

# Discussion of “Balance sheet policy above the effective lower bound”

By Jordi Galí<sup>1</sup>

## 1 Introduction

This paper's contribution to the 2023 ECB Forum couldn't be more timely: central banks in advanced economies have started to shrink their balance sheets, after a large expansion in their size associated with the asset purchasing programs enacted when the effective lower bound (ELB) became binding. In that context, a natural question arises: how much quantitative tightening (QT) is desirable? Or more specifically: what is the optimal quantity of reserves, given the size of autonomous factors?

This is the question Annette Vissing-Jorgensen (henceforth, AVJ) sets out to answer in the present paper. In doing so she adopts a particular perspective, namely, that of the optimal supply of extremely safe, highly liquid assets. These assets are referred to in the literature as “convenient” assets, bank reserves being an example. What makes some assets “convenient” is that their holders attach a value on them beyond their pecuniary payoffs, a “convenience value”. As a result, they are generally willing to hold them even if their yield is lower than (non-convenient) assets of similar maturity.

My discussion has two parts. In the first part I will briefly review AVJ's framework using an alternative diagrammatic device which I find somewhat more transparent. In the second part I will put forward a number of implications of that framework for ECB policy which are not pursued in AVJ's paper.

## 2 Convenient Assets and Optimal Reserve Policy

A key ingredient in AVJ's framework is the notion that banks derive some “convenience value”  $v_R(R)$  from their reserve holdings, resulting from their usefulness as a highly liquid riskless asset.  $v_R(R)$  is assumed to be increasing and concave. At the same time banks may face a cost of holding reserves, possibly related to capital requirements. Let  $\varphi$  denote that cost, per unit of reserves held. Then the demand for reserves will be determined by the following equation:

$$r - IOR = v'_R(R) - \varphi$$

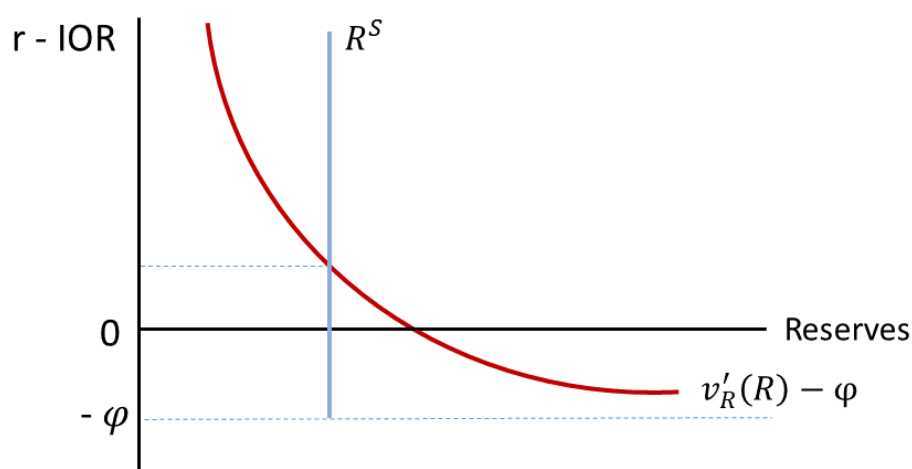
where  $r$  is the yield on alternative, non convenient short-term money market assets (e.g., interbank loans), and  $IOR$  is the interest rate on reserves. Thus, a bank will

---

<sup>1</sup> CREI, Universitat Pompeu Fabra and BSE.

increase its holdings of reserves up to the point where their marginal convenience value (net of holding cost) exactly compensates for the interest rate differential  $r - IOR$ . The latter can thus be interpreted as a measure of the convenience yield of reserves. Figure 1 displays in red the inverse relationship between  $r - IOR$  and the quantity of reserves demanded,  $R$ . That schedule, combined with a supply of reserves (represented by the vertical blue line), determines the equilibrium convenience yield  $r - IOR$ .

**Chart 1**  
The market for reserves



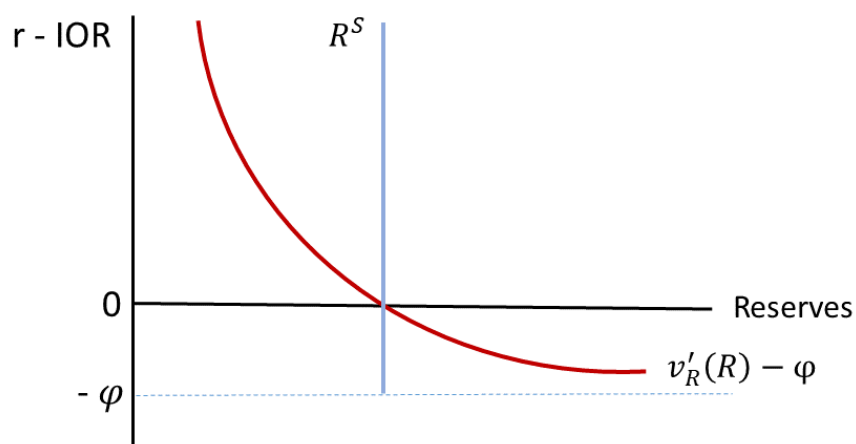
AVJ assumes that the central bank's monetary policy stance is summarized by the money market rate  $r$ , whose current and anticipated values will have an influence on the whole spectrum of market interest rates. We can thus think of  $r$  as the policy rate, chosen by the central bank according to some policy rule. In an economy where reserves do not yield any interest (as it was the case in the U.S. before 2008), we have  $IOR = 0$ , and so a one-to-one mapping emerges between the quantity of reserves  $R$  and the money market rate,  $r$ . In that environment, there is no reserve policy independent from monetary policy, for there is only one level of reserves consistent with a given monetary policy stance  $r$ . This is not the case if the central bank sets an interest rate on the reserves deposited by banks. As the reserve demand equation above implies, in that case there is a continuum of configurations  $(IOR, R)$  that are consistent with a given value for  $r$ . Accordingly, the central bank must develop a criterion to choose one among all those possible configurations, i.e. it must have a reserve policy.

How should the central bank determine its optimal quantity of reserves? AVJ's analysis considers two cases, which I will cover in turn. In the first case the central bank adjusts the quantity of its reserves through changes in its holdings of assets that do not have a convenience value. This would include, e.g., the central bank's short-term loans to banks. In that case, AVJ shows how the optimal policy consists in flooding banks with reserves up to the point where their convenience yield (net of holding costs) is exactly zero, while setting  $IOR$  to match the desired money market

rate  $r$ . This case is represented in Figure 2. Given an estimated demand for reserves (as found in AVJ's paper) one can in principle compute the implied optimal quantity of reserves at any point in time.

### Chart 2

Optimal reserve supply with inconvenient assets



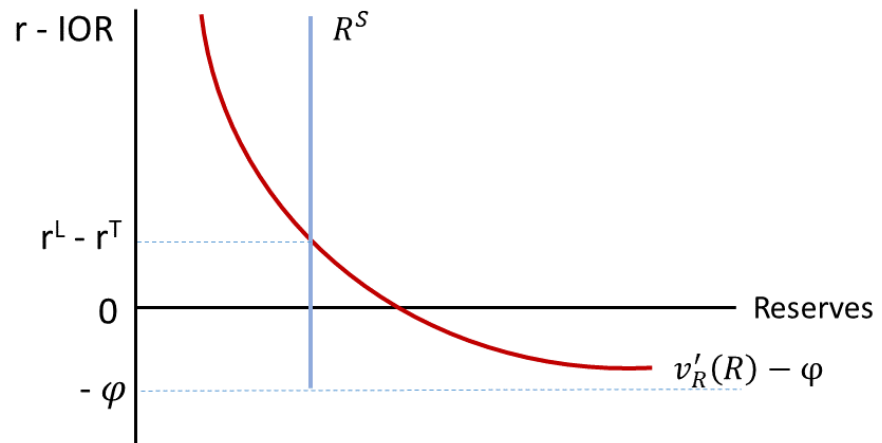
The previous framework provides a reasonable description of the environment facing the ECB before its asset purchase program was initiated in 2015. Since 2015, however, changes in reserves have been determined at the margin by the size of the ECB's asset purchases. Some of those assets have themselves a convenience value  $v_B(B^p)$  to their private holders, in which case their private sector demand must satisfy the condition

$$r^L - r^T = v'_B(B^p)$$

where  $r^T$  denotes the yield on the convenient assets purchased by the central bank ("Treasuries", for short), and  $r^L$  is the corresponding yield of non-convenient assets of similar maturity. When determining the optimal quantity of reserves, the central bank should take into account that any increase in that variable through the purchase of Treasuries will reduce the quantity of the latter available to private investors. This is the second case analysed by AVJ in her paper. She shows that in that context the optimal policy will seek to equate the marginal convenience value of reserves (net of holding costs),  $v'_R(R) - \varphi$ , with that of Treasuries,  $v'_B(B^p)$ . Equivalently, the central bank will choose the level of reserves so that the condition  $r - IOR = r^L - r^T$  is satisfied. That outcome is depicted in Figure 3. For any given monetary policy stance represented by  $r$ , the resulting differential  $r - IOR$  will pin down the corresponding interest rate on reserves,  $IOR$ .

**Chart 3**

Optimal reserve supply with convenient assets



AVJ uses the estimated demand schedules for reserves and Treasuries in the U.S. and the euro area to determine the optimal quantity of reserves. Her analysis concludes that current reserves are well above the optimal level in both economies. This is reflected in the convenience yield for Treasuries,  $r^L - r^T$ , being above that for reserves,  $r - IOR$ . Based on this analysis the QT policy currently underway in the U.S. and the euro area has still a long way to go before the size of the Fed and ECB's balance sheets approaches its optimal value.

### 3 Some Implications and Insights Pertaining to ECB Policy

Next, I discuss some implications and insights of AVJ's analysis that bear on ECB policy.

#### 3.1 A Policy Paradox

As discussed above, the prescriptions for reserve policy that emerge from AVJ's framework are conditional on the type of assets (convenient or non-convenient) that are the counterpart to any adjustment in reserves. If the counterpart are non-convenient assets, as it was the case for the ECB before January 2015, it is optimal to flood the market with reserves up to the point where the money market rate equals the interest rate on reserves. Was this implication of optimal policy met before 2015? The answer is positive only since the start of the financial crisis at the end of 2008, but not before that time. More specifically, the money market rate (e.g., the EONIA) hovered around the interest rate on main refinancing operations (MRO) between January 1999 and the start of the financial crisis, implying a market rate about 100bp above the Deposit Facility Rate. This suggests that the ECB undersupplied reserves during that period.

On the other hand, if the counterpart to reserve adjustments are changes in convenient assets it is optimal to limit the growth of reserves (and thus of convenient assets in the central bank's balance sheet) in order to guarantee that the convenience yield is equated across the two assets (reserves and Treasuries). Since January 2015, the ECB has adjusted reserves using government debt issued by euro area countries as a counterpart (for the most part). Furthermore, and as argued by AVJ, a significant fraction of that debt undoubtedly qualifies as convenient assets, so the previous regime would apply. However, as shown in AVJ's paper, during this period and up to the present day, measures of the convenience yield for securities like German government debt have been positive and relatively large at different maturities, and have thus remained above measures of the convenience yield for reserves, whose average value has been slightly negative. On that basis AVJ's analysis concludes that the ECB has oversupplied reserves during this period. This would justify the current plan to shrink the balance sheet.

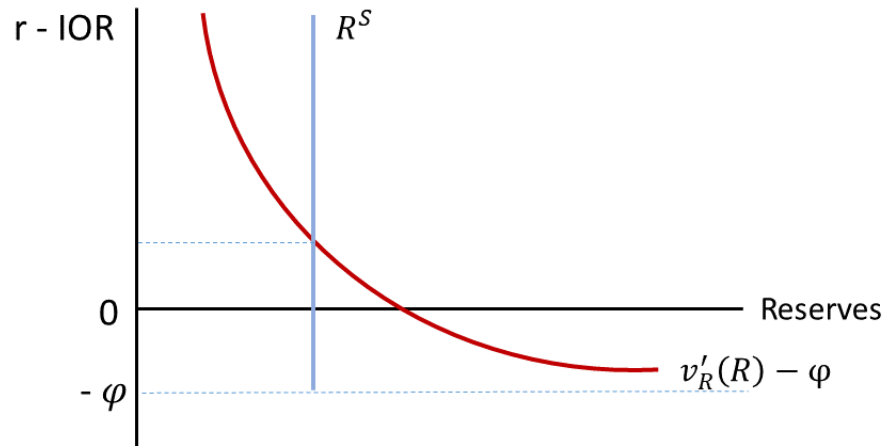
Why has the ECB deviated from the optimal reserve policy during much of its existence? Deviations from optimal policy since 2015 (and up to the recent policy rate increases) seem to have a straightforward explanation: the ECB's reserve policy during this period has been dominated by its desire to bring down long term rates, given the binding ELB, in order to stimulate the economy and bring inflation closer to the 2% target. This motive has clearly offset any other consideration, including the maximization of the economy's aggregate convenience value, which is the focus of AVJ's analysis. Less obvious, however, are the reasons for deviating from the optimal policy during the first decade of ECB policy.

## 3.2 The Corridor vs. Floor Debate

The ECB is currently debating what operational framework to adopt for the implementation of its monetary policy decisions (see, e.g., Schnabel (2023)). AVJ's analysis has some bearing on that debate. Figure 4 depicts the equilibrium in the market for reserves under a so called corridor system. Under that system the central bank steers the market rate to its target value by fine-tuning the supply of reserves in the face of shifts in the demand for reserves, while keeping the interest rate on reserves unchanged in the short term. Figure 5 represents the corresponding equilibrium under a floor system, with the central bank flooding the market with reserves beyond the point at which the demand for reserves becomes perfectly elastic.

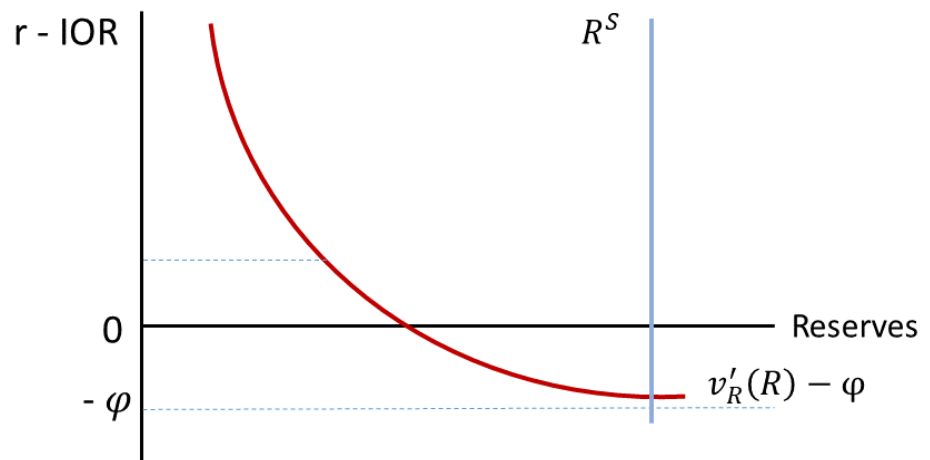
**Chart 1**

Reserve supply: The Corridor System



**Chart 5**

Reserve supply: The Floor System

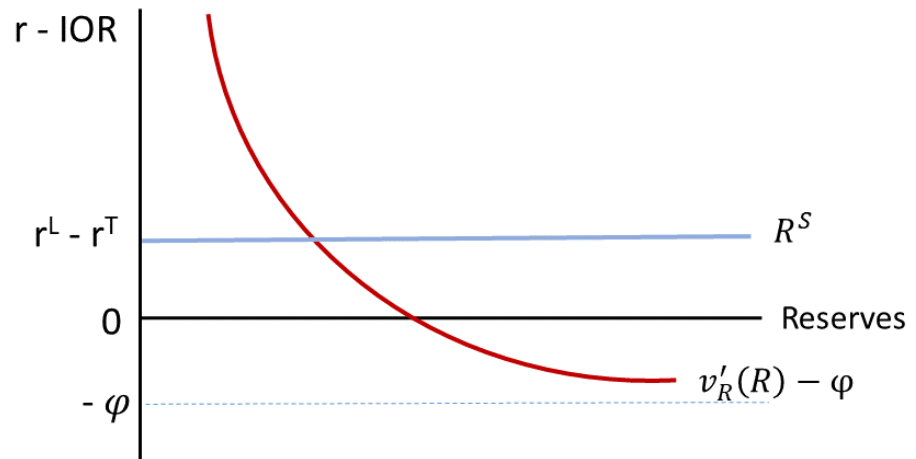


A look at Figure 5 makes clear that the floor system cannot be consistent with convenience maximization (at least in the presence of a non-negligible reserve holding cost) since that would require either a zero convenience yield (in the case of non-convenient assets as counterpart) or a strictly positive one (if reserves are adjusted through purchases or sales of Treasuries, and assuming a positive convenience yield in the latter, as observed). On the other hand, the corridor system can be made consistent with the optimal reserve policy for any positive convenience yield for Treasuries, and as long as the interest rate on reserves is kept below the target money market rate.

Of course, the corridor system has shortcomings of its own, including the potentially large volatility of market rates in the face of unexpected shifts in the demand for

reserves. A possible solution to this is the adoption of a "demand-driven floor system," as represented in Figure 6. Under that system the central bank can commit to supplying reserves perfectly elastically at the target market rate, while setting an interest rate on reserves so that the convenience yield on reserves and Treasuries are effectively equalized at each point in time.<sup>2</sup>

**Chart 6**  
Reserve supply: Demand-driven Corridor System



### 3.3 Optimal Portfolio Management

A distinctive feature of ECB bond holdings is its heterogeneity, in terms of risk, maturity, liquidity, issuing country, etc. AVJ's analysis has some bearing on how the ECB should allocate its portfolio: it should seek to equalize convenience yields across securities. In particular, for any given maturity, the ECB should equalize risk-adjusted yields. In order to attain that objective, it should sell bonds with the lowest risk-adjusted yields (and hence with the highest implicit convenience yields) and buy bonds with highest risk-adjusted yields (and low convenience yields). That policy would tend to equalize convenience yields thus maximizing the economy's aggregate convenience value.

It is important to stress that this policy is potentially very different from one that seeks to "close spreads" across jurisdictions: In the presence of risk differentials such a policy would effectively entrench persistent differences in convenience yields.

<sup>2</sup> As noted by Schnabel (2023) that system resembles the one in place at the Bank of England. The latter, however, sets the interest rate on reserves (the "Bank rate") to match the target market rate, which is consistent with optimal policy only if non-convenient assets are used as a counterpart to reserves.

Needless to say, the implied shares of different jurisdictions in the resulting portfolio may be very different from the corresponding shares in ECB's capital, and hence may not fulfil the legal constraints currently in place.

### 3.4 Optimal Implementation of Quantitative Tightening

The ECB is expected to shrink its balance sheet over the next few years. That will require selling a significant fraction of its bond portfolio. What criterion should the ECB adopt to determine which securities to sell and which to keep? Once again, AVJ's analysis provides a guideline for the implementation of QT, under the assumption that the starting convenience yield of Treasuries is higher than that of reserves, i.e.,  $r - IOR < r^L - r^T$  for all securities. In that case the ECB should sell the bonds with the highest convenience yield (i.e., those with the lowest risk-adjusted yield) in its portfolio and keep doing so up to the point where  $r - IOR = r^L - r^T$  for all securities held.

## 4 Concluding Remarks

AVJ's paper is a significant contribution to the literature on monetary policy implementation. The paper is also very timely and policy relevant, given its bearing on the desirable extent of the QT policies currently underway in many economies. The paper focuses on one dimension of a central bank's reserve policy, namely, the desire to maximize the convenience value of available assets in the economy. In the real world, the convenience maximizing motive may be overshadowed by other considerations. AVJ's paper is a reminder that convenience factors should not be ignored.

## References

Schnabel, I. (2023), "Back to Normal? Balance Sheet Size and Interest Rate Control," speech delivered at Columbia University and SGH Macro Advisors.