of funds, and also building up their own piles

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<sup>19</sup> Lorie Logan, "Money Market Developments: Views from the Desk," Remarks at the Annual Primary Dealer Meeting, Federal Reserve Bank of New York, New York City, November 4, 2019; [Money Market Developments: Views from the Desk - FEDERAL RESERVE BANK of NEW YORK \(newyorkfed.org\)](https://www.newyorkfed.org/newsroom/2019/11/04/money-market-developments-views-from-the-desk)

<sup>20</sup> Bill Nelson, "The Fed's Balance Sheet Can and Should Get Much Smaller," Remarks at Brookings Symposium on Repo Market Disruption, December 5, 2019; <https://www.brookings.edu/wp-content/uploads/2019/11/Nelson-remarks.pdf>

<sup>21</sup> See, in addition, George Selgin, "Central Bank Digital Currency as a Potential Source of Financial Instability," *CATO Journal* (forthcoming).

of cash. For example, between Feb. 12 and April 1, 2020, bank loans increased a bit over \$700 billion without experiencing funding strains, precisely because deposits grew by \$1.2 trillion over the same interval.<sup>22</sup>

Interest rate movements also tend to mitigate flights to quality. If investors flood out of CP and into T-bills, CP rates rise and T-bill rates fall. Although those shifts may do little to slow outflows when everyone is concerned about the return *of* their money rather than the return *on* their money, they do help speed the recovery when the panic eases and rate spreads return to normal. However, if everyone had a digital wallet where they could keep an infinite amount of perfectly safe interest-earning assets, if investors were under stress, they would presumably abandon banks and nonbanks alike, and they would remain invested in their CBDC until investor confidence improved.<sup>23</sup>

Under such circumstances, concerted Fed action would be required to avoid a collapse in the financial system, along with declines in economic activity and employment. As in 2008 and 2020, the Fed would have to step in and replace the lost funding to a much greater extent than it did. In such episodes, the Fed could replace a large share of intermediation by depository institutions and financial institutions. Everyone would keep their wealth as deposits at the Fed, rather than deposits in banks or investments in securities. The Fed would, in turn, invest in banks, nonbank financial institutions, federal and municipal governments and nonfinancial corporations.

Because flights to quality would be at least as large in the case of CBDC that did not pay interest, or a hybrid CBDC that offered households some zero-interest currency, the need for the Fed to lend to replace lost funding would be at least as great.

### ***The effect on Fed profits***

Currency is a zero-interest liability of the Federal Reserve System. The Fed invests the proceeds from issuing currency in interest-bearing securities. The profits generated are remitted to Treasury. FOMC participants currently anticipate short-term interest rates in normal times to be 2.5 percent, and there is \$2 trillion in paper currency. In normal times, the Fed would therefore be expected to earn \$50 billion a year in net interest income from currency, with that amount increasing as the amount of currency grows. If the Fed replaced currency with interest-bearing CBDC, it would lose that revenue.

From a public policy point of view, it may seem like the lost revenue would be offset by the public no longer being forced to use non-interest-earning currency for cash transactions. However, most U.S. currency is held abroad.

If, however, the Fed issued non-interest-earning CBDC, or a hybrid CBDC, and public demand for zero-interest-paying Fed liabilities rose, Fed profits would increase if interest rates were positive. If, however, the Fed issued a hybrid CBDC and interest rates were significantly negative, it would be extremely profitable for households to hold the tranche. If other money market rates are –8 percent, an asset that offers a risk-free return of zero would be a goldmine. Consequently, the public could be expected to fully use its option to hold the zero-interest swath of CBDC. If each of the 200 million adults in the United States had access to and used \$3,000 zero-interest CBDC, the Fed would have to issue \$600 billion in the liability. If interest rates were –8 percent, the Fed would lose nearly \$50 billion a year on the household tranches of CBDC.

### ***Making it impossible for the Fed to drive interest rates negative***

If the Fed were to issue non-interest-earning CBDC, or if it were not permitted to set the interest rate on CBDC below zero, it would become impossible for the Fed to shift short-term rates negative if it wanted to do so. As we discussed, the limiting factor on how far below zero a central bank can drive interest rates is the zero-interest on

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<sup>22</sup> Federal Reserve statistical releases H.4.1. and H.8.

<sup>23</sup> The flight to quality could be mitigated and the speed to recovery shortened if the Fed set the CBDC rate deeply negative, but such a policy may be seen as inconsistent with offering the public a safe replacement for currency.

currency. Because it is costly to stockpile currency, central banks can and do push interest rates somewhat below zero in an effort to stimulate growth. If everyone had access to a digital wallet of currency that paid zero, the Fed could not drive interest rates below zero at all.

Again, a CBDC that could pay negative interest would not prevent the Fed from lowering interest rates below zero, nor would a hybrid CBDC that offered households a limited amount of currency that paid zero interest.

### ***Potential public anger over negative interest rates on CBDC***

There would likely be considerable resentment about a CBDC paying negative interest, especially if paper currency were eliminated—a necessary precondition of removing the ZLB on nominal interest rates. As noted, the negative interest rate would result in a steady decline in the amounts held in digital wallets. Public anger might be eased by the fact that short-term alternatives such as money market mutual funds and Treasury bills would also be paying negative interest in those circumstances. Nevertheless, the public could call for its right to a form of money that does not decline in value.

The total negative interest bill to CBDC holders would depend on the amount of CBDC, but it could be large. Currently, there is \$2 trillion in paper currency in circulation. Such currency would need to be eliminated for these negative interest rates to be possible, so it is reasonable to assume that there would be at least \$2 trillion in CBDC. There are about \$16 trillion in demand deposits and other liquid deposits at commercial banks, thrifts and credit unions. An interest-bearing CBDC would attract some of those deposits, although it is impossible to know how much. (See [Baer 2021](#) for a discussion of the factors that would determine the amount of substitution from deposits to CBDC.) As a guess, one-fourth, or \$4 trillion, would move to CBDC, resulting in a total of \$6 trillion in CBDC. Using that guess, if the interest rate on CBDC were –8 percent (the peak case considered above), the Fed would remove \$480 billion a year from the digital wallets of households and nonbank institutions and transfer the amount to Treasury. The Fed would also be charging banks, thrifts and credit unions –8 percent on their deposits, which currently equal about \$4 trillion. So, in total, the Fed would be “paying” interest of negative \$800 billion and transferring those receipts to Treasury each year, equal to 17 percent of projected federal outlays in 2020.

It is worth emphasizing that –8 percent is a figure only judged appropriate in the depth of a severe recession. Nevertheless, the Federal Reserve typically cuts interest rates by about 5 percent in a recession. If interest rates are normally 2.5 percent, the Fed could therefore reasonably be expected to cut rates below zero, even in a more normal slowdown.

A CBDC that did not pay interest or could not pay negative interest would clearly not face similar public resentment about negative interest rates on currency, but they also couldn't eliminate the ZLB. A hybrid currency that offered the public a limited amount of currency that paid zero interest would be less problematic, although businesses without access to the zero-interest tranche could still be resentful.

## **Conclusion**

A CBDC in the United States could offer significant benefits for monetary policy implementation, but it could also entail considerable costs. Although eliminating the ZLB constraint on monetary policy would enable the United States to avoid the catastrophe of a deflationary spiral, to reap those benefits, the public would need to be forced to give up paper currency and accept a CBDC whose amounts evaporate over time in some circumstances. An interest-paying CBDC could help the Fed raise interest rates when it concludes it is time to do so, but it not clear that the Fed needs the help.

Against these potential benefits, there would be potential costs associated with CBDC. Most costs are related to the digital currency making it less costly for the public to flee from other investments and into CBDC in times of uncertainty. The Fed would have to be much larger in normal times to be prepared for massive shifts into CBDC. It might also have to replace lost depository and market intermediation under such circumstances through direct

lending to banks and nonbanks and by purchasing public and private securities. In sum, it is not clear that a CBDC in the United States would help the Fed, on net, to conduct monetary policy.

That said, no major central bank appears to be placing much weight on fostering monetary policy implementation as a reason to adopt a CBDC. As discussed in [Baer 2021](#), the principal reasons appear to be fear of being displaced by stablecoins or by the CBDC of other central banks, and a desire to increase financial inclusion. However, the Fed is giving serious consideration to the potential complexities for monetary policy implementation discussed here when contemplating potential CBDC design, as is appropriate.