Felipe, Jesus et al.

Working Paper

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ADB Economics Working Paper Series, No. 627

Provided in Cooperation with:
Asian Development Bank (ADB), Manila

Suggested Citation: Felipe, Jesus et al. (2020) : How "monetization" really works: Examples from nations' policy responses to COVID-19, ADB Economics Working Paper Series, No. 627, Asian Development Bank (ADB), Manila, https://doi.org/10.22617/WPS200368-2

This Version is available at:
https://hdl.handle.net/10419/246704

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NO. 627

December 2020

ADB ECONOMICS WORKING PAPER SERIES

ASIAN DEVELOPMENT BANK

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ISSN 2313-5867 (print), 2313-5875 (electronic)
Publication Stock No. WPS200368-2
DOI: http://dx.doi.org/10.22617/WPS200368-2

Notes:
In this publication, "$" refers to United States dollars.
ADB recognizes "China" as the People's Republic of China.

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ABSTRACT

The severe economic downturn caused by the coronavirus disease (COVID-19) pandemic has forced governments worldwide to increase spending while tax revenues simultaneously collapsed. Concurrent with this, central banks in several of these countries are financing a significant percent of their direct income support through direct lending or purchases of government bonds in primary and/or secondary markets. Many oppose this for their alleged negative consequences on the economy, inflation in particular. This paper describes the actual workings of what most people (including many economists) often call monetization of government debt and its major implication, namely, that it leads to printing money and, consequently, to inflation. We show that the reality is very different: once one knows how modern central banks manage monetary policy (i.e., through a corridor interest rate targeting system), and how they coordinate their daily operations with their treasuries, monetization does not occur as it is often described, and it is not nearly as dangerous as its critics argue (and not as useful as its supporters claim). The examples of the People's Republic of China, the Philippines, Singapore, and the United States clarify this.

Keywords: central bank, corridor system, inflation, monetization, printing money

JEL codes: E42, E52, E58

I. INTRODUCTION

The severe economic downturn caused by the coronavirus disease (COVID-19) pandemic has forced governments worldwide to increase spending as tax revenues simultaneously collapsed. According to the Asian Development Bank (ADB) COVID-19 Policy Database (https://covid19policy.adb.org/), as of 24 August 2020, its 68 members had announced packages that amount to a total of about $19,500 billion. $3,656 billion corresponds to the announced packages of its 46 developing members. Direct support to income (spending, tax cuts, etc.) is about $7,687 billion, of which $1,690 billion is from ADB's developing members.

Central banks (CBs) in several of these countries are financing a significant percent of this direct income support through direct lending or purchases of government bonds in primary and/or secondary markets. According to the ADB COVID-19 Policy Database, CB financial support of government across all ADB members is $3,114 billion (plus nearly $400 billion more from the European Central Bank [ECB]), or 40% of the direct income support governments have authorized. CBs in the developing ADB members account for only about $131 billion of this or around 8% of those countries' direct income support (again, as of 24 August 2020). In some instances, the CB's support of the government is a large percent of the government's direct income support. For instance, announced support for the governments of Indonesia and the Philippines by their respective CBs is well over 100% of each government's direct income support to the private sector.

Of course, with CB financial support of government there is always controversy about the potential for inflation and/or the threat of fiscal dominance. Less often understood is that governments and their CBs are already carrying out operations daily that are inherently interdependent. These operations provide the necessary context for being able to think carefully about how CB financial support of government is occurring now and help clarify where more or less concern is appropriate. In particular, whereas standard thinking has been that CB support of government deficits amounts to "printing money" and/or "monetizing government debt," actual operations and accounting show this not to be the case. Instead, these operations simply replace an interest-earning government liability with an interest-earning CB liability, though they obviously also can enable more CB influence over risk-free interest rates in the domestic currency.

The purpose of this paper is to describe "monetization" through operations and accounting, within the context of the experiences of four countries—the People's Republic of China (PRC), the Philippines, Singapore, and the United States (US)—during the first half of 2020 in response to COVID-19. The next section presents three core points for understanding "monetization" from the operations and accounting in real world CBs. The subsequent four sections each deal with a significant part of the countries' response to COVID-19 relevant to "monetization." In the end, consistent with the use of quotes here around the term, "monetization" is not what most think it is. Instead, it is not nearly as dangerous as its critics argue, but also not necessarily as useful as its supporters claim or hope. And, without most even knowing it, it is already happening, even in normal times.

II. CENTRAL BANK OPERATIONS AND GOVERNMENT DEBT

Table 1 lists countries (plus the ECB) whose CBs are known to have engaged in some form of support of government debt, separated into those that have engaged in direct lending and/or primary market purchases of government debt,[1] secondary market purchases,[2] and/or secondary market purchases for directly setting rates on government debt along the yield curve either outright or in exchange for sales of short-term government bills ("maturity swaps," denoted by [a] in the table). Some countries' CBs appear in multiple columns: Indonesia, New Zealand, the Philippines, and the United Kingdom in columns 1 and 2, and India in columns 1 and 3.

Table 1: Central Banks Supporting National Governments in Response to COVID-19

Direct Loans or Primary Market Purchases (1)	Secondary Market Purchases (2)	Secondary Market Purchases: Yield Curve Control or Maturity Swap (3)
India Indonesia New Zealand Philippines United Kingdom Canada	Bangladesh, Canada, Colombia, European Central Bank, Fiji, Hungary, Indonesia, New Zealand, Papua New Guinea, Philippines, Poland, Republic of Korea, Romania, Solomon Islands, South Africa, Sweden, Thailand, Turkey, United Kingdom, United States	Australia Japan India[a] Mexico[a] Suriname[a]

COVID-19 = coronavirus disease.

[a] Countries engaged in maturity swaps.

Source: Authors based on ADB COVID-19 Policy Database. https://covid19policy.adb.org/ accessed 24 August 2020.

There are three core points to understand about these CB operations to support government. First, CBs set interest rate targets or target ranges, necessarily, because of the flexibility in the quantity of CB reserve balances (RBs, which are CB liabilities banks use to settle payments and, where applicable, meet regulatory requirements for liquid balances against their own liabilities) required on a daily basis to ensure functioning of the payments system and stability in wholesale funding markets. This means the CB carries out daily operations using a version of either a corridor or a floor system in achieving its interest rate target, both of which appear in Figure 1 below.

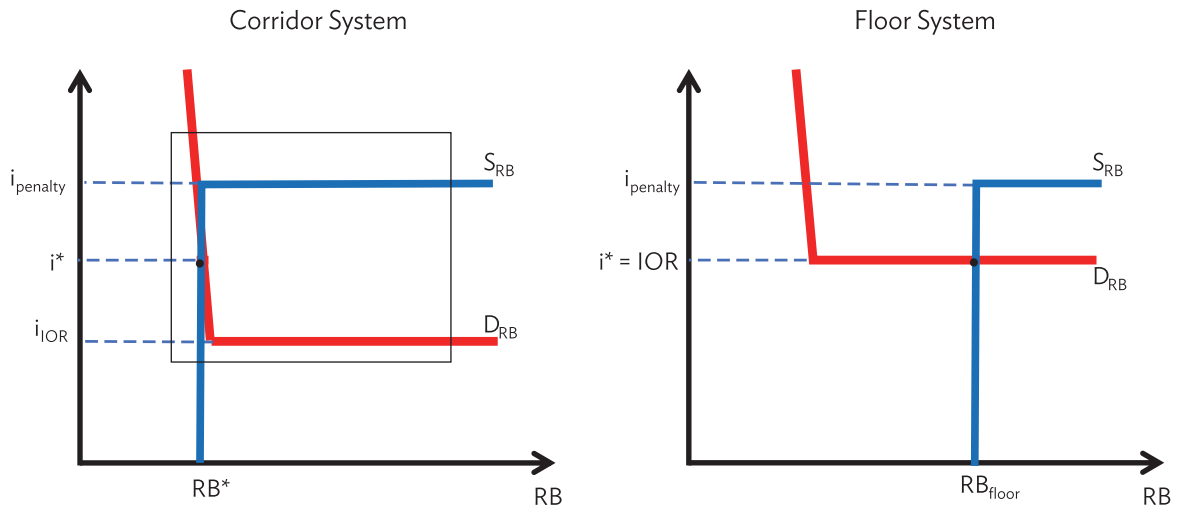
In the corridor system, the CB's "penalty rate" for borrowing from its standing facility and the rate paid on RBs (IOR—for "interest on reserves"—or zero for a CB that does not pay IOR) together set a 'corridor' for the market interest rate to fluctuate within. The CB then adds or drains RBs via open market operations, loans, and so on, to shift the vertical portion of the supply of RBs (S_{RB}) as it accommodates shifts in banks' demand for RBs (D_{RB}) at the CB's interest rate target (i^*), or to offset changes to its own balance sheet that would otherwise alter the quantity of RBs and move the market rate away from i^*. In a floor system, the CB simply ensures the S_{RB} is shifted right to well beyond any

[1] This is exclusive of some CBs normal practice of rolling over their maturing holdings of government debt in primary markets.

[2] This is exclusive of, or in addition to, the normal practice of many CBs that already purchase government debt in secondary markets regularly in order to replenish banks' reserve balances debited as banks purchase of physical currency for their customers' withdrawals.

projected downward-sloping portion of D_{RB}. From basic supply and demand analysis, this pushes the price (the market interest rate) to zero. If the CB wants to set its interest rate target above zero it must pay IOR equal to i*. Thus, the floor in the floor system is either zero or IOR, which becomes the de facto interest rate target. The quantity of RBs in the corridor system graph is an equilibrium (hence the "*" in RB*), while any quantity of RBs along the horizontal portion of D_{RB} achieves the target rate in the floor system.

Figure 1: Corridor and Floor Systems for Central Bank Interest Rate Targeting



D_{RB} = demand for RBs, i* = interest rate target, $i_{penalty}$ = penalty rate, IOR = interest on reserves, RB = reserve balance, S_{RB} = supply of RBs.

Source: Authors.

The second core point is that government spending, tax revenues, and bond sales in the domestic currency all occur on the CB's balance sheet because the government's account is a liability of the CB. From simple double-entry accounting the financial flows into and out of the government's account will have the opposite effect on the quantity of RBs circulating. Table 2 shows the t-account entries for a government deficit and a government bond sale, respectively. Considering Table 2 and Figure 1 together, the deficit raises RBs, placing downward pressure on the market rate in the corridor system, though obviously not in the floor system given the floor's presence at IOR = i*. The bond sale drains RBs and offsets the deficits effect on the quantity of RBs in both systems; in the corridor system, the pressure on the market rate to fall is reversed, while as long as the quantity of RBs in the floor system remains to the right of the downward-sloping portion of DRB throughout, there is no effect on the market interest rate.

Even in normal times, the flows to and from the government due to spending, revenues, and bond sales are not perfectly timed. In the US, for instance, prior to the 2008 global financial crisis the US Treasury would transfer from or to its account at the Federal Reserve (Fed) to or from accounts it held at thousands of private banks to offset this lack of daily synchronization's effect on the quantity of RBs, thus largely allowing the Fed to avoid having to offset these flows itself in its own operations (Kelton [Bell] 2000, Tymoigne 2014). Other countries, like the PRC, that use a Treasury Single Account System (TSAS) instead leave these offsetting operations to their CBs to integrate into day-

to-day operations for achieving the interest rate target (e.g., He and Jia 2020). A CB using a corridor system will have to offset these flows if they move the market rate away from the CB's target, either by changing its assets (more or fewer loans or open market operations, for instance) or changing its own non-RB liabilities to counter the flow to and from the government's account. In a floor system, again the CB simply ensures the quantity of RBs is "ample" such that SRB is to the right of the downward-sloping part of DRB.

Table 2: T-Accounts for Government Deficit and Bond Sale

	Government		Central Bank		Banks		Dealers		Households	
	A	L/E	A	L/E	A	L/E	A	L/E	A	L/E
(1) Deficit	Acct @ CB (-)	Net Worth (-)		RBs (+) Govt Acct (-)	RBs (+)	HH Dep (+)			Dep (+)	Net Worth (+)
(2) Government bond sale	Acct @ CB (+)	Bonds (+)		RBs (-) Govt Acct (+)	RBs (-)	Dealer Dep (-)	Dep (-) Bonds (+)			

A = assets, Acct @ CB = the government's account at the central bank on the government's assets, Dep = deposits, HH = households, Govt Acct = the government's account at the central bank on the central bank's liabilities, L/E = liabilities and equity, Net Worth = assets minus liabilities, RB = reserve balance.

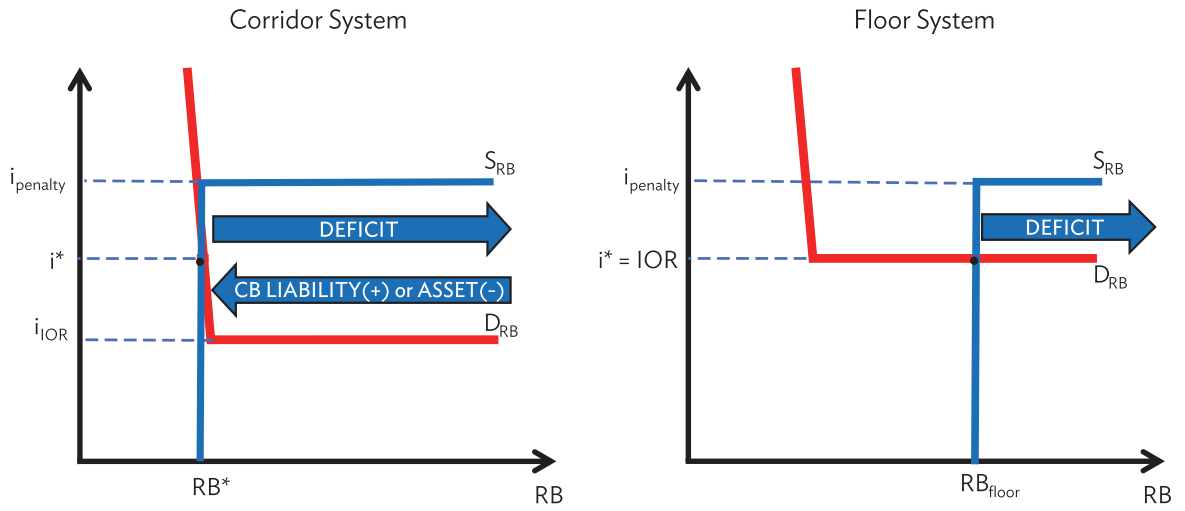
Source: Authors.

The corollary here is that when CBs finance government, whether directly (primary market or direct loans) or indirectly (secondary market), they cannot do so without sterilizing these operations. Figure 2 shows these operations in the corridor and floor system graphs. Both direct and indirect CB finance shift SRB to the right. A CB in a corridor system will need to respond by draining RBs to achieve the target rate, either issuing its own liabilities at a rate similar to its target rate or some combination of reducing its assets via sales or allowing its claims on the private sector to mature and not roll over. In a floor system, the CB responds by paying interest on the additional RB, which become essentially an interest-bearing overnight debt issued by the CB earning the CBs target rate. There is no "printing money" or "monetization" because it is not operationally possible in either system.

Lastly, as the CB ends up paying interest on its own liabilities issued in these operations within a floor system, this reduction in its net income will lead to an in-kind reduction in the CBs remittances to the government, reducing the government's own budget position such that it is effectively servicing the debt itself as if it had issued bonds. It is the standard practice across countries in which CBs remit their profits (or some percent of profits), often legally prescribed, to the government. Remittances arise mostly from interest paid by the government to the CB on government liabilities held by the CB, which is in essence returned to the government. In terms of accounting, the remittance is a simple debit from the CB's equity and credit to the government's account at the CB. Likewise, though, if the

CB must pay interest on its liabilities issued when it acquires government debt in the secondary market or when a government incurs a deficit the CB directly finances, the CB's profits are reduced in kind and so are its remittances. This is important for understanding government debt operations, since it means that when the CB acquires the government's debt in a floor system, the cost of servicing this debt is still effectively borne by the government indirectly through reduced remittances from the CB.

Figure 2: Sterilizing Central Bank Support of Government in Corridor and Floor Systems



CB = central bank, D_{RB} = demand for RBs, i^* = interest rate target, $i_{penalty}$ = penalty rate, IOR = interest on reserves, RB = reserve balance, S_{RB} = supply of RBs.

Source: Authors.

The final core point relates to interest rates on domestic currency government debt being the yield curve for the risk-free rate, which is a benchmark from which markets price other financial assets. This means that interest rates on government debt are an integral part of the transmission of monetary policy. This is well known in principle, but the implications are usually not. A competitive, highly liquid market for government debt will price the yield curve mostly based on the CB's current target rate and the market's expected path for the CB's target rate. This is because sufficient finance liquidity (that is, ability to finance and refinance asset positions) and market liquidity (ability to buy or sell quickly, in large quantities, and at low cost) in a competitive market bring the returns from holding the government bonds into line (again, mostly) with the borrowing costs of acquiring the funds to purchase them—namely, the current CB target rate and its expected path. Where government debt markets are highly liquid, CBs enable this via at least an implicit support for markets and finance liquidity for achieving their interest rate targets (or target ranges), especially (or necessarily) where CBs' operations occur with a network of government bond dealers.

This suggests there are primarily two reasons for a CB to support government liabilities: (i) to reduce the yield curve (or portions of it) below market expectations of the path of the CB's target rate, and/or (ii) to support market functioning where liquidity is insufficient, perhaps temporarily impaired by a systemic 'shock,' without which monetary policy will not transmit through financial markets or will transmit perversely. Representative examples of (i) are the 'yield curve control' operations of the Bank of Japan (BoJ) since 2016 and the Fed's quantitative easing operations during 2010–2015. The BoJ's

yield curve control operations target explicit, very low interest rates across the yield curve. The Fed's quantitative easing operations during the first half of the 2010s did this, as well, but via an announced quantity of bond purchases rather than an announced desired interest rate for any particular maturity. In both cases, the CBs operations occurred within floor systems and the RBs created by these operations earn interest; the two CBs have different frameworks for this, with RBs of banks earning 0.25% at the Fed and excess RBs earning negative rates at the BoJ since 2016.

In the course of responding to COVID-19, at least initially, many CBs intervened to support government bond markets due to (ii), including the Fed in March 2020, which came only 6 months after it intervened to provide finance liquidity to government bond dealers in September 2019 and had continued to support government bond markets thereafter through treasury bill purchases.[3] This reduction in bond market liquidity happened in rich countries, like the United Kingdom, as well as emerging market countries like Indonesia and the Philippines, prompting an active CB response in these countries even beyond that of 2008–2009. The next section discusses these events as they occurred in the Philippines within the context of the three core points in this section.

III. THE BANGKO SENTRAL NG PILIPINAS AND FAILED TREASURY AUCTIONS IN MARCH

The events of March and April related to liquidity issues in government bond markets were particularly interesting in the Philippines. The Philippines' Bureau of the Treasury (BTr) experienced failed auctions throughout the second half of March (although "failed" here does not mean there were no buyers; in fact most of the auctions were least almost fully subscribed, though it has not been uncommon for BTr to reject bids it deemed to high). The Philippines' CB, Bangko Sentral ng Pilipinas (BSP), responded with the following series of actions:

- 17 March: Cancelled its Term Deposit Facility (TDF) auctions that drain RBs to achieve the target rate so that these would not compete with BTr's auctions.
- 23 March: Authorized a PHP300 billion repurchase agreement with BTr with a maturity of 3 months, which BSP could extend for 3 more months at the due date.
- 24 March: Increased interventions in the secondary government bond market with a new daily 1-hour facility to buy select BTr securities.
- 26 March: Remits PHP20 billion advanced dividend to BTr.
- 8 April: Increased interventions in the secondary government bond market yet again by making all BTr securities eligible for purchase during the new facility's hour of operation.

The action on 17 March involves BSP's corridor system for achieving its interest rate target, as BSP regularly issues its own term liabilities at roughly its own interest rate target to achieve its target rate in normal times.[4] The 24 March and 8 April actions show BSP acting as a backstop to the

[3] See Fleming (2020) and Logan (2020) for discussion. In the Fed's case, its own liquidity and capital regulations contributed to continuing liquidity issues, as Pozsar (2019a, 2019b) had warned earlier, that worsened in the COVID-19 crisis.

[4] As BSP's own literature on its operations states, "The Term Deposit Facility is a key liquidity absorption facility, commonly used by CBs for liquidity management. The TDF is used to withdraw a large part of the structural liquidity from the financial system to bring market rates closer to the BSP policy rate" (Bangko Sentral ng Pilipinas 2016, 5).

government bond market, attempting to generate greater market liquidity. The 23 March and 26 March actions are BSP's direct finance of the government.

The 23 March repurchase agreement was essentially a 6-month direct loan (assuming renewal after the first 3 months) from BSP to BTr. Table 3 walks through the operations and their effects on the interest rate corridor targeting system for this loan and its eventual repayment. The first transaction is simply BSP crediting the BTr's account. In transaction 2, BTr incurs a deficit and RBs rise. To achieve its target interest rate, BSP would have to return to TDF auctions to drain any RBs that would otherwise push the market rate below its target rate (transaction 3), and would have to pay interest on however much is ultimately auctioned (transaction 4). As the loan from BSP matures, BSP will reduce outstanding TDF liabilities so sufficient RBs are circulating (or otherwise increase RBs as needed, such as by lending in repurchase agreement markets) in transaction 5. Then, in transaction 6, BTr issues its own securities to fund the repayment. In transaction 7, BTr repays the loan.

Table 3: Operations of the Loan to the Government by the Bangko Sentral ng Pilipinas

Action	Effect on Interest Rate Corridor System (left side in Figures 1 and 2)	Effect on Bangko Sentral ng Pilipinas' Balance Sheet	
		A	L/E
(1) BSP credits BTr's account		Loan to BTr (+300)	BTr Acct (+300)
(2) BTr incurs a deficit	Shift S_{RB} to the right		RBs (+300) BTr Acct (-300)
(3) BSP's TDF auctions drain excess RBs	Shift S_{RB} to the left		RBs (-300) TDF (+300)
(4) BSP pays interest on new TDF balances			TDF (+int) Equity (-int)
(5) BSP reduces TDFs auctioned	Shift S_{RB} to the right		RBs (+300) TDF (-300)
(6) BTr auction settles	Shift S_{RB} to the left		RBs (-300) BTr Acct (+300)
(7) BTr repays loan principal to BSP		Loan to BTr (-300)	BTr Acct (-300)
(8) BSP remittances to BTr are lower by the interest paid on TDFs[a]			BTr Acct (-300-int) Equity int (+300+int)

A = assets, BSP = Bangko Sentral ng Pilipinas, BTr = Bureau of the Treasury of the government's Department of Finance, BTr Acct = BTr's account at BSP, int = size of the interest payment, L/E = liabilities and equity, RBs = reserve balances, S_{RB} = supply of RBs, TDF = Term Deposit Facility.

[a] BSP does not actually debit BTr's account in (8), but rather the remittance transfer is less than it would have been in the absence of (1) earlier.

Source: Authors.

Note that for BTr, BSP, and the private financial markets, the primary change is that interest on BTr liabilities has been explicitly set by BSP. Because the TDF liabilities auctioned by BSP in transaction (3) are interest bearing, BSP reduces its remittances in kind in transaction (8).[5] For BTr,

[5] BSP's loan to BTr is a zero-interest loan (Leyco 2020).

then, it is as if it issued its own liabilities to financial markets at the rate BSP set. From the financial system's perspective, the result is to effectively swap BTr liabilities normally linked to the anticipated path of BSP's target rate for TDFs at BSP that earn roughly BSP's target rate. Overall, BSP's explicit backstop of the government securities market and its loan to BTr show its own interest in ensuring the link remains between BSP's target rate and interest rates on government liabilities.

As for its 26 March advanced dividend payment to the government, BSP explains:

> To further support the government in its fight against Coronavirus disease 2019 (COVID-19), the Bangko Sentral ng Pilipinas (BSP) will remit [PHP]20 billion as advance dividend to the National Government (NG). The advance dividends constitute 87% of the estimated total dividends based on the BSP's unaudited financial statements for the year 2020.
>
> BSP will remit the [PHP]20 billion advance dividends today, 26 March 2020, through direct credit to the Treasurer of the Philippines-Treasurer Single Account, which is maintained with the BSP (Bangko Sentral ng Pilipinas 2020).

BSP's remit advance to BTr is effectively direct finance of government, and the repayment occurs as a reduction in kind of future remittances. The transactions for this are in Table 4, for which transactions (2) through (4) are identical to those in Table 3. As with the 23 March repurchase agreement, once the national government incurs a deficit, BSP will drain RBs to achieve its interest rate target within the corridor by auctioning interest-bearing TDF liabilities. When BSP pays interest on TDF liabilities, this *reduces* its profits. Later, BSP will reduce its remittances by the combined amount of the advance and the interest paid on the new TDF liabilities. The advanced dividend payment ultimately functions *as if* BTr issued its own debt to the private sector at the TDF auction rate.

Table 4: Operations of the Dividend Advance to the Government by the Bangko Sentral ng Pilipinas

Action	Effect on Interest Rate Corridor System (left side in Figures 1 and 2)	Effect on Bangko Sentral ng Pilipinas' Balance Sheet	
		A	L/E
(1) BSP makes advanced remittance to BTr			BTr Acct (+20) Equity (-20)
(2) BTr incurs a deficit	Shift S_{RB} right		RBs (+20) BTr Acct (-20)
(3) BSP's TDF auctions drain excess RBs	Shift S_{RB} left		RBs (-20) TDF (+20)
(4) BSP pays interest on new TDF balances			TDF (+int) Equity (-int)
(5) Later, BSP reduces remittances to BTr by combined advance & interest on new TDF balances[a]			BTr Acct(-20-int) Equity (+20+int)

A = assets, BSP = Bangko Sentral ng Pilipinas, BTr = Bureau of the Treasury of the government's Department of Finance, BTr Acct = BTr's account at BSP, int = size of the interest payment, L/E = liabilities and equity, RBs = reserve balances, S_{RB} = supply of RBs, TDF = Term Deposit Facility.

[a] BSP does not actually debit BTr's account in (5), but rather the remittance transfer is less than it would have been in the absence of (1) earlier.

Source: Authors.

As in the previous section's discussion of core points, BTr cannot avoid "paying" interest on new debt created by deficits even when BSP finances them directly. Because BSP must issue its own interest-bearing liabilities in the meantime, it reduces remittances in kind and BTr effectively pays roughly BSP's interest rate target on new increases in the national debt. Overall, the reality of CB finance of government is not like the "printing money" tale in textbooks, financial press, or even from most economists. Instead, the result is an increase in interest-bearing liabilities of the CB, which the government ultimately services, much like if the government had issued the debt in the first place. BSP's actions in the first months of the COVID-19 crisis illustrate the point that the primary rationale of CB support of government is to keep interest rates on new debt lower or intervene to reduce liquidity problems, not to somehow add more impact to the existing deficit, since that is not what happens.

IV. THE MONETARY AUTHORITY OF SINGAPORE AND THE GOVERNMENT'S DRAWDOWN OF RESERVES

The case of the Monetary Authority of Singapore (MAS) is equally interesting, but in an entirely different way. MAS is well known for its exchange rate-driven monetary policy strategy that targets the Singapore dollar (SG$) against a weighted basket of currencies to achieve low inflation. At the tactical level, MAS notes that its Monetary and Domestic Markets Management Department, responsible for implementing monetary policy, is tasked with achieving the nominal effective exchange rate (NEER) target band via foreign exchange markets intervention as well as managing banks' abilities to settle payments and meet regulatory reserve requirements (Monetary Authority of Singapore 2013, 2). Of particular interest here is Singapore government's "draw on the nation's reserves" to pay for COVID-19 support and how this is, in fact, an example of "monetization" of government deficits. This requires some details on MAS's typical operations to understand.

Throughout its own publications and speeches, MAS describes itself as an exchange rate targeting CB, not an interest rate targeting CB: "MAS' liquidity management framework therefore does not target any level of interest rate or money supply" (Monetary Authority of Singapore 2013, 8). Accordingly, it argues, "as MAS does not have an interest rate target, the borrowing and lending rates for the Standing Facility are market-determined" (p. 18). The ceiling for MAS's interest rate corridor (the Standing Facility Borrowing Rate [SFBR]), as well as the rate it pays on banks' RBs as the corridor's floor (the Standing Facility Deposit Rate [SFDR]), are set daily at +0.5% and −0.5% (though not falling below 0%), respectively, from the day's market rate, rather than being policy variables for MAS.

This is true at a strategic level, but not at the tactical level of policy making. MAS obviously understands this and is usually clear in its own publications in this regard, but those without expertise in CB operations may miss the subtleties. Consider the following passages in which MAS distinguishes *intermediate* targets from *direct* or *operational* targets:

> Unlike most central banks which target interest rates, MAS uses the nominal exchange rate as the *intermediate target* of monetary policy (Monetary Authority of Singapore 2018, 7; emphasis in original).
>
> Money Market Operations (MMOs) are conducted Daily by the Monetary and Domestic Markets Management Department (MDD) in MAS to manage liquidity within the banking system . . . . These are distinct from the implementation of exchange

> rate policy as MAS does not use domestic interest rates as a tool to carry out its exchange rate-centered monetary policy (Monetary Authority of Singapore 2018, 11).

In other words, there is a distinction to be made between decisions regarding where to set the NEER target range—as set by monetary policy strategy, much like a Taylor-type rule framework works in an interest-rate target strategy for many other CBs—and operations that achieve "an appropriate amount of liquidity in the banking system—sufficient to meet banks' demand for precautionary and settlement balances, but not excessive" (Monetary Authority of Singapore 2013, 8).

Recalling the first core point earlier in this paper, at the tactical level of policy, CBs necessarily employ interest rate targets or target ranges, even if the placement of the target or target range is endogenous to, in MAS's case, an NEER target at the strategic level of policy. RBs in circulation exist only on the CB's balance sheet; the quantity of RBs is not and cannot be something the "market" determines without a conscious choice by the CB to accommodate. As Federal Reserve Bank of New York researchers put it, "the costs of reserves, both intraday and overnight, are policy variables. Consequently, a market for reserves does not play the traditional role of information aggregation and price discovery" (Martin and McAndrews 2008, 1). As with other CBs that are the monopoly supplier of RBs with no operational limit to its ability to do so, there is no "price discovery" in the market for RBs: how much or little precision MAS chooses to use in accommodating banks' demand for RBs necessarily determines the "market's" rate.

Singapore private banks' demand for RBs arises from their need to meet required RB holdings against certain liabilities and to also have enough RBs to settle payments for customers and for their own payment obligations. This is standard for monetary policy implementation in other countries, as well (though many do not require banks to hold a minimum quantity of RBs greater than zero). Banks' required RBs in Singapore are 3% of "qualifying liabilities" held on average during a 2-week computation period. After a 2-week lag, banks meet the requirement on average throughout a 2-week maintenance period (MAS's RB requirement is thus based on lagged-reserve accounting). End-of-day RBs for a bank can fluctuate between 2% and 4% of the qualifying liabilities, as long as average RBs held across the period is at least 3%. Banks can also run intraday RBs down to zero temporarily to settle payment obligations (Monetary Authority of Singapore 2013, 2014). In general, a minimum RB requirement met on average during a maintenance period generates a flatter region DRB around the CB's interest rate target for much of the period, but this flatter region largely evaporates by the period's end, leaving DRB much more inelastic.

CBs must accommodate banks in the payments system, and they also must accommodate with some degree of flexibility banks' attempts to meet RB requirements (where applicable, since not all CBs impose RB requirements), all in order to avoid large swings in the market interest rate. In MAS's case,

> MAS carries out money market operations every morning at about 9:45am. The purpose of these operations is to ensure that there is an appropriate amount of liquidity in the banking system: sufficient to meet banks' demand for precautionary and settlement balances, but not excessive (Monetary Authority of Singapore 2013, 12).
>
> After deciding on the amount of liquidity to inject or withdraw from the system, as well as the instruments and tenors to transact in, MAS conducts an auction and transacts with Primary Dealers based on the distribution of liquidity in the banking system and the competitiveness of their bids (Monetary Authority of Singapore 2013, 13).

To reiterate, provision of "an appropriate amount of liquidity" is not possible without doing so consistent with an interest rate or an interest rate range. This is simply supply and demand. Everything that affects S_{RB} is on MAS's balance sheet and thus *can* be accommodated *or* countered if MAS so chooses; it cannot shift or not shift S_{RB} in isolation from the existence of D_{RB}. If it shifts S_{RB}, the market rate changes. If D_{RB} shifts and MAS leaves S_{RB} where it is, the market rate changes. If the market rate does not change, MAS enabled that, as well. The fact that D_{RB} becomes very inelastic beyond what is necessary to settle payments and meet RB requirements further reinforces this. The interest rate or interest rate range that MAS targets is endogenous to the needs of its NEER targeting strategy, but setting a target rate or a target rate range at the tactical level of policy is inherently impossible for it to avoid.[6] Of course, in MAS's case, because the corridor itself is set by the day's "market" rate that results from MAS's tactical operations—which it refers to as the reference rate—its corridor system enables greater swings in the "market" rate across days, but this is by MAS's own choices in designing its corridor system and tactics, not something deriving from "market forces."[7]

MAS has several tools beyond the standard repo operations with dealers and its standing facilities (SFBR and SFDR) for managing the quantity of RBs within its tactical target range for the reference rate. These are, namely,

(i) very inexpensive intraday credit (currently 0%);
(ii) a term (28- and 84-day) repurchase facility for banks and finance companies;
(iii) term (7-, 28-, and 84-day) lending and borrowing US dollars ($) against various possible types of collateral, which, if SG$ denominated, can include "cash" (that is, a currency swap that drains RBs);
(iv) a term renminbi facility for loans against SG$ (a currency swap that drains RBs);
(v) an overnight renminbi facility against SG$ collateral which can also include "cash" (a currency swap that drains RBs); and
(vi) MAS's own bills (MAS Bills) that have 4- or 12-week maturities, and also issues its own 6-month floating rate notes.

As MAS confirms, "the liquidity facilities allow MAS to fine-tune the liquidity in the system as necessary" (Monetary Authority of Singapore 2013, 17). Consequently, shifts in D_{RB} from banks, or shifts in S_{RB} from foreign exchange operations, changes in the private sector's desired holdings of currency, flows to and from the government's account, and/or anything else on MAS's balance sheet are accommodated or countered (that is, sterilized) as MAS chooses, and the resulting market interest rate and possible ranges in its volatility are inherently a result of those choices and the design of its corridor system, notwithstanding the fact that those choices are subservient to its NEER targeting strategy.

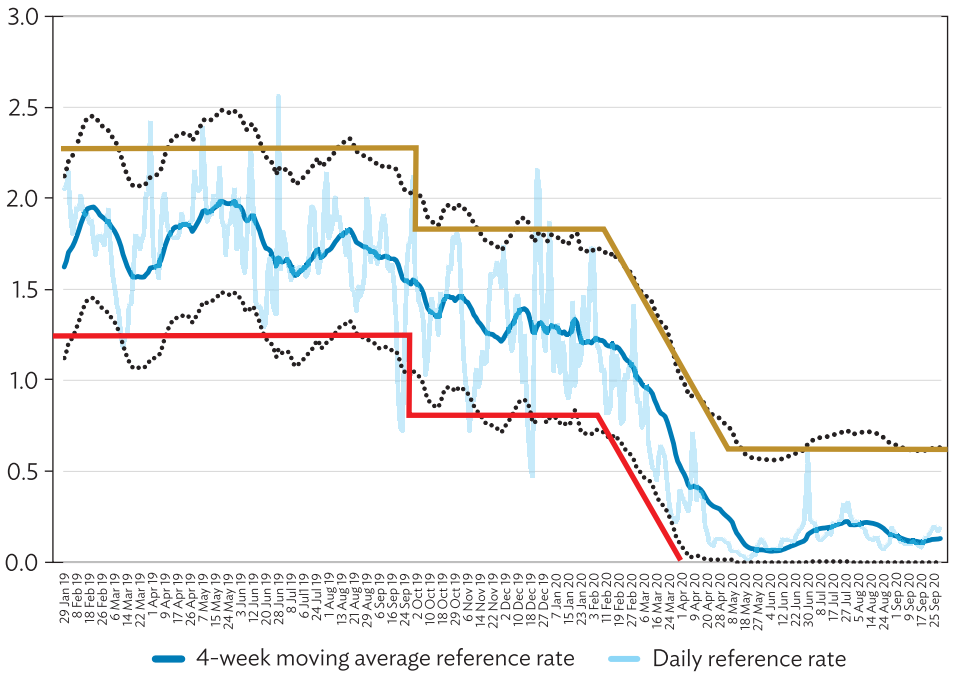
Figure 3 shows the overnight reference rate and MAS Standing Facilities data for 2019 and 2020 (through September 30). Values for the daily reference rate (Monetary Authority of Singapore 2013, 2014; calculated here as 0.5% below the reported SFBR) are in both daily data form (thinner, lighter line) and as a 4-week moving average (thicker, darker line). The reported SFBR and SFDR are the dotted lines, here in the form of 4-week moving averages. From the graph, a fairly clear corridor for

6 This is essentially the "compensation thesis" in Lavoie and Wang (2012).

7 MAS defines the reference rate—for which it sets its standing facilities' 0.5% above and below—as "the weighted average of successful bids for MAS's SG$500 million overnight clean borrowing conducted during Money Market Operations on the same day, rounded to two decimal places" (see https://www.mas.gov.sg/monetary-policy/liquidity-facilities/mas-standing-facility [accessed 30 September 2020]). As the block quotes in the text from MAS (2013, 12–13) explain, MAS's operations are in the mornings, which thereby establish the standing facility rates for the day. So, standing facility rates (SFBR and SFDR) can rise or fall from day to day, but MAS's morning operations set them for any given day.

SFBR and SFDR appears between around 2.25% and 1.25% from January to September 2019, and between 1.75% and 0.75% from October 2019 to around February 2020. These are the values for the gold and red horizontal lines in the graph through February 2020, and could be near what MAS targeted for SFBR and SFDR through February 2020 to be consistent with its NEER target. Thereafter, as COVID-19 events took hold, MAS fairly abruptly allowed both rates to fall, with SFDR at its zero lower bound and SBDR usually between 0.5% and 0.75%. From January to September 2019, there is an apparent average target range between 1.5% and 2% as shown by the 4-week average reference rate. This appears to decline to 1.25%–2% for October 2019 to February 2020, and then slowly declines to 0%–0.25% by May 2020.

Figure 3: Monetary Authority of Singapore's Standing Facility Borrowing Rate, Standing Facility Deposit Rate, and Imputed Standing Facility Reference Rate, January 2019–September 2020

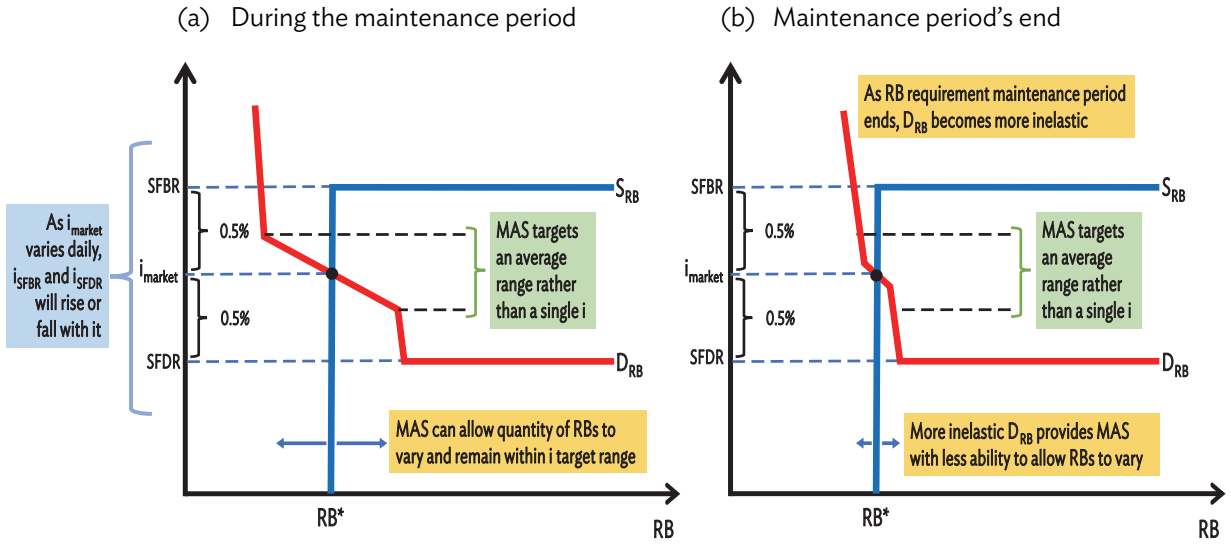


Notes: Upper and lower dotted lines are 4-week moving averages for the Standing Facility Borrowing Rate (SFBR) and Standing Facility Deposit Rate (SFDR), respectively. Gold and red lines are hypothesized average targeted values for SFBR and SFDR, respectively.

Source: Monetary Authority of Singapore and authors' calculations.

From Figure 3, a representation of MAS's corridor system emerges, which is in Figure 4. The corridor set by SFBR and SFDR shifts up or down daily with changes in the standing facilities' reference rate (i_{market} in Figure 4). In Figure 3, MAS appears more interested in an average value over time for i_{market}, and appears to target average i_{market} within a range that is not as wide as the corridor. D_{RB} flattens somewhat within the range that banks hold RBs during most of the maintenance period in the left graph, providing MAS with a range of quantities of RBs that are consistent with an average target range. As the maintenance period comes to an end, nearly all of this flattened portion of D_{RB} evaporates in the right graph, leaving MAS facing a more inelastic D_{RB}.

Figure 4: Monetary Authority of Singapore's Corridor System During the Maintenance Period and at the Maintenance Period's End



D_{RB} = demand for RBs, i_{market} = reference rate, SFBR = standing facility borrowing rate, SFDR = standing facility deposit rate, MAS = Monetary Authority of Singapore, RB = reserve balance, S_{RB} = supply of RBs.

Source: Authors.

The exceptions in which the overnight rate has increased or decreased significantly prove the rule. As MAS explains,

> In mid-September 1985 when there was a speculative attack on the Singapore dollar, MAS intervened in the foreign exchange market to buy the Singapore dollar against the US dollar but did not offset the liquidity drain of the intervention through money market operations. The intervention operation was left unsterilized, so as to reduce banking system liquidity and make it costly for speculators to cover their short Singapore dollar positions. . . . Overnight interest rates surged close to 100% per annum that day and hovered between 20-30% per annum for the following few days (Monetary Authority of Singapore 2013, 13).
>
> On the morning of 12 September 2001, following the terrorist attacks on New York City the night before, MAS injected [SG$]2.5 billion into the banking system to bring banks' cash balances with MAS to 4.5%, above the statutory minimum of 3%, to calm market participants and ensure the smooth functioning of all Singapore dollar markets. It was only after some calm had been restored to the market that MAS withdrew some of the liquidity late in the afternoon (Monetary Authority of Singapore 2013, 13).

Clearly MAS recognizes that its own actions created these significant swings in the overnight interest rate, not the "market," at the tactical level.

What do MAS's operations to set an interest rate target range at the tactical level consistent with its NEER targeting strategy have to do with "monetization" given that the Government of Singapore legally prohibits itself from incurring deficits? Everything. While it may not run deficits as

typically understood, Singapore nonetheless issues government debt, and the details of how and why are very unique. As Singapore's Ministry of Finance explains,

> The Singapore Government currently issues the following domestic securities for reasons unrelated to the Government's fiscal needs:
>
> (1) Singapore Government Securities (SGS) are issued to develop the domestic debt market;
> (2) Special Singapore Government Securities (SSGS) are non-tradable bonds issued primarily to meet the investment needs of the Central Provident Fund (CPF), Singapore's national pension fund; and
> (3) Singapore Saving Bonds are introduced to provide individual investors with a long term saving option that offers safe returns (Accountant-General's Department 2019, 3).

It confirms that, "under the Government Securities Act, the borrowing proceeds from the issuance of these securities cannot be spent and are invested" (p. 3). When the Government of Singapore raises funds from the issuance of Singapore Government Securities or Singapore Savings Bonds, or net inflows to CPF, these are all credits to its account(s) at MAS and an in-kind reduction in RBs held by Singapore's banks, consistent with the second core point earlier in this paper. Next, the funds are pooled together and "MAS converts these funds into foreign assets through the foreign exchange market" (Singapore Ministry of Finance n.d.). Note that this adds back the RBs, leaving no net change to RBs from bond issuance. Government of Singapore Investment Corporation (GIC)[8] manages much of the government's international investments (the other "fund manager" being MAS, which manages the official foreign reserves) in a globally diversified portfolio, then takes over management of the foreign assets.[9]

While the government cannot spend proceeds of bond sales, it does have legal access to total net investment returns beyond the costs of servicing the securities and managing the investment portfolio. This Net Investment Returns Contribution (NIRC) is then additional annual funding for the government's budget. NIRC is composed of (i) up to 50% of annual Net Investment Income (NII) from interest and dividends (again, net of debt service and other expenses); and (ii) up to 50% of annual Net Investment Returns (NIR), calculated as the real expected long-term capital gains[10] (that is, after netting out anticipated long-term inflation) from the net of invested assets less liabilities (Singapore Ministry of Finance n.d.). The NIRC values for 2018 and 2019 were SG$16 billion (Accountant-General's Department 2019, 7) and SG$17.2 billion (Singapore Ministry of Finance n.d.), or 3.25% of 2018 gross domestic product (GDP) and 3.4% of 2019 GDP, respectively.

Returning to MAS's operations, when the government spends its annual NIRC, this is a net increase in RBs. The NII portion is a credit to the government's account at MAS, while the offsetting operations is MAS acquiring foreign assets from GIC or adding to its own foreign investment

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8 GIC is "a private company wholly owned by the Government of Singapore. We do not own the assets we manage...." Further, "although we are government-owned and manage Singapore's reserves, our relationship with the government is that of a fund manager to a client" (See https://www.gic.com.sg/faq/ [accessed 30 September 2020]).

9 As in the Accountant-General's Department description, CPF receives non-marketable Special Singapore Government Securities (SSGS) in exchange for the funds GIC invests. Essentially, CPF's holdings of SSGS provide it with legal authority to pay future benefit payments equal to revenues, interest from SSGS, and the value of the SSGS holdings. The SSGS holdings do not provide *financial ability* to pay, though, since CPF's SSGS holdings and interest payments from them exist only as internal accounting among different departments within the same government.

10 Essentially this is an expected average annual real return from capital gains.

portfolio (that is, dividends and interest cash flows from GIC's and MAS's international investments are in foreign currencies).[11] The quantity of combined actual assets owned by MAS and/or the government (itself the owner of GIC) in fact remains unchanged; at most, there are asset transfers between the government via its own investments and MAS so that the full value of the NIRC is on MAS's balance sheet (if it was not already) while total holdings across the two remain the same.

Table 5 presents the case of NII where MAS's investments are the source of the interest cash inflows. Transaction (1) shows the interest income from MAS's global portfolio ("Inv Port" in the table) increasing MAS's equity. In (2), MAS makes NII transfers to the government's account, reducing MAS's equity and raising the government's net worth. The government's spending is in (3), here assumed to be payments to households, which raises household net worth and reduces the

Table 5: Monetary Authority of Singapore Credits Net Income Investment to Government

	Singapore Government		MAS		Banks		Households	
	A	L/E	A	L/E	A	L/E	A	L/E
(1) MAS receives interest on global investments			Inv Port (+)	Equity (+)				
(2) MAS credits Government with NII	MAS Acct (+)	Net Worth (+)		Govt Acct (+) Equity (-)				
(3) Government spends (or cuts taxes)	MAS Acct (-)	Net Worth (-)		RBs (+) Govt Acct (-)	RBs (+)	HH Dep (+)	Dep (+)	Net Worth (+)
(4) MAS issues MAS Bills to sterilize RBs				RBs (-) MAS Bills (+)	RBs (-) MAS Bills (+)			

A = assets, Dep = deposits, Govt Acct = the government's account at the central bank on the central bank's liabilities, HH = households, Inv Port = investment portfolio, L/E = liabilities and equity, MAS = Monetary Authority of Singapore, Net Worth = assets minus liabilities, NII = net investment income, RB = reserve balance.

Source: Authors.

[11] For simplicity the discussion abstracts from Temasek Holdings, a third manager of Singapore government's reserves (in addition to GIC and MAS) focusing on long-term equity investments within and outside of Singapore. The Singapore government is the sole equity holder of Temasek.

government's by the same amount in-kind. Because (3) increased RBs, MAS sterilizes it in (4) by issuing MAS Bills to banks. Following (4), of course, MAS will pay interest on its bills, ultimately reducing its remittances. (The operations are not dissimilar for NII paid from GIC's interest and dividend income, since these also come from international investments and, being wholly owned by the government, GIC's income is the government's income.) As noted above, and of particular interest, is that the government's spending of the NII proceeds does not reduce the balances in MAS's global portfolio. Instead, MAS's interest obligations on its MAS Bills become a cost relative to the returns that can be earned on this increased size of the investment portfolio. Overall, then, spending NII proceeds is equivalent to the government running a deficit without a bond sale—monetization—and MAS issuing its own bills to raise funds for the global investment portfolio. The net effect is as if the Government of Singapore ran a deficit, with its indirect debt service for MAS's new liabilities reducing in kind future interest and dividend income from the national reserves net of cost of servicing liabilities.

The NIR portion is an outright credit to the government's account at MAS beyond assets held by MAS and/or GIC, since NIR does not arise from any cash flows to the investment portfolios or from asset sales. The actual mechanics are unreported, but at most, NIR is merely an intragovernmental advance from the reserve fund(s) to MAS and the government's account that is made whole upon the funds' realization of capital gains in the future. Effectively, this is the same as beginning with transaction (2) in Table 5 and skipping (1). While there is no increase in the investment portfolio (since [1] is skipped), like NII, NIR does not reduce combined assets of the funds. Further, as with NII yet again, following (4), MAS pays debt service on its additional liabilities, and then reduces remittances. The overall effect is again as if the government simply runs a deficit that MAS sterilizes rather than the government issuing its own bonds, which increases the costs of the existing global investment portfolio relative to its total future returns (both interest and capital gains).[12] In short, the NIR contribution may provide the legal authority for the government to spend, but the operational reality is the spending is "funded" when MAS credits the government's account as the law requires it to do.

In response to COVID-19, the Government of Singapore is effectively doubling the size of its budget, with more than half of the total—more than SG$100 billion—applying to the COVID-19 response. The NIRC for 2020 is SG$18.6 billion. The government is also making a SG$54.5 billion drawdown from national reserves, the portfolios of investments that originate from past government securities issuance, past surpluses, past government asset sales, and so on.[13] As with NIRC, actual operations for a drawdown are unreported, so it is unclear if it involves actual sale of SG$54.5 billion in assets to acquire the funds. If not, then it is simply a credit to the government's account at MAS, like the NIR portion of NIRC in transactions (2), (3), and (4) in Table 5. And, again, like with NIRC, the government's subsequent spending increases RBs that MAS will sterilize via increases in its own interest-bearing liabilities, for which the interest payments also reduce remittances to the government. If the drawdown *is* from a sale of foreign currency-denominated assets held by GIC, for instance, this functions like the NII portion of NIRC, again raising RBs, requiring sterilization operations and increased debt service from MAS, and ultimately reduced remittances to the government. Note that the actual size of the national reserves is unchanged in either case, and is effectively the same as with NIR: to leave the national reserves themselves unchanged but to increase

[12] Of course, given the government's regular auctions of SGS, it could also be that an SGS auction removes the excess RBs and MAS's sterilization via MAS Bill issuance is unnecessary. Note that this is effectively the government running a deficit and *afterward* issuing SGS, illustrating that its own bonds are for the purpose of aiding MAS's interest rate maintenance, not funding a deficit.

[13] 2020 NIRC and National Reserves drawdown figures are in several sources, such as Kurohi (2020).

their relative costs (or, otherwise stated, to reduce their net returns) through additional debt service by MAS and/or the government if its SGS auctions are at the time such sterilization is necessary.

To conclude, while to the casual observer a drawdown of national reserves may appear to be simply a drawdown of savings like any firm or household might, for a government with a CB, this is in fact simply a credit to the government's account at the CB, with the subsequent spending raising RBs that must either be drained and replaced by an interest-earning liability of the CB (in a corridor system) or earn interest at the CB's target. Thus, the drawdown of reserve funds by the Government of Singapore creates additional, interest-bearing liabilities for MAS, who then reduces remittances such that the government effectively pays this interest as if it had incurred new debt equal to the amount of the drawdown. Thus, a "reserve drawdown" for a government transacting through its account at the CB is operationally the same thing as a deficit that results in new debt outstanding along with new debt service requirements. While "pre-funding" likely appears to many to be "better housekeeping" (including perhaps to international governance institutions like the International Monetary Fund), operationally there is no way around the accounting fact that either the Government of Singapore or MAS (or both) will end up with more interest-bearing liabilities outstanding. Finally, unlike when the private sector draws down its own savings or investments, for a nation with a CB that creates its own liabilities in its own currency without prior funding or concerns for its own solvency in its own currency, this does not reduce the CB's assets, which means it is not the assets that are necessary for the spending in the first place, but rather simply the legal authorization or requirement from the government that the CB credit the government's account.

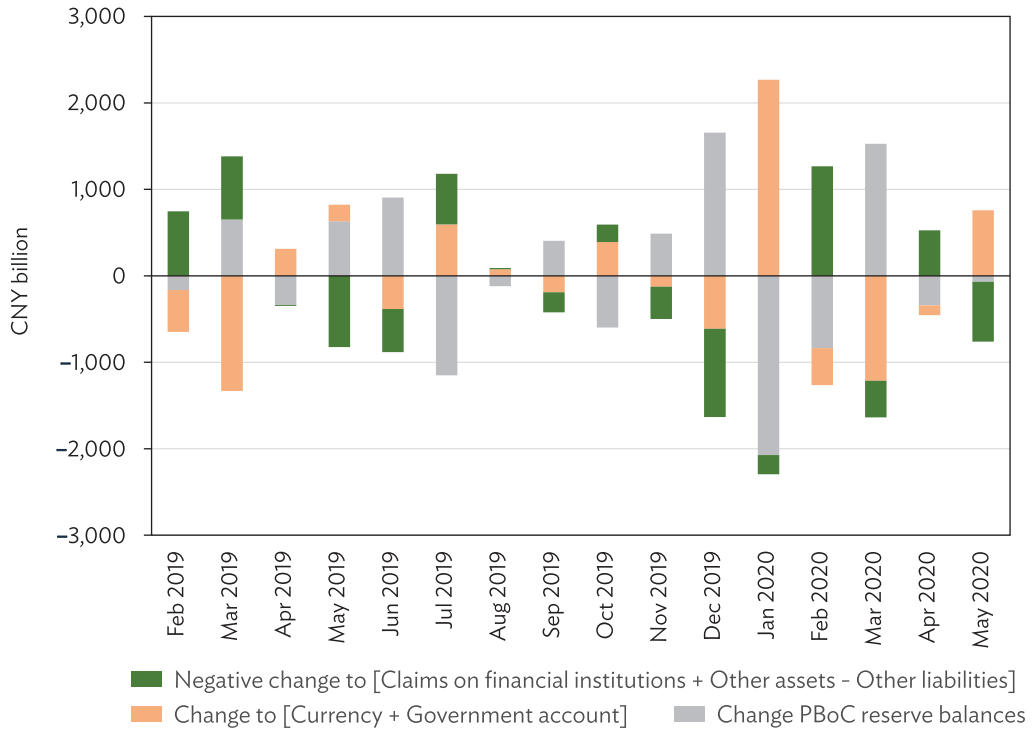
V. MONETIZATION DEBATE IN THE PEOPLE'S REPUBLIC OF CHINA

A "heated" debate emerged in the PRC in Spring 2020 regarding whether or not the People's Bank of China (PBoC) should "monetize" the national government's deficits. Liu Shangxi, President of the Academy of Fiscal Science and member of the PRC's top political advisory body, argued that "monetization of the fiscal deficit will ease the government's tight financing conditions;" he further suggested it could avoid the crowding out effect on financial markets as the deficit reached a multiyear high as a percent of GDP (Liu 2020). Numerous others countered this view. Ma Jun, a member of PBoC's monetary policy committee referred to "direct printing of money" as the source of asset price bubbles and hyperinflation (Ma 2020). Wu Xiaoling, former deputy governor of PBoC and current Vice Chair of the Financial and Economic Committee of the National People' Congress, argued that "currently, the Chinese [government bond] market has plenty of room for government bonds" (Wu 2020). The previous sections of this paper can shed light on these differing points of view, walking through the three core points and applying, where applicable, the experiences of the Philippines and Singapore.

PBoC's operations lie somewhere between the Philippines' BSP and Singapore's MAS. It runs an interest rate corridor system for which it announces both ceiling and floor rates like BSP rather than allowing them to vary across days, but it also allows interest rates to vary within the corridor on average and uses numerous tools at different maturities to achieve a target range on average like MAS (He and Jia 2020). Unlike the other two CBs, PBoC's interest rate targeting operations also occur within a significantly wider corridor (for instance, during January through May 2020, the width of the corridor was 2.6%), enabling PBoC's target rate range changes to occur without requiring PBoC to announce changes to the corridor itself. Further, PBoC makes more frequent use of changes in RB requirements than is typical for other CBs, and its operations are across a broader range of maturities that appear to tie interbank and repo rates out to 1 year (Felipe and Fullwiler 2020).

As noted earlier, the Government of the PRC employs a TSAS that does not make use of correspondent bank accounts, unlike, say, the US before the Lehman Brothers failure (He and Jia 2020).[14] The TSAS leaves daily changes to the government's account at PBoC as a significant source of "autonomous" changes to PBoC's balance sheet, and leaves PBoC with the task of sterilizing these changes as necessary in order to achieve the policy target range. Figure 5 shows monthly averages for PBoC's balance sheet (in billions of Chinese yuan) categorized by the change to currency and the governments account together (the two primary autonomous portions of PBoC's balance sheet (orange columns), change to RB's (gray columns), and the negative of the sum of changes to claims on financial institutions, "other assets", and "other liabilities" (green columns).[15] The changes to RBs were those (again, on average for the month) implicitly consistent with achieving the PBoC's interest rate target range. The autonomous changes to currency and the government's account are changes to RB's (negative or positive) that would occur if PBoC did not sterilize them. The operations of PBoC (reported as claims on financial institutions, "other assets," and "other liabilities") adjust the quantity of RBs such that the quantities in the figure above and below zero are roughly the same in absolute value and thus their netted value is close to zero.[16]

Figure 5: Changes to the Balance Sheet of the People's Bank of China, January 2019–May 2020
(Monthly averages)



CNY = yuan, PBoC = People's Bank of China.

Source: People's Bank of China and authors' calculations.

[14] See Kelton [Bell] (2000) and Tymoigne (2014) on the Treasury Tax and Loan account system in place until 2008 in the US.
[15] PBoC publishes its balances sheet at the monthly frequency.
[16] Claims on financial institutions are many times larger than both the "other" assets and "other liabilities." Other items on the balance sheet, including claims on government, foreign exchange, foreign liabilities, and bonds issued, varied little at least at a monthly frequency during this period.

Given that PBoC sets an interest rate target within a corridor system *and* that government spending, revenues, and bond sale settlement all occur via the government's account on the PBoC's balance sheet, as with BSP and MAS, any "monetization" operations by the PBoC of government debt would necessarily require it to allow the overnight interest rate to fall to the rate it pays on RBs (for PBoC, this is the rate paid on excess RBs, since RBs required against liabilities do not earn interest), to increase this rate, and/or to issue its own interest-bearing liabilities.[17] Yet again, "monetization" in the sense of creating noninterest bearing RBs is not operationally possible without a zero interest rate target policy. Government deficits *are* accompanied by interest-bearing liabilities in some combination from the CB or government.

As with the third core principle from earlier, whether or not it is desirable for PBoC to engage in "monetization" therefore has more to do with whether there is sufficient liquidity in the government bond markets to bring the yield curve on government bonds in line with the anticipated path of the CB's interest rate target, and if so, whether or not the CB prefers bond markets to have a still lower anticipated path of its target rate. Wu Xiaoling's (2020) op-ed from above expressed essentially this view for the PBoC:

> If there is a problem with market liquidity, the central bank will buy and sell government bonds in the secondary market to provide liquidity.
>
> The biggest advantage of the People's Bank of China buying and selling government bonds from the secondary market is that it can form the yield curve of government bonds and provide a risk-pricing benchmark for the financial market.

As above, she concluded that the Chinese market for government bonds was sufficiently liquid, having "plenty of room" for more bond issuance. Figure 6 shows monthly averages for the interbank overnight rate that PBoC manages with rates on government securities across the yield curve for January through May 2020. The treasury rates decline from January through April with the interbank overnight rate, and then increase with the interbank rate's slight rise in May. The May increases in government treasury rates are larger than for the overnight rates, suggesting further anticipated rate increases from PBoC. Consistent with Wu, the PRC's treasury rates did not move in a way inconsistent with the PBoC's average target rate for the interbank overnight rate.

Returning to the "monetization" debate in the PRC, the analysis here suggests flaws in the arguments both for and against "monetization." It is not "direct printing of money"—it is an exchange of an interest-earning government liability for an interest-earning central bank liability. While the size of a deficit could surely be too large with respect to a given inflation target, whose interest-earning liability accompanies it is not a difference of macroeconomic significance, much less the knife-edge point between price stability and hyperinflation. On the other hand, PBoC indirectly supports the Government of the PRC's bond market already. "Crowding out" does not apply here—from the simple accounting in Table 1, a government deficit adds private saving rather than withdrawing it, while a bond market backstopped by PBoC even indirectly means interest rates on government debt are driven by monetary policy strategy, not savers and borrowers of "loanable funds."

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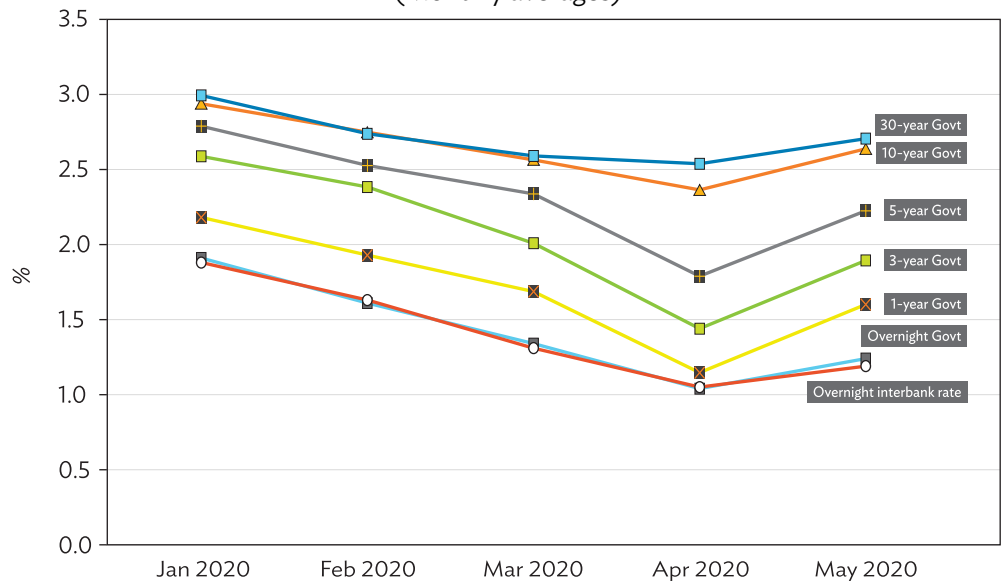
[17] For sure, there are periods for which changes in the government's account may not require sterilization. In its open market operations announcement for 29 June 2020, PBoC explained, "due to growing fiscal expenditure at the end of the month, the liquidity is adequate at a reasonable level in the current banking system. The PBoC decides not to conduct reverse repo operations on June 29, 2020" (People's Bank of China 2020). In other words, the net reduction in the government's account on that day, or for a series of days, was already consistent with accommodating bank's D_{RB} within PBoC's interest rate target range and, at least for the time being, did not require sterilization.

Figure 6: Interest Rates for Interbank Overnight Lending and Government Bonds ("Govt"), January 2020–May 2020
(Monthly averages)



Source: People's Bank of China.

VI. THE FEDERAL RESERVE AND THE CARES ACT

A portion of the United States' (US) CARES Act, which authorized $2.2 trillion for direct income support, loan guarantees, and loans, deserves special mention and discussion here for its relation to some of the Fed's new standing facilities set up as special purpose vehicles (SPVs). The Fed lends to the SPVs, and in turn they lend to or purchase debt in the secondary market of businesses and state or local governments.[18] The CARES Act authorizes $454 billion in US Treasury (Tsy) equity positions in the SPVs, which essentially allows up to $454 billion of the SPVs' loans and asset purchases to default or cancel. When default reduces equity of the SPVs, losses to the Tsy's equity positions then shields the Fed's equity. Yet the operational design of these transactions effectively creates "monetization" of the losses, rather than the losses being funded by the Tsy.

The financial positions of the SPVs as of 30 June 2020 are in Table 6. Except for the Main Street Lending Program (MSLP, which had yet to make any loans), the other four SPVs had balances in accounts at the Federal Reserve Bank of New York ("FNY") and received loans from the Fed equal to or roughly equal to the loans each made. The Fed invests the Tsy's equity positions on behalf of the SPVs in nonmarketable Tsy debt. For all but MSLP, the SPVs have 85% of the Tsy equity positions in Tsy debt and hold the remaining 15% in balances at FNY. The entirety of MSLP's Tsy equity position is in Tsy debt. As the nonmarketable Tsy debt accrues interest, the Fed invests it for the SPVs in more of

[18] The Fed's weekly report on its balance sheet refers to these as its limited liability companies, whereas its quarterly report for the second quarter of 2020 refers to them as variable interest entities. The text here uses SPV.

the same nonmarketable Tsy debt. This interest, together with fees and interest on loans made by SPVs, adds to profits for the SPVs (retained earnings); these are the Fed's profits upon consolidation.

Table 6: Financial Positions of the Federal Reserve's Special Purpose Vehicles, 30 June 2020
($ million)

Commercial Paper Funding Facility II		Corporate Credit Facility		Main Street Lending Program		Municipal Liquidity Facility		Term Asset-Backed Loan Facility	
A	L/E	A	L/E	A	L/E	A	L/E	A	L/E
FNY 1,500	Fed loan 4,242	FNY 5,625	Fed loan 9,445			FNY 2,625	Fed loan 1,200	FNY 1,500	Fed loan 253
Tsy debt 8,501	Tsy equity 10,000	Tsy debt 31,879	Tsy equity 37,500	Tsy debt 37,502	Tsy equity 37,500	Tsy debt 14,877	Tsy equity 17,500	Tsy debt 8,501	Tsy equity 10,000
Loans 4,252	RE 18	Loans 10,007	RE 136		RE (-10)	Loans 1,200	RE 3	Loans 252	RE (-1)
Other 7		Other (-430)		Other (-12)		Other 1		Other (-1)	
Total 14,260	Total 14,260	Total 47,081	Total 47,081	Total 37,490	Total 37,490	Total 18,703	Total 18,703	Total 10,252	Total 10,252

A = assets, FNY = Federal Reserve Bank of New York, L/E = liabilities and equity, RE = retained earnings, Tsy = Treasury.

Source: Board of Governors of the Federal Reserve System (2020), 18-19.

Table 7 illustrates how the SPVs acquire the Tsy's equity positions and then provide credit to the private sector. In transaction (1), the Tsy takes an equity position that the SPV holds in nonmarketable Tsy debt (85%) and as balances at the Fed (15%). For the Fed, the SPV's deposit is a liability and also credited to its "other assets" account (as note 22 explains). For the Tsy, the equity position in the SPV is an asset, the nonmarketable debt is a liability, and the difference between the two (15% of the equity position) is an increase in net worth. Transaction (2) rewrites (1) by consolidating the Fed and SPV balance sheets. While the SPV's assets remain the Fed's assets and the Tsy's equity position is a Fed liability, consolidation eliminates the SPV's deposit at the Fed. In transaction (3), the SPV makes loans to corporations, which transmit through RB credits to corporations' banks, who in turn credit the corporations' deposit accounts. The Tsy's equity position in the SPV enables the SPV to secure credit from the Fed, which is how the SPV funds its lending to corporations. Consolidating (3) in transaction (4) for the Fed and its SPV eliminates the Fed's loans to the SPV. Table 8 presents totals through transaction (4) in Table 7, with the Fed and its SPV consolidated as they appear on the Fed's weekly report with the investment in Tsy debt and SPV loan combined as a single entry and the 15% credited in its "other assets," while the Tsy's equity position appears as a Fed liability separate from the Tsy's account at the Fed.

Table 7: Federal Reserve Support for Financial Markets via Its Special Purpose Vehicles

	US Government		Federal Reserve		Fed's SPV		Banks		Corporations	
	A	L/E	A	L/E	A	L/E	A	L/E	A	L/E
(1) Tsy equity position in SPV; SPV invests 85% in Tsy debt and holds 15% at Fed	Equity in SPV (+)	85% Tsy debt (+) 15% Net Worth (+)	15% Other Assets (+)	15% SPV's Acct (+)	85% Tsy debt (+) 15% Fed Acct (+)	Tsy equity (+)				
(2) *Rewrite (1) with Fed and SPV consolidated*	*Equity in SPV (+)*	*85% Tsy debt (+)* *15% Net Worth (+)*	*85% Tsy debt (+)* *15% Other Assets (+)*	*Tsy equity in SPV (+)*						
(3) Fed loan to SPV; SPV loan to corporations			Loan to SPV (+)	RBs (+)	Loan to Corps (+)	Loan from Fed (+)	RBs (+)	Dep (+)	Dep (+)	Loan from SPV (+)
(4) *Rewrite with Fed and SPV consolidated*			*SPV Loan to Corps (+)*	*RBs (+)*			*RBs (+)*	*Dep (+)*	*Dep (+)*	*Loan from SPV (+)*

A = assets, Corps = corporations, Dep = deposits, Fed = Federal Reserve, L/E = liabilities and equity, Net Worth = assets minus liabilities, RB = reserve balance, SPV = special purpose vehicle, Tsy = Treasury, US = United States.

Source: Authors based on the Board of Governors of the Federal Reserve System (2020).

Table 8: Totals for Table 7 with Federal Reserve and Special Purpose Vehicle Consolidation

US Government		Federal Reserve		Banks		Corporations	
A	L/E	A	L/E	A	L/E	A	L/E
Equity in SPV (+)	85% Tsy debt (+) 15% Net Worth (+)	SPV Loan to Corps and 85% Tsy debt (+) 15% Other Assets (+)	RBs (+) Tsy equity in SPV (+)	RBs (+)	Dep (+)	Dep (+)	Loan from SPV (+)

A = assets, Corps = corporations, Dep = deposits, L/E = liabilities and equity, Net Worth = assets minus liabilities, RB = reserve balance, SPV = special purpose vehicle, Tsy = Treasury, US = United States.

Source: Authors based on the Board of Governors of the Federal Reserve System (2020).

Table 9 continues from Tables 7 and 8 with transactions' (5) and (6) depicting of corporations defaulting on loans from the SPVs. In transaction (5), the default debits the loans (for the SPV *and* the borrowers), which is then a debit to the Tsy's equity position in the SPV and a reduction in the Tsy's own net worth. (Note that the borrowers' net worth increases, here assuming there is no further recourse for simplicity.) Recall that the Fed still holds via the SPV the nonmarketable Tsy debt and the credit to its "other assets" funded by the Tsy's original equity investment, which confirms that the entire loss is borne by the Tsy, while the Fed assumes none of it.

Table 9: Loan Defaults and the Federal Reserve's Special Purpose Vehicles

	US Government		Federal Reserve		Fed's SPV		Banks		Corporations	
	A	L/E	A	L/E	A	L/E	A	L/E	A	L/E
(5) Corporate loan default	Equity in SPV (-)	Net Worth (-)			Loan to Corps (-)	Tsy Equity (-)				Loan to Corps (-) Net Worth (+)
(6) *Rewrite (5) with Fed's SPV consolidated with Fed*	*Equity in SPV (-)*	*Net Worth (-)*	*Loan to Corps (-)*	*Tsy Equity in SPV (-)*						*Loan to Corps (-)* *Net Worth (-)*

A = assets, Corps = corporations, Fed = Federal Reserve, L/E = liabilities and equity, Net Worth = assets minus liabilities, SPV = special purpose vehicle, Tsy = Treasury, US = United States.

Source: Authors based on the Board of Governors of the Federal Reserve System (2020).

Two things are of particular interest from this discussion. First, operationally there are obviously multiple ways for the Fed and/or Tsy to provide the financial support intended. In terms of budgetary impact, however, they are *identical* from the Tsy's perspective. For instance, consider the following alternatives:

(i) The Tsy takes equity positions in the Fed's lending facilities; the facilities lend via RB creation.
(ii) The Tsy issues its own debt, makes the loans itself (from Table 1 and Figure 2 earlier in this paper, this results in no net change to RBs), and takes all losses itself.
(iii) The Fed makes the loans via RB creation and takes all losses itself.

The existing framework with the Fed's SPVs is in (i). Losses occurring in option (ii) are essentially identical to (i) from the Tsy's perspective—the Tsy loses the principal and interest payments from the loan and is left servicing either the Fed's IOR in (i) or its own liabilities issued to fund the loans in (ii). Option (iii) is also identical to (i) since the loss to the Fed's equity is the forgone principal along with the IOR payments on RBs created by the original loan, all of which reduce the Fed's remittances to the Tsy in kind as if the Tsy had issued and then serviced debt equal to the size of

the defaulted loans. In all three cases, ultimately the Tsy ends up paying the interest or indirectly paying the IOR on any defaults among the SPVs' loans and asset purchases. In other words, what the Tsy's equity positions in the SPVs accomplish is political, not financial. Losses incurred by SPVs are sheltered from affecting the Fed's equity and therefore also from affecting remittances, *notwithstanding* the fact that the loans create RBs that earn IOR that *are not* sheltered and *will* reduce remittances when loans default *as if* the Tsy had issued interest-bearing debt itself.

Second, perhaps nearly forgotten in all the details above is how they matter, if at all, in regard to the Fed's financial support of the Tsy. Consider, a fourth option to those above:

(iv) The Fed directly credits the Tsy's account; the Tsy lends via debit to its own account and credit to banks' RBs, and the Tsy also takes all losses.

Again, this is identical to the previous three options from the Tsy's perspective in terms of budgetary effects. What appears different is that in (iv) the Fed obviously directly finances the Tsy's lending. Yet while this may appear dissimilar to the current setup in (i), it is not. Note from transaction (1) (and thus, [2] as well) in Table 7 that the Fed *is* simply crediting the Tsy's equity investment to the SPV; this *is* the Fed directly financing the Tsy. If instead these funds were from the Tsy's main account at the Fed, rather than simply created by the Fed, it would make no sense to invest them in nonmarketable Tsy debt. If in fact the Tsy funded its own equity positions, it would have issued bonds to credit its account at the Fed prior to the Fed investing the funds on its behalf in the SPVs. However, when the Fed subsequently *also* invests the funds in nonmarketable Tsy debt, it would result in *twice* the increase in national debt from raising the same funds—first from issuing marketable debt to credit the Tsy's account at the Fed, and then again to invest in nonmarketable debt for the SPV. But an entity that issues debt to raise funds, then invests the funds in its own debt is *buying* and thereby *reducing* its own outstanding debt, *not* doubling it. Therefore, there is no debt issuance by the Tsy to prefund its equity positions in the SPVs, nor to fund any losses SPVs might incur, precisely because it is not necessary and would double count the SPVs' investments in nonmarketable Tsy debt.

As above for (i) through (iv), regardless of how the loans were funded or by whom, the ultimate impact to the Tsy of defaults on SPV loans is the cost of debt service on its own liabilities or on the Fed's RBs (via reduced remittances) left outstanding as a result of the defaults. The Tsy's equity positions in the SPVs are simply accounting entries created by the Fed, directly invested into newly created nonmarketable Tsy debt (mostly, with a smaller entry under the Fed's "other assets"). None of these balances actually circulate beyond the Fed and the Tsy's intragovernmental accounting, and thus none of them are of *financial* consequence beyond these internal accounts. The Fed's SPV's lend via creation of new RBs, not through any funds the Tsy has raised, which the Fed clearly states in its weekly report—the Fed's loans to the SPVs are *secured* by the Tsy's equity positions, not funded by them. The purpose of the SPV's and the Tsy's equity positions is political, not financial. The allocated $454 billion in the CARES Act is for the *politics* of the Tsy taking the losses rather than the Fed doing so, since the Tsy takes any such losses *financially* in any event, indirectly via reduced remittances, under current law.[19]

[19] Tankus (2020) is one of the first, if not the first, to correctly describe the $454 billion in the CARES Act authorized as Tsy equity positions in the Fed's SPVs as an "accounting gimmick."

VII. CONCLUSIONS

The core argument of this paper is that "monetization" does not occur in the way most learn it, economists and lay people alike. "Direct printing of money" as commonly understood is not operationally possible. In a corridor interest rate targeting system, the CB's purchases of government debt are sterilized by an offsetting reduction in the CB's assets or an increase in its own interest-bearing liabilities. In a floor system, the sterilization is via interest on RBs. It is not operationally possible for "monetization" to be the macroeconomic equivalent of adding "jet fuel" to a government's deficits. This means that it is not worth fearing, but it also means that it is not a solution in itself for an economy that is growing too slowly.

The recent examples from Singapore and the US illustrate this: "monetization" already happens, quite regularly, and rarely does anyone notice or care, since, again, it is merely a swap of interest-bearing government liabilities for CB interest-bearing liabilities. Beyond the examples in this paper, obviously, the experiences of the ECB, the Federal Reserve, and Japan in the 2000s and 2010s demonstrate that "printing money" to create inflation is not as easy as undergraduate economics textbooks claim. But old theories die hard even when they are inapplicable, and the fearmongers (again, economists and noneconomists alike) appear without exception even now whenever CB "monetization" of government debt appears to have a likelihood greater than zero, much less announced as policy.

This paper's caveat regarding the noneffects of "monetization" is that CBs can set the yield curve on domestic currency government debt. In countries with very liquid bond markets, they are already doing this and have been doing so for decades, indirectly "monetizing" government debt as a counterparty and/or backstop to primary dealers in order to enable competitive, liquid markets in which the cost of funds for the marginal trader is roughly the anticipated path of the CB's target rate. While "monetization" does not have a *quantitative* effect beyond a deficit itself, it can have an interest rate effect if the CB chooses to bring down the interest rates on government debt below such levels or provides market liquidity when government debt markets are short of it.

The above notwithstanding, perceptions and understandings are evolving, if slowly. In September 2020, as the Philippines legislated a temporary increase in BSP lending to BTr, and as Indonesia rewrote laws to both allow Bank Indonesia to directly purchase government debt in the primary market and then also to increase the influence of the Finance Ministry in monetary policy strategy, Standard & Poors' response was, "We have not seen signs that increased government bond purchases have damaged central bank credibility in India, Indonesia, and the Philippines. Inflation and interest rates have not picked up in these economies, and exchange rate changes have been modest so far" (quoted in Noble [2020]). There are obvious continuing concerns for nations that are not able to withstand or otherwise avoid negative macroeconomic impacts of significant exchange rate depreciations, but it is well past time for recognizing that exchange rates are much more complex than anyone's theory of them.

Of course, potential issues remain, chief among them being what to make of CB independence in the current context. While largely beyond the scope of this paper, it is worth recalling that for the past 12 years economists of many different persuasions have increasingly pushed for an increased role for fiscal policy. At some point, this should bring a rethink of the standard approach to "fiscal rules" that international institutions like the International Monetary Fund promote, to instead embed an inherently necessary, active fiscal policy in a macroeconomic policy framework that is also consistent

with inflation targeting. Furthermore, because interest rates on domestic currency government debt are at worst indirect CB policy variables *always* where government bond markets are liquid, it is incoherent to consider that there is an on–off switch in which "markets" impose "discipline" and CB's usurp it.

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How "Monetization" Really Works—Examples from Nations' Policy Responses to COVID-19

The coronavirus disease (COVID-19) has forced governments to provide stimulus packages amid falling tax revenues, prompting debate on "monetization" of government debt. Drawing on selected country experiences, this paper shows through actual central bank operations and accounting that "monetization," commonly equated with "printing money," is operationally impossible and that inflationary concerns are misplaced.

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