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Options for an Additional LSAP Program[1]

Introduction

This memo reviews options for an additional Large-Scale Asset Purchase (LSAP) program should the Committee wish to ease financial conditions further. All options discussed in this note assume that such a program would replace the maturity extension program (MEP) and that the FOMC would direct the Desk to resume the reinvestment of maturing Treasury proceeds. We present four options, each of which involves an LSAP program that would allocate 60 percent of purchases to Treasury securities and 40 percent to agency mortgage-backed securities (MBS).[2] This allocation is roughly similar to the ratio of estimated purchasable capacity for the two security types described in the memo entitled "Market Functioning and Limits on Asset Purchases" provided to the Committee ahead of its last meeting. The first option considers $1 trillion in purchases over approximately 13 months and an initial increase in the target federal funds rate in June 2015. The second option is the same but with an earlier liftoff date of December 2014.[3] The third option reduces the program size to $750 billion over about 10 months. The fourth option implies a notably larger program of $2 trillion and serves as a proxy for a longer, flow-based program in a scenario in which the economy proves to be weaker than currently projected.

The analysis below suggests that these LSAPs would boost aggregate demand and hasten progress toward the FOMC's objectives. These programs would also lead to a significant increase in the size of the Federal Reserve's balance sheet and a higher level of reserves at liftoff. Federal Reserve income would be boosted in the near term as a result of the larger portfolio, but income would fall once exit starts due to higher interest expense on reserve balances and larger capital losses as MBS are sold. Cumulative remittances to the Treasury through 2020 would be roughly equal in all four scenarios and modestly lower than those from the July Tealbook Alternative B projection. Under the $2 trillion scenario, however, the balance sheet takes much longer to normalize, and when measured through 2025, cumulative remittances are somewhat lower than for the other scenarios. Because remittances are very close to zero for a few years in options 1 and 2, a small deferred asset may be created. A substantially larger deferred asset is projected under the $2 trillion program, and it is projected to last for a number of years. The baseline interest rate path is subject to uncertainty; to illustrate this point, we present results for two of the options under a higher interest rate scenario.

The next section discusses the allocation of purchases between Treasury securities and MBS. Then, we detail the four options considered in this memo and discuss the financial market and macroeconomic effects. We then review the balance sheet and income projections associated with these options, and close with a summary.

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[2] Other allocations that ranged from as little as 25 percent in MBS to as much as 60 percent in MBS were also considered, but did not lead to materially different financial market or macroeconomic effects. These scenario results are reviewed in the Appendix.

[3] This is the same liftoff date as that embedded in the July Tealbook Alternative B projection.

Asset Allocation Choice

Should the Committee opt to implement a new LSAP program, it would need to decide on the allocation between Treasury securities and MBS and the distribution of maturities of Treasury securities purchased. Several factors would presumably bear on this decision, including the expected macroeconomic effects, the expected effects on the evolution of the Federal Reserve's balance sheet and income, the Committee's preferences about the composition of the balance sheet, and considerations about market functioning in the two markets. Any model simulations will rely on assumptions, and those assumptions are subject to debate. For clarity, we lay out the assumptions in the simulations so that the effects of different beliefs or assumptions can be understood. The staff models the macroeconomic effect of LSAPs in a number of steps.[4] First, we model the effects of LSAPs on a set of market interest rates. To quantify the interest rate effects, we use Li and Wei's (2012) term premium model, which provides an estimate of the impact of an LSAP on the 10-year Treasury yield.[5] That model assumes that purchases of Treasury securities can be summarized by the amount of duration risk that is removed from private hands, and therefore specifies the "Treasury supply factor" in terms of ten-year equivalents. For MBS purchases, the model considers the par amount purchased and the average duration of MBS separately, in part because the duration of MBS changes noticeably with different levels of interest rates due to the embedded prepayment risks. The estimates from this model suggest that purchases of MBS have about three-quarters of the impact on the ten-year Treasury term premium than would purchases of Treasury securities that have an average duration of nine years.[6] Later in this memo, we discuss several caveats in interpreting these estimates.

We assume for simplicity that the changes in Treasury and MBS rates spillover to other financial markets according to standard assumptions built into FRB/US. In particular, declines in the ten-year Treasury yield are assumed to pass through directly to a lower primary mortgage rate. The current coupon on MBS declines by a similar amount. Changes in the ten-year Treasury yield are also assumed to be passed through to corporate bond rates on a roughly one-for-one basis.[7]

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[4] A more complete explanation of the model was previously presented in "Possible MBS Large-Scale Asset Purchase Program," memo by Staff of the Federal Reserve Bank of New York and the Board of Governors, January 18, 2012.

[5] The staff model relies on "Term Structure Modeling with Supply Factors and the Federal Reserve's Large Scale Asset Purchase Programs" by Canlin Li and Min Wei, Finance and Economics Discussion Series paper 2012-37, Federal Reserve Board, July 2012. The effect of LSAPs implied by this model are fairly representative of those found in other studies: For example, D'Amico, English, Lopez-Salido, and Nelson (2011) report effects from LSAP2 on Treasury yields that are somewhat larger than implied by the model of Li and Wei (2012), while Swanson (2011) finds effects that are somewhat smaller.

[6] The LSAP options considered in this memo are assumed to have an average duration of nine years, which matches the net effect of the purchases and sales conducted under the maturity extension program.

[7] The pass-through of Treasury rates to investment-grade corporate bond rates could be greater than 100 percent if the operation eases the pricing of default risk (as in the case in FRB/US). This easing may occur due to a reduction in market participants' expectation of future defaults, perceived default tail risk, and/or risk aversion, and is especially likely to occur if the operation is surprisingly large in magnitude or scope relative to market participants' perception of the headwinds to economic growth. Conversely, in practice the pass-through could be less than 100 percent (and even less than 0) if market participants perceive that the operation is being undertaken because the prospects for economic growth are weaker than they had previously thought, and the operation is perceived as insufficient to offset those economic headwinds. Pass-through could also be limited if high-grade corporate bonds are not viewed as close substitutes for Treasury securities, an implicit assumption embedded in FRB/US.

In addition, the lower Treasury rate reduces the discount factor in pricing equities, boosting stock prices. The foreign exchange value of the dollar falls as well. For LSAPs that include purchases of MBS, there is an additional effect assumed, wherein for every $100 billion of MBS purchased, the spread between the MBS current coupon yield and the 10-year Treasury rate narrows about 2½ basis points and the primary mortgage rate declines by about two-thirds of this additional effect.[8,9]

Finally, the FRB/US model is used to simulate the macroeconomic effects of these changes in financial market variables.[10] Table 1 summarizes the effects of $500 billion in purchases of Treasury securities with an average duration of about nine years compared to those arising from $500 billion in purchases of MBS. The term premium effect of purchases of Treasury securities is estimated to be 21 basis points, while the MBS purchases have an effect of 16 basis points. Purchases of MBS deliver the additional effect of a narrowing of the MBS basis; as a result, the decline in the MBS current coupon rate is 29 basis points and the decline in the primary mortgage rate is 24 basis points. For the unemployment rate after two years, the Treasury purchases result in a 20 basis-point decline, compared to 16 basis points for MBS purchases. Inflation would be boosted by 13 and 10 basis points, under the Treasury and MBS purchases, respectively. As the table highlights, the differences are rather small when translated into macroeconomic outcomes. In particular, although purchasing MBS reduces mortgage rates by more than purchases of Treasury securities, the resulting economic effect is small because residential investment is currently a small portion of GDP.[11]

Several caveats apply to these assumptions and they are all subject to significant uncertainty. Also of note is that the estimated effects are not linear in the size of the LSAP program. The path of the balance sheet, which determines the term premium effect, evolves through time in response to a variety of factors, and there is endogenous monetary policy in the FRB/US model. For example, a very powerful LSAP program would push the unemployment rate to its natural rate more quickly than a weaker program. In reaction to this improvement in the economic outlook, in the model, conventional monetary policy begins to tighten endogenously relative to a scenario without the LSAPs starting in 2016, muting some of the effect of the purchases.

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[8] See "Estimates of the Effects of MBS Purchases on MBS-Treasury Spreads" by Matthew Raskin (MarketSOURCE, January 17, 2012) for more details. To estimate the path of this effect we assume the peak effect occurs in the same quarter as the peak term premium effect implied by the term structure model. In addition, we assume the effect diminishes over time by the same proportion as the term premium effect implied by the term structure model. Other work addressing this issue includes "Models Suggest MBS Rate Pass-through is Relatively High and Stable" by Kris Dawsey and Linsey Molloy (MarketSOURCE, March 1, 2012).

[9] In Hancock and Passmore's paper, they focus on the portfolio rebalancing effects of MBS LSAPs in the mortgage market. They find that the pass-through from the MBS current coupon rate to the primary mortgage rate is generally less than one for one, and moreover, their estimated effect on the MBS basis is also more uncertain and probably differs somewhat from that assumed here. Overall, however, the changes in mortgage rates they estimate for the quantities of LSAPs under discussion are of roughly the same magnitude. See Diana Hancock and Wayne Passmore, "The Federal Reserve's Portfolio and its Effects on Mortgage Markets," Finance and Economics Discussion Series working paper, June 2012.

[10] Conditional on the decline in term premiums associated with any LSAP program, alternative macroeconomic models would imply different effects on economic activity. For example, studies by Macroeconomic Advisers (2011), Fuhrer and Olivei (2011), Chen, Curdia, and Ferrero (2011), and Kiley (2012) imply less stimulus to economic activity than in FRB/US from the declines in long-term interest rates that would accompany further LSAPs, while Baumeister and Benati (2010), for example, imply a more substantial impetus to activity.

[11] The impact of home prices on consumption is discussed later in this memo.

In addition, we assume that Treasury securities with an average duration of about nine years are purchased. This assumption is consistent with the view that taking more duration risk out of the market will result in a larger interest rate effect, and so choosing a relatively long average duration is more powerful. Moreover, this average duration is very similar to the purchases conducted under the MEP, suggesting that the distribution can be used in practice. Changing the assumed duration of Treasury security purchases would alter the effects associated with purchases. Reducing the average duration could increase capacity, but doing so would damp the estimated macroeconomic effects somewhat. That said, the models essentially assume that the only direct effect of a Treasury LSAP program comes through the removal of duration risk; other mechanisms could be at play. In particular, this specification may not fully capture a portfolio-rebalancing channel of LSAPs.

We also assume that the proposed MBS purchases do not affect the average duration of MBS in private hands, and that other risks associated with privately held MBS, such as prepayment risk, do not have direct macroeconomic effects. Should these assumptions fail to hold, the true term premium effect may be larger or smaller than those reported above.[12] For example, substantial purchases of newly issued securities with higher estimated durations than existing MBS would cause the duration of privately held MBS to decline. Moreover, private investors often hedge the prepayment risks associated with MBS, while the SOMA does not. The reduced need for such hedging would, all else equal, reduce implied volatility, an effect not completely modeled in staff estimates.

Our assumption of a one-for-one pass through from the ten-year Treasury yield to mortgage rates could misstate the connection of the two rates, and indeed the spread between Treasury yields and MBS yields is now wide by historical standards. Although the models allow for purchases of MBS to narrow the spread between Treasury yields and MBS yields, it is also possible that purchases of Treasury securities could widen the spread – something our models do not assume. The effect on primary mortgage rates from changes in the ten-year Treasury yield is also uncertain, especially in the short run when capacity restrictions may prevent mortgage rates from fully adjusting. As an example, around the time of the announcement of the MEP, Treasury yields and agency MBS yields moved down in tandem, while rates on thirty-year conforming mortgages fell by somewhat less.

Another source of uncertainty concerns assumed spillover effects on corporate bond yields, equity prices, and the foreign exchange value of the dollar along with the response of real activity and inflation to these changes in financial conditions. Some other asset valuation models used by the staff, for example, would predict smaller spillovers. Moreover, the headwinds facing the economy may have reduced the sensitivity of aggregate spending to improvements in financial conditions.[13] For example, if the cost-of-capital channel is currently smaller than estimated in the model, the macroeconomic impact of an LSAP program would be smaller. In that case, while the general cost-benefit analysis of additional LSAPs might change, it is not clear that the optimal allocation of purchases across Treasury securities and MBS would change. On the other hand, the specification of the FRB/US model does not allow reductions in interest

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[12] The assumed narrowing of the MBS basis, however, might capture at least some of these possible effects.

[13] Modest evidence for such attenuation was reported in Hess Chung, Geng Li, Ralf Meisenzahl, and Jeremy Rudd, "Are the Real Effects of Monetary Policy Currently Smaller than Usual?" memorandum distributed to the Committee on April 6, 2012.

rates to boost home prices. If such a boost were substantial, it could lead to a wealth effect on consumption spending, implying that the current estimates would understate the efficacy of purchases of MBS compared to Treasury securities.

Overall, staff models do not provide a great deal of guidance as to the optimal allocation across asset classes of an LSAP program. Other considerations, therefore, may be relevant. For example, there could be a concern that large purchases of Treasury securities might be interpreted as monetizing the federal debt. In addition, an LSAP program concentrated in Treasury securities would reduce the supply of Treasury securities at a time when the demand for safe and liquid assets may be high because of factors such as regulatory reform, possibly increasing market functioning risks. On the other hand, higher MBS allocations would result in greater realized losses as those securities are sold under the current exit strategy principles and could be interpreted as allocating credit to a particular sector of the economy.

Finally, market functioning concerns across the two security types may also be relevant when considering the optimal purchase allocation. All of the LSAP options considered below assume that 60 percent of purchases are Treasury securities and 40 percent are MBS as benchmark. That allocation is roughly the ratio of estimated purchasable capacity for the two security types described in the memo entitled "Market Functioning and Limits on Asset Purchases" provided to the Committee ahead of its last meeting, so if comparisons of programs up to the maximum estimated size were desired, the allocation could be kept fixed. The allocation could be adjusted, of course, if a greater proportion of purchases in Treasury securities or MBS were desired for a total LSAP program that is smaller than the estimated maximum size. As discussed in the Appendix, staff estimates that, under a $1 trillion LSAP program, up to 75 percent of purchases could be made in Treasury securities, or 60 percent in MBS, without causing significant market disruption.

LSAP Program Options

Table 2 presents the key elements of the LSAP options considered. Under each of the options we assume that the MEP is discontinued and replaced by an LSAP program.[14] As a result, maturing principal amounts from Treasury securities begin to be reinvested again at auction, while the policy of reinvesting principal payments on agency debt and agency MBS into agency MBS is unchanged. For the exit strategy, we assume that redemptions of all assets begin six months prior to the initial increase in the federal funds rate and sales of MBS begin six months after liftoff. Sales of MBS are expected to eliminate MBS holdings over a five year period.

All four options include $75 billion in purchases each month, with $45 billion in Treasury securities and $30 billion in MBS. The first two options assume the completion of a $1 trillion LSAP program over 13 months, with purchases of $600 billion in Treasury securities and $400 billion in MBS. In option 1, we assume that the first increase in the federal funds rate takes place in June 2015, consistent with the LSAP scenario presented in the staff projection in the Tealbook for the July-August meeting.[15] In order to distinguish between the effects of the LSAP

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[14] While the LSAP option presented in Alternative A of the July Tealbook included the possibility of a cut in the rate of interest paid on excess reserve balances (the IOER rate), the options here each assume that the IOER rate remains unchanged at 25 basis points.

[15] The July Tealbook LSAP scenario used a shorter-dated distribution for Treasury securities purchases than that used in this memo.

and the change in the liftoff date, option 2 presents the same $1 trillion LSAP program but with a federal funds liftoff date of December 2014. In option 3, the overall size of the program is reduced to $750 billion, and its length is shortened to 10 months. Finally, option 4 serves as a proxy for the effects of a flow-based purchase program in a scenario in which the economy proves to be weaker than currently projected.[16] It is assumed that the program ultimately lasts 26 months and purchases total $2 trillion, $1.2 trillion in Treasury securities and $800 billion in MBS. As in options 1 and 3, the federal funds rate is assumed to leave its effective lower bound in June 2015. All four of the options assume that the Treasury securities purchased have maturities of greater than four years, with a weighted-average duration of about 9 years and that MBS purchases are concentrated in newly issued securities.[17]

Consistent with the capacity analysis conducted ahead of the July FOMC meeting, the overall size and monthly pace of these programs would not be expected to result in a material disruption of functioning in the markets for either Treasury securities or MBS. After completing the $2 trillion in purchases assumed in option 4, the largest amount of purchases presented, the SOMA's share of the Treasury market with maturities greater than 4 years is expected to grow from 30 to 35 percent, and the SOMA's share of the MBS market is expected to grow from about 20 to about 35 percent. Furthermore, when including both LSAP purchases and reinvestments of principal payments on agency securities, MBS purchases as a share of gross issuance total roughly 60 percent, a proportion that appears feasible based on experience from the first LSAP program.[18] Table 3 provides a more detailed breakdown of the percent ownership of Treasury securities by maturity bucket at the end of each LSAP option.

Financial and Economic Impact

The four proposed LSAP programs are expected to put downward pressure on longer-term interest rates and thereby stimulate aggregate demand, but the modeling of the first three options is a bit different than the fourth, which is supposed to proxy for a flow-based LSAP program. Staff estimates suggest that option 1, which adds $1 trillion in securities to the balance sheet and pushes back the liftoff of the federal funds rate until mid-2015, reduces the term premium on the ten-year Treasury yield by 38 basis points, as shown in the third row of table 2. Option 2, which is of the same size but includes a liftoff date about six months earlier, has an associated term premium effect of 34 basis points; the difference with option 1 reflects the modest effect of changing the date when the federal funds rate first begins to rise and, as a result, the date when the balance sheet begins to shrink. Option 3 keeps the date of the first federal funds rate increase as in option 1 but reduces the amount of purchases by $250 billion; under option 3, the term

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[16] As discussed in the memo by Jean-Philippe Laforte, David López-Salido, Steve Meyer, Ed Nelson, and John Roberts, "Macroeconomic Effects and Communication Issues Associated with Flow-Based Balance-Sheet Policies," the other options presented here could also be the outcome of an flow-based program. As discussed in that memo, the distinguishing feature of the scenario underlying option 4 is that the program is initially expected to entail $1 trillion in purchases, but, because of adverse shocks, the program is ultimately extended to $2 trillion.

[17] Purchases of newly-issued MBS would be conducted in the To-Be-Announced (TBA) market, which is the most liquid market for purchasing MBS. TBA market prices are used to price loans to borrowers, and thus are most closely linked to the primary mortgage rate.

[18] Purchases over the 26 months would represent roughly 60 percent of the projected gross issuance in the TBA market. Gross issuance projections are quite uncertain over such a long timeframe as they rely on model estimates for prepayment activity – the only assumed source of new issuance in the agency MBS market over the projection period.

premium falls by 27 basis points. The projected effects are presented in figure 1 and summarized in table 2. Option 1 reduces the unemployment rate over the next two years by about 0.6 percentage point, to 7.2 percent, while options 2 and 3 reduce it by a bit less.

It is difficult to make a simple comparison for option 4, in part because the economy is assumed to be weaker than under the other scenarios and the purchase program evolves with the outlook. The macroeconomic effects of this option are modeled in the memo by Laforte et al, and reported in figure 2. The FOMC and the public initially believe the SOMA portfolio will expand by $1 trillion. As a result, the immediate term-premium effect would be the same as in a stock-based $1 trillion LSAP program. Over time, however, as adverse news about the economy arrives, expectations for the total amount of purchases are revised up to $2 trillion. Once the public understands that the program will result in $2 trillion in purchases, the term-premium effects increase as do the expected macroeconomic effects. In essence, under a flow-based LSAP program, the ultimate size and evolution of the balance sheet, and therefore its effect on interest rates and the economy, depends crucially on the assumed evolution of economic activity, making a comparison to more straightforward LSAPs potentially challenging.[19]

Impact on Federal Reserve Balance Sheet and Income

For each scenario, we project the path of the Federal Reserve's balance sheet and its income and remittances to the Treasury. As shown in the top left panel of figure 3, an LSAP program leaves the level of the SOMA portfolio significantly higher than it would be under the current policy, with the level of reserves following a similar path to the level of the portfolio in all four scenarios considered.[20] In option 1, reserves are $2.3 trillion at the time of fed funds liftoff, nearly $1 trillion higher than the level in the July Tealbook Alternative B scenario. Option 2 is not substantially different than option 1 in this regard, and option 3 projects slightly lower reserve balances. By contrast, under option 4, reserve balances are $3.3 trillion at the time of the first increase in the federal funds rate.

Under option 1, asset sales begin six months after the assumed first increase in the federal funds rate in June 2015, and as a result, the portfolio shrinks to a normal size in April 2019, 41 months after MBS sales begin.[21] In contrast, if the funds rate were to depart the effective lower bound in December 2014, as considered in option 2, the portfolio would normalize in size in February 2019.[22] Reducing the size of the program to $750 billion, as in option 3, also results in the

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[19] See the memo by Laforte et al. for additional discussion of this scenario.

[20] We do not consider different prepayment estimates in the analysis, because at the time of exit MBS prepayments are assumed to be largely insensitive to interest rate changes. Under the scenarios considered, at liftoff, mortgage rates would be higher than those on mortgages underlying most of the MBS portfolio, and therefore prepayments are less sensitive to upwards shifts in interest rates. As a result, the change in MBS prepayments from different interest rate assumptions would have only small effects on the balance sheet and income projections. The impact on exit can be seen in the comparison between the option 1 scenario under the baseline rate path and the shocked rate path.

[21] The exit strategy principles published in June 2011 suggest that the size of the portfolio would be normalized within three years of the initiation of asset sales. The staff memo "The effect of an additional $1 trillion LSAP on the exit strategy" (distributed to the Committee on August 27, 2012) summarizes issues related to the exit strategy principles. For the analysis here, each of the options assumes MBS are sold over a five year period. As discussed further in the memo on exit issues, the pace of sales would have to be somewhat more rapid under any of the LSAPs in order to be aligned with the exit principles.

[22] The faster normalization under option 1 as compared to option 2 reflects the additional growth in Federal Reserve notes and bank capital over the additional time before asset sales begin. The growth in these balance sheet items

normalization of the size of the balance sheet in February 2019. Finally, under the $2 trillion LSAP scenario, the portfolio does not normalize in size until February 2020.

As outlined in table 2, cumulative remittances to the Treasury from 2012 to 2020 are similar under the LSAP scenarios considered, although they are $25 to $50 billion lower than in the July Tealbook Alternative B scenario, which did not contain an LSAP program.[23] Through 2017, as shown in figure 3, remittances are higher under all of the LSAP scenarios because the higher interest income associated with a larger portfolio outweighs the growth in interest expense associated with paying interest on a higher level of reserve balances. However, later in the projection period, the increase in interest expense and larger capital losses from MBS sales push remittances lower than would be the case without an additional LSAP program.[24] Once the size of the balance sheet normalizes and purchases of higher-yielding Treasury securities begin, remittances recover. Under options 1, 2, and 3, annual remittances decline to roughly zero by 2018. Under the larger option 4, remittances fall to zero for more than 6 years, creating a substantial deferred asset.

In general, an LSAP program will cause the Federal Reserve to face more income risk as interest rates rise, given the portfolio's larger size and its higher overall level of interest rate risk.[25] To demonstrate the risks to income of a higher interest rate environment, we consider an alternative scenario for options 1 and 4, in which market interest rates are 100 basis points higher after the time of federal funds liftoff than in the model simulations. Specifically, we assume that one year after federal funds liftoff, the federal funds rate and 10-year Treasury yield are 100 basis points above their levels in the baseline versions for each of options 1 and 4 and that the higher level of interest rates persists for the remainder of the projection period.

With this assumption, under option 1—shown in figure 4—remittances to the Treasury fall to zero in 2017 and remain there through 2020. A deferred asset is created that lasts for about four years. The lower income reflects both the higher interest expense from the higher interest rate paid on reserves and larger capital losses on MBS sales because market rates are higher. In total, compared to the baseline interest rate path discussed above, the higher interest rate scenario reduces cumulative remittances under option 1 by $43 billion from 2012 to 2020.

Had the LSAP program in option 1 not been implemented and instead the MEP was completed as announced, then the higher rate scenario would also reduce cumulative remittances, in this case by $24 billion. Because the higher interest rate scenario lowers cumulative remittances by $43 billion with the LSAP and by $24 billion without the LSAP, one could approximate the additional interest rate risk of the LSAP as being about $19 billion in terms of cumulative remittances.

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reduces the level of reserve balances. Different assumptions about the growth in these items will impact the time it takes for the portfolio to normalize.

[23] Cumulative remittances from 2020 to 2025 under the $2 trillion scenario are notably lower than that for the other scenarios, and there is a deferred asset that is projected to persist through 2023.

[24] Interest expense on reserve balances is calculated based on the projected level of the federal funds rate. Essentially, we are assuming that the IOER rate and the rates paid on reserve management tools—reverse repurchase agreements and term deposits—are equal to the federal funds rate. In practice, these rates may exceed the federal funds rate, particularly the rate on reserve draining tools, and as a result, interest expense would be somewhat higher than calculated, reducing remittances by the same amount.

[25] An illustration of these risks is the information on unrealized gains and losses contained in figures 3 and 4.

The losses from substantially higher interest rates are more noticeable in the $2 trillion LSAP scenario of option 4, shown in figure 5. In this scenario, remittances approach zero in 2016 and stay at that level for about 8 years. As a result, a substantial deferred asset is created, which reaches a maximum value of around $200 billion in 2020, and lasts for a considerable number of years. For this LSAP program, the cumulative difference in remittances through 2025 for the baseline interest rates versus the substantially higher interest rates is $70 billion.

Conclusion

This memo presents four options for implementing an LSAP program, should the Committee wish to provide additional monetary accommodation. Each of the options involves purchases with an allocation of 60 percent in Treasury securities and 40 percent in MBS, which is roughly proportional to the estimated purchase capacity in the two markets and is unlikely to result in significant disruptions to market functioning. In the staff models, the composition of purchases has relatively little effect on the macroeconomic outcomes, but the Committee may wish to consider an alternative distribution between Treasury securities and MBS based on other considerations, such as different modeling assumptions than those used by the staff, different risk characteristics of the assets, the implications of the asset mix for the exit strategy, or the perception of credit allocation or debt monetization.

The $1 trillion stock-based LSAP options presented are estimated to reduce the unemployment rate by between 40 and 60 basis points after two years relative to a projection without the LSAP. The program would also increase inflation between 25 and 45 basis points over a similar time period; larger programs are estimated to have a larger economic impact. These FRB/US results are, of course, subject to considerable uncertainty, and our results would differ using different macroeconomic models. Options 1 through 3 imply similar cumulative remittances to the Treasury, but in the case of option 4, the $2 trillion LSAP program, a large deferred asset is created. Moreover, in an alternative scenario in which market interest rates are substantially higher than projected, capital losses and interest expense are noticeably higher than they would be should an additional LSAP not be conducted, resulting in a number of years of zero remittances, lower cumulative remittances, and accumulation of a deferred asset under the options considered.

Appendix

This appendix provides a summary of the financial, macroeconomic, balance sheet, and income effects of asset allocations that differ from the allocation of 60 percent to Treasury securities and 40 percent to MBS considered in the four options presented in the memo. In particular, we consider two alternative distributions.[26] The first alternative option involves the purchase of $750 billion in Treasury securities and $250 billion in MBS. This scenario represents the most Treasury purchases with an average duration of about nine years that the Desk could conduct over a 13 month period without risking significant market functioning issues.[27] The second alternative option involves the purchase of $400 billion in Treasury securities and $600 billion in MBS, also over a 13 month period. This scenario represents the most MBS purchases that the Desk could conduct without risking significant market functioning issues. Both alternative distributions consider a purchase pace of $75 billion per month, consistent with the four options presented in the memo. Furthermore, given that each scenario involves the most aggressive purchase pace for a given asset class, it is likely that neither alternative option could be extended for an additional year without causing market functioning issues.

A summary of the scenario results is found in Appendix Table 1 and Appendix Figure 1.

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[26] In each alternative distribution, the securities to be purchased are consistent with the four options presented in the memo. Specifically, the Treasury securities to be purchased have an average duration of about 9 years, and the MBS to be purchased are concentrated in newly issued securities. Each alternative assumes that such a program would last approximately 13 months.

[27] It is possible that the Desk could purchase more than $750 billion Treasury securities in a 13-month period; however, additional purchases would have a much shorter duration and, therefore, smaller financial and economic benefit.

Table 1

		Program	
		$500B Treasury LSAP (Avg Duration: 9 yrs)	$500B MBS LSAP
Maximum Impact Over Next Two Years (basis points)	Term Premium Effect	-21	-16
	MBS Current Coupon	-21	-29
	Mortgage rate	-21	-24
	Unemployment Rate	-20	-16
	Core PCE Inflation	13	10
	Real GDP	43	34

Note: Estimates based on staff exit strategy assumptions.

Table 2
Key Scenario Assumptions and Projections

	No Policy Action	Option 1	Option 2	Option 3	Option 4
	Continue MEP	$600B Treasury/ $400B MBS	$600B Treasury/ $400B MBS	$450B Treasury/ $300B MBS	$1200B Treasury/ $800B MBS
Additional Program Details					
Program Length		13 months	13 months	10 months	26 months
Average Duration of Treasury Purchases		9 years	9 years	9 years	9 years
Maximum Financial Market Impact (bp)					
Term Premium		-38	-34	-27	N/A
Maximum Economic Impact (bp)					
Unemployment Rate Over Next 2 Years		-62	-38	-50	-92
Core PCE Inflation Over Next 2 Years		44	25	36	63
Exit Assumptions					
Fed Funds Liftoff	Dec-14	Jun-15	Dec-14	Jun-15	Jun-15
Redemptions Start	Jun-14	Dec-14	Jun-14	Dec-14	Dec-14
Agency MBS Sales Start	Jun-15	Dec-15	Jun-15	Dec-15	Dec-15
Agency MBS Sales End	May-20	Nov-20	May-20	Nov-20	Nov-20
Balance Sheet					
Reserves at Liftoff ($B)	1,363	2,296	2,361	2,038	3,314
SOMA Balance Normalization Date	Apr-18	Apr-19	Feb-19	Feb-19	Feb-20
Peak Size of SOMA ($B)	2,626	3,602	3,602	3,353	4,588
Income Metrics					
Cumulative Remittances ($B)[1]	364	322	319	338	315
Duration of < $5B Annual Remittances	N/A	2 years	3 years	N/A	4 years[2]
Cumulative Agency MBS Capital Losses ($B)	-33	-73	-69	-64	-106
100 bp Shock to All Rates Starting at Fed Funds Liftoff					
Income Metrics					
Cumulative Remittances ($B)[1]	340	279			298
Duration of < $5B Annual Remittances	N/A	4 years			5 years[3]
Cumulative Agency MBS Capital Losses ($B)	-53	-123			-166

[1] Cumulative remittances to the Treasury between 2012 and 2020.

[2] Duration of < $5B annual remittances is 6 years through 2025.

[3] Duration of < $5B annual remittances is 8 years through 2025.

Table 3
Percent of Treasury Securities owned by the Federal Reserve

Percent of Outstanding

	0 - 4 yrs	4 - 4 3/4 yrs	4 3/4 - 5 3/4 yrs	5 3/4 - 7 yrs	7 - 10 yrs	10 - 20 yrs	20 - 30 yrs
August 2007	28	17	11	9	10	14	13
Extended MEP End of Program - Dec 2012	6	16	33	36	32	30	38
Option 1 End of Program - Oct 2013	7	30	40	32	37	31	41
Option 3 End of Program - Jul 2013	7	26	38	31	36	30	40
Option 4 End of Program - Nov 2014	13	38	43	41	53	54	48

Includes nominal and inflation-protected securities

Figure 1
Macroeconomic Effects of Alternative Balance Sheet Policies

—— July TB Alt B
----- Option 1: $600B T, $400B MBS June 2015 liftoff
– – Option 2: $600B T, $400B MBS December 2014 liftoff
– – Option 3: $450B T, $300B MBS June 2015 liftoff
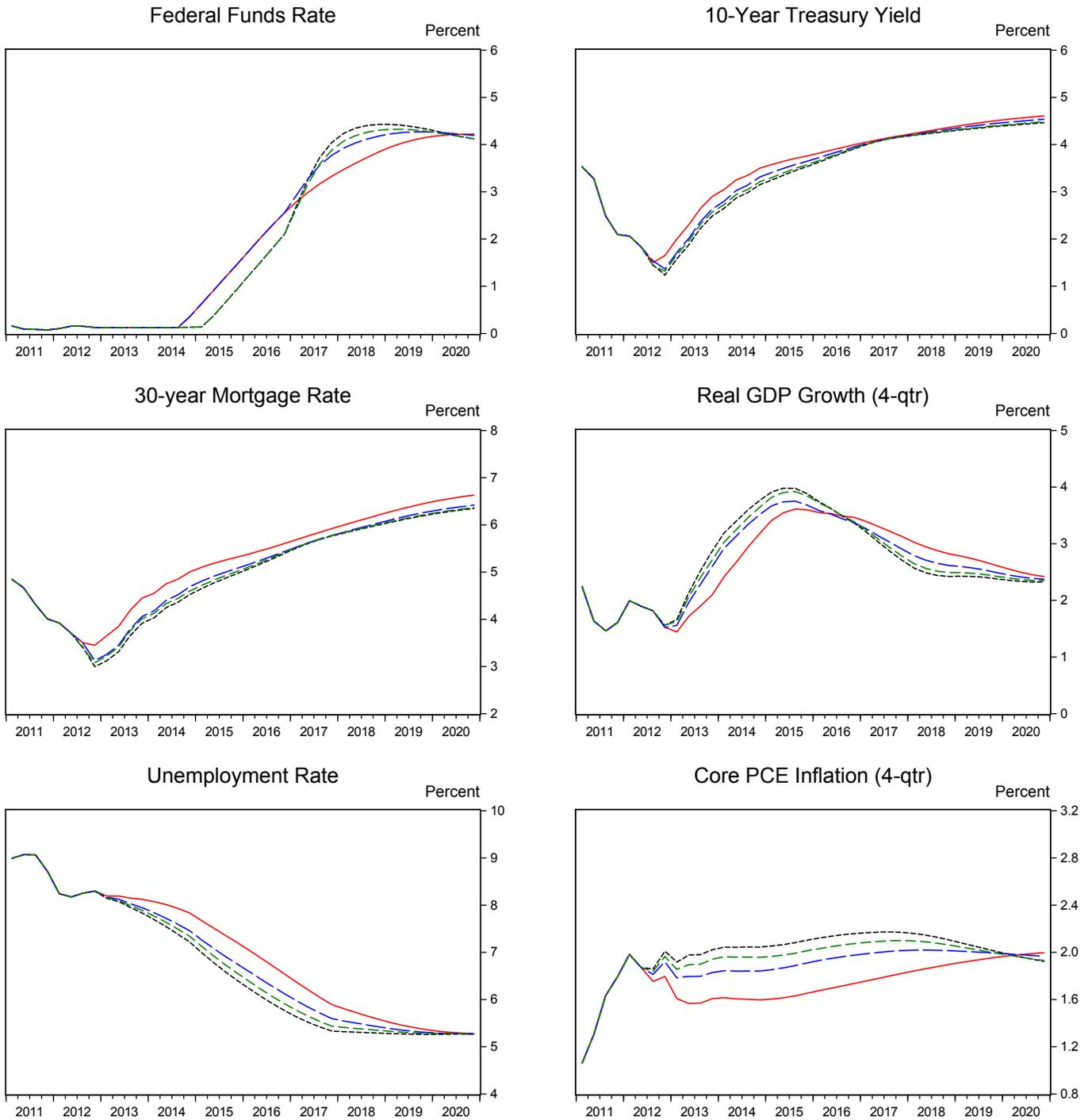
Figure 2
Macroeconomic Effects of Alternative Balance Sheet Policies, continued

—— July TB Alt B
------ Option 1: $600B T, $400B MBS
— — Option 4: $1,200B T, $800B MBS

Federal Funds Rate

10-Year Treasury Yield

30-year Mortgage Rate

Real GDP Growth (4-qtr)

Unemployment Rate

Core PCE Inflation (4-qtr)

15 of 25

Figure 3

SOMA Holdings

Monthly

Billions of dollars

- July TB Alt B (MEP)
- Option 1
- Option 2
- Option 3

Reserve Balances

Monthly

Billions of dollars

- July TB Alt B (MEP)
- Option 1
- Option 2
- Option 3

SOMA Treasury Holdings

Monthly

Billions of dollars

- July TB Alt B (MEP)
- Option 1
- Option 2
- Option 3

SOMA Agency MBS Holdings

Monthly

Billions of dollars

- July TB Alt B (MEP)
- Option 1
- Option 2
- Option 3

Figure 3 (cont.)

SOMA Interest Income
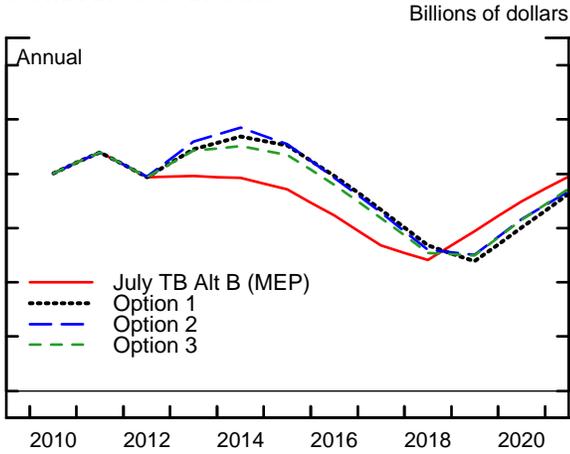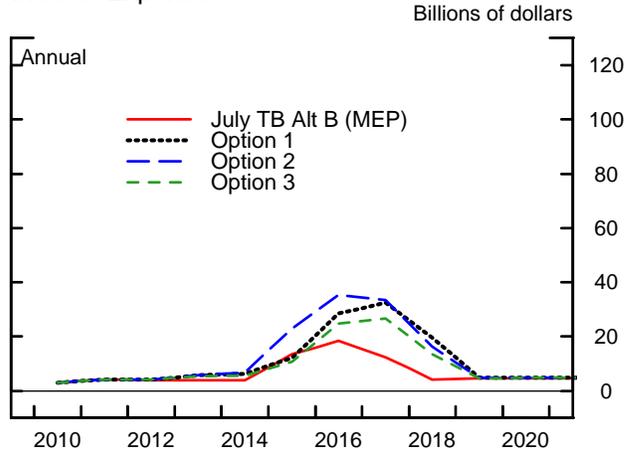
Billions of dollars

Annual

July TB Alt B (MEP)
Option 1
Option 2
Option 3

Interest Expense

Billions of dollars

Annual

July TB Alt B (MEP)
Option 1
Option 2
Option 3

Realized Capital Losses

Billions of dollars

Annual

July TB Alt B (MEP)
Option 1
Option 2
Option 3

Remittances to Treasury

Billions of dollars

Annual

July TB Alt B (MEP)
Option 1
Option 2
Option 3

Deferred Asset

Billions of dollars

End of year

July TB Alt B (MEP)
Option 1
Option 2
Option 3

Unrealized Gains/Losses

Billions of dollars
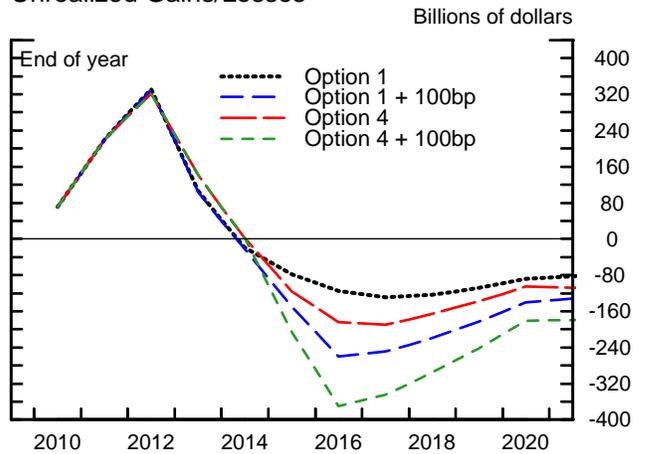
End of year

July TB Alt B (MEP)
Option 1
Option 2
Option 3
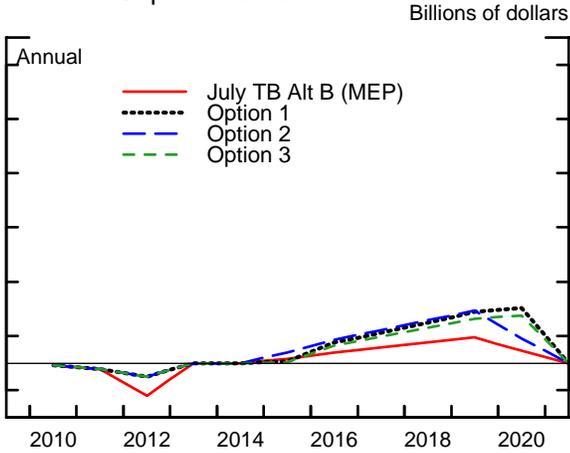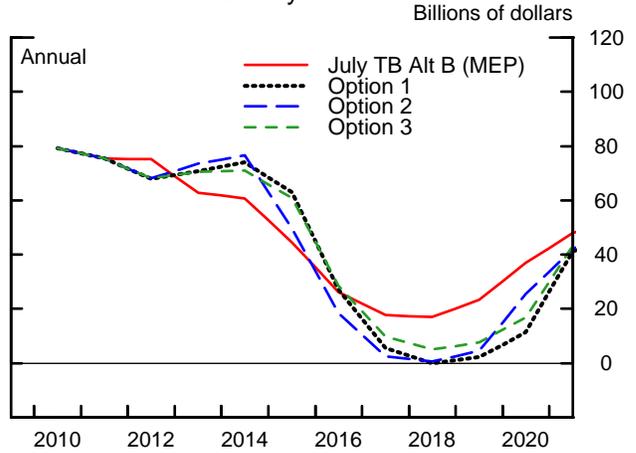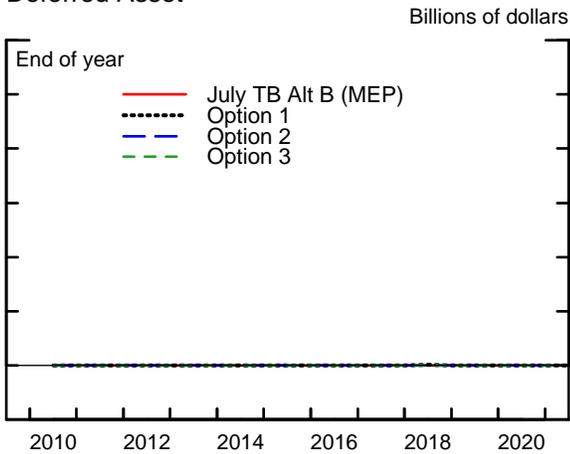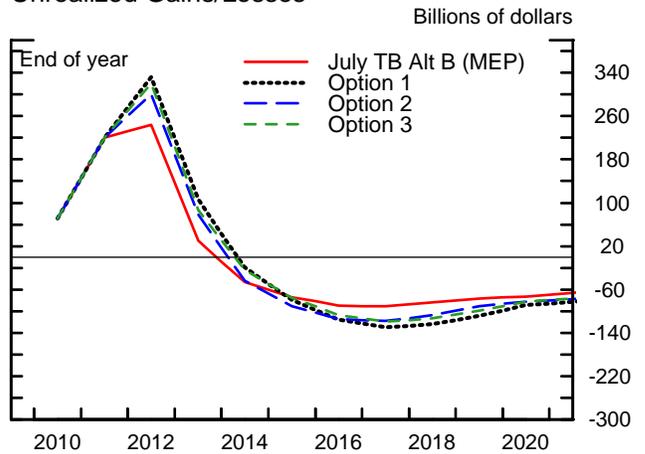
Figure 3 (cont.)

Federal Funds Rate
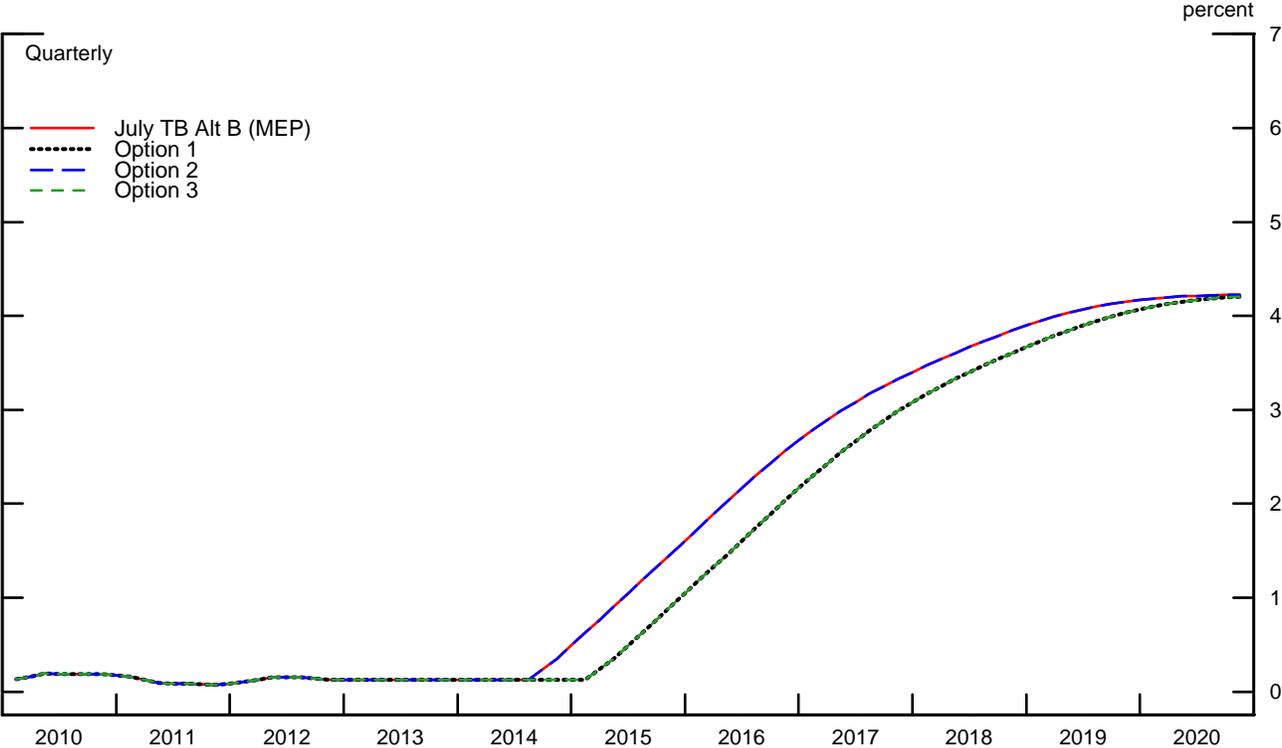
10 year Treasury Rate
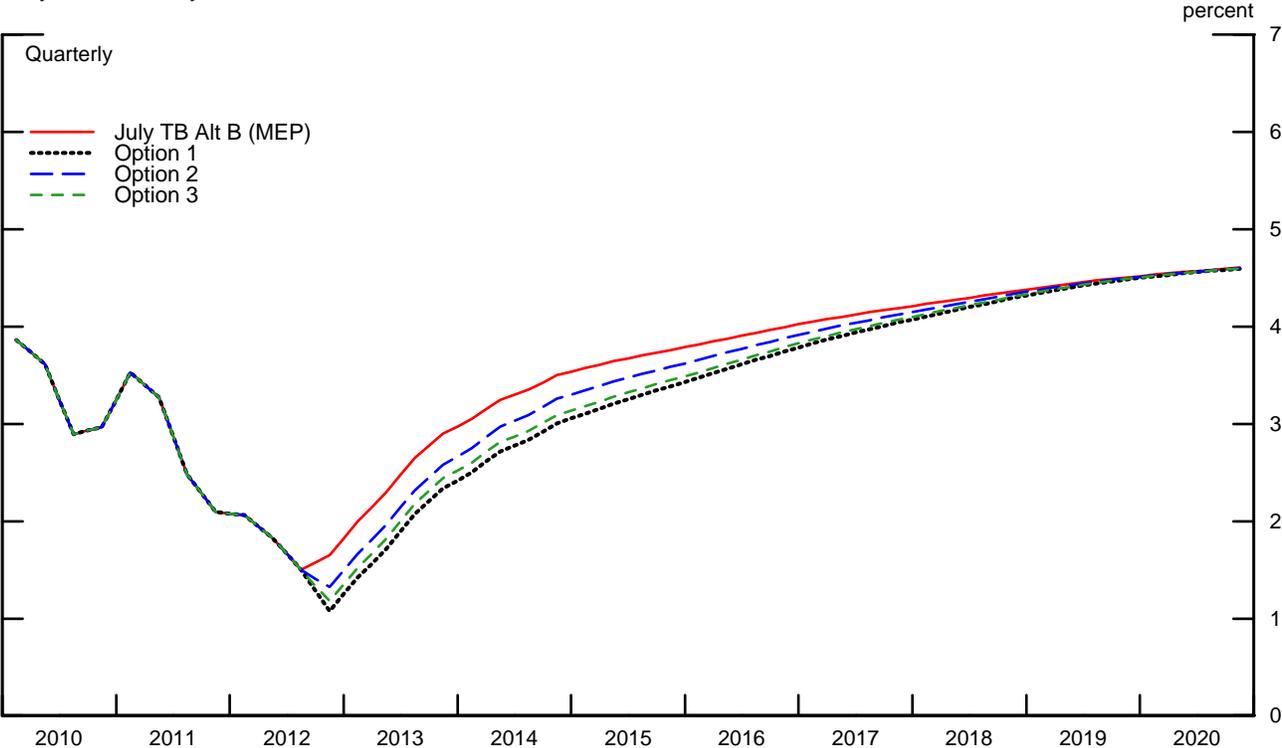
Figure 4

SOMA Holdings

SOMA Treasury Holdings
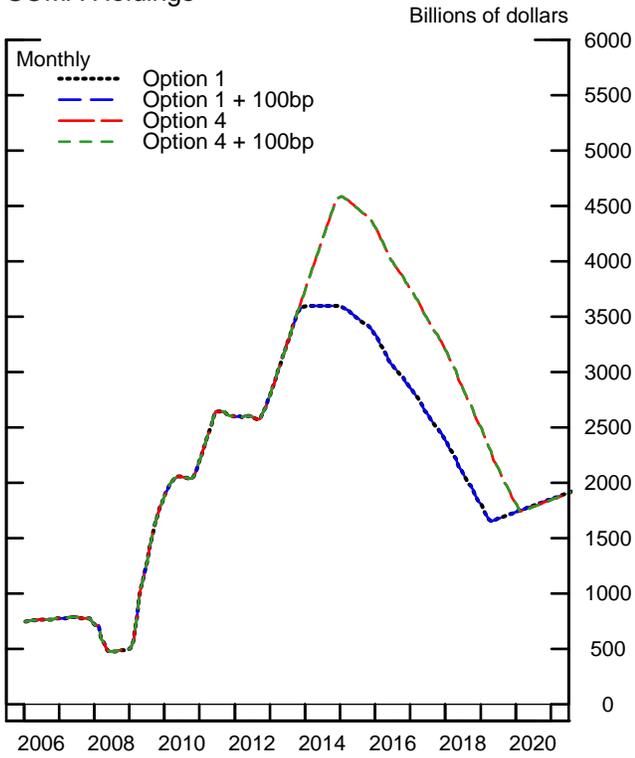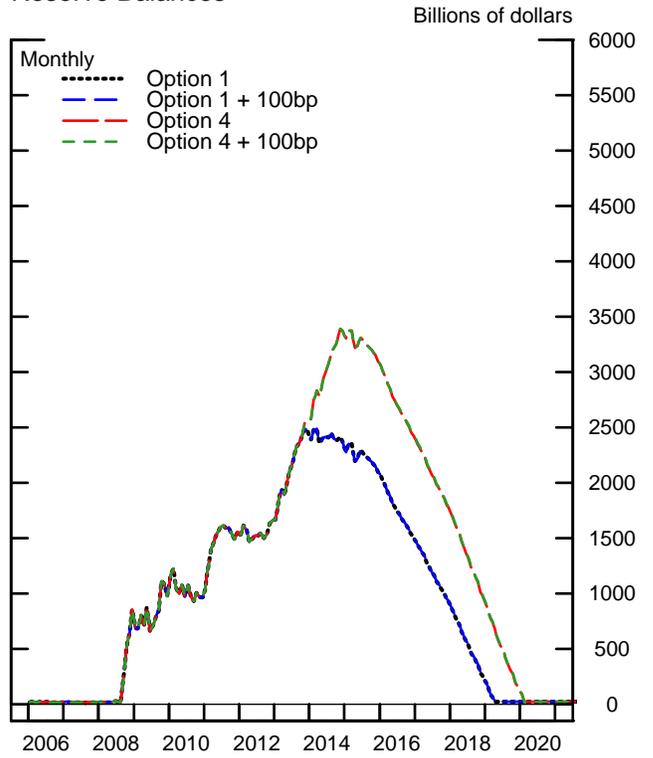
Reserve Balances
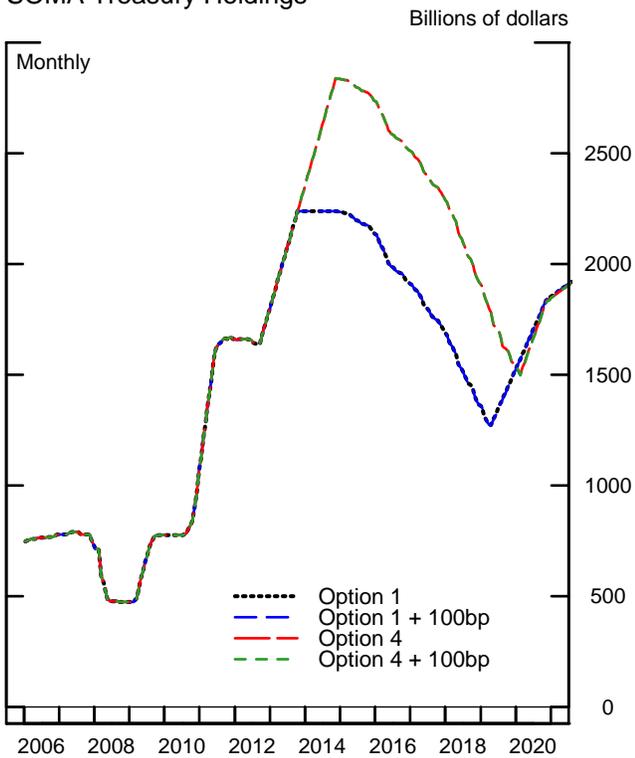
SOMA Agency MBS Holdings
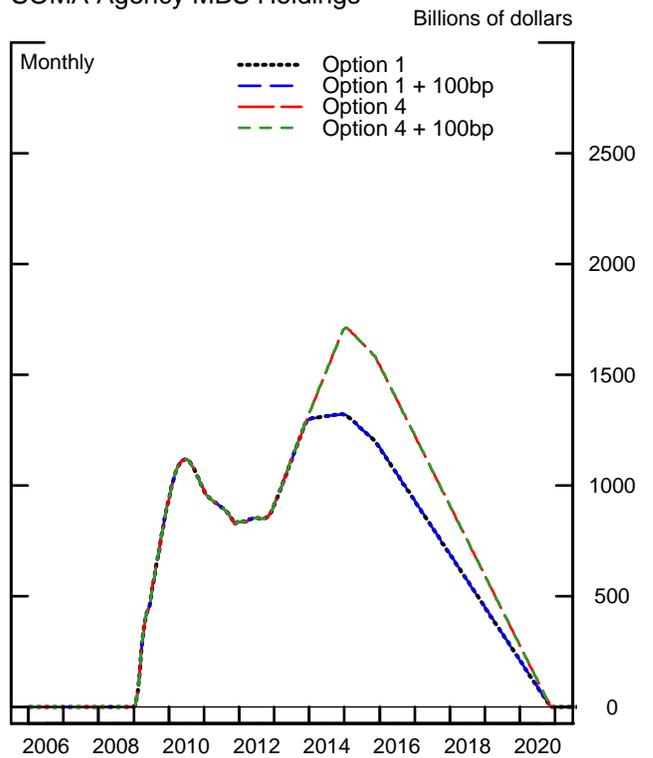
Figure 4 (cont.)

SOMA Interest Income
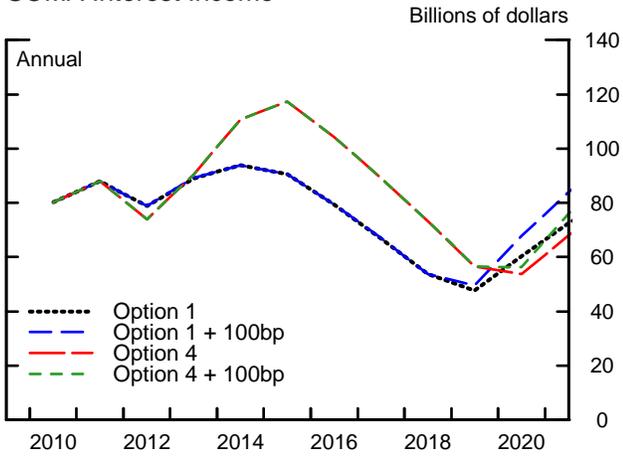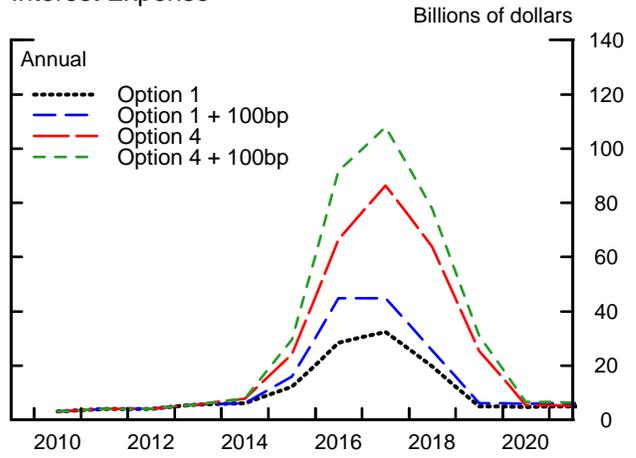
Billions of dollars

Annual

Option 1
Option 1 + 100bp
Option 4
Option 4 + 100bp

Interest Expense

Billions of dollars

Annual

Option 1
Option 1 + 100bp
Option 4
Option 4 + 100bp

Realized Capital Losses

Billions of dollars

Annual

Option 1
Option 1 + 100bp
Option 4
Option 4 + 100bp

Remittances to Treasury

Billions of dollars

Annual

Option 1
Option 1 + 100bp
Option 4
Option 4 + 100bp

Deferred Asset

Billions of dollars

End of year

Option 1
Option 1 + 100bp
Option 4
Option 4 + 100bp

Unrealized Gains/Losses

Billions of dollars

End of year
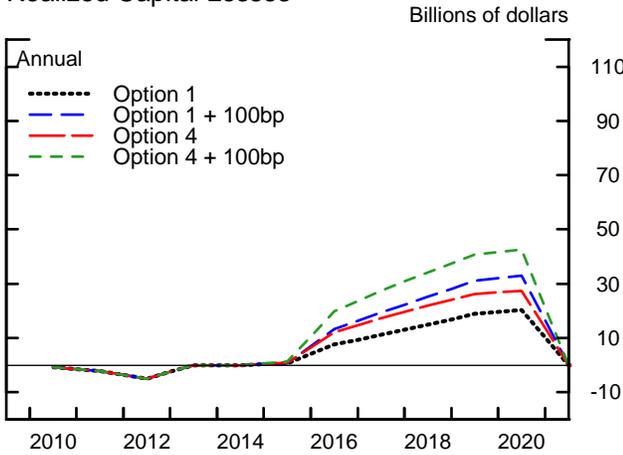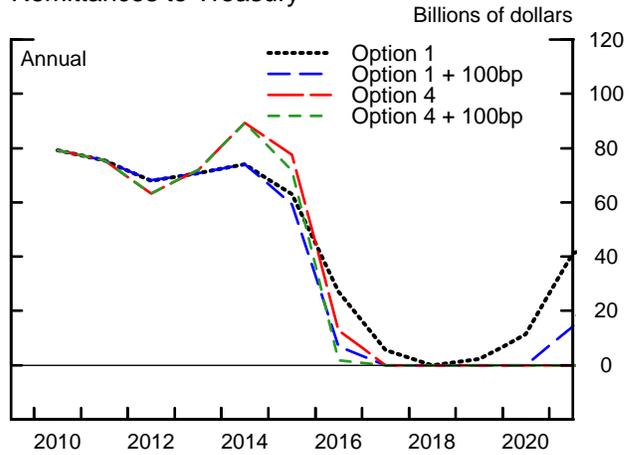
Option 1
Option 1 + 100bp
Option 4
Option 4 + 100bp
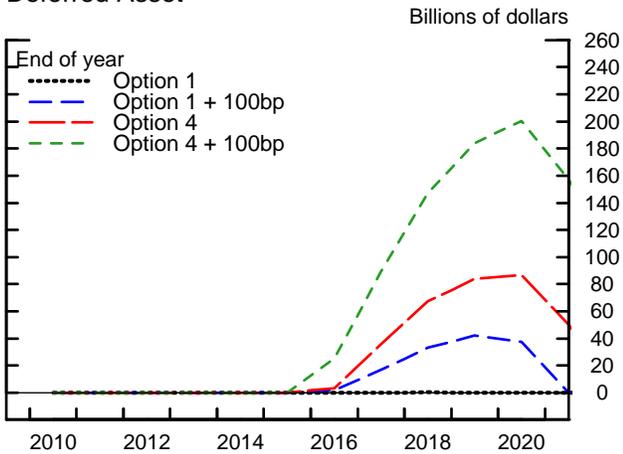
Figure 4 (cont.)

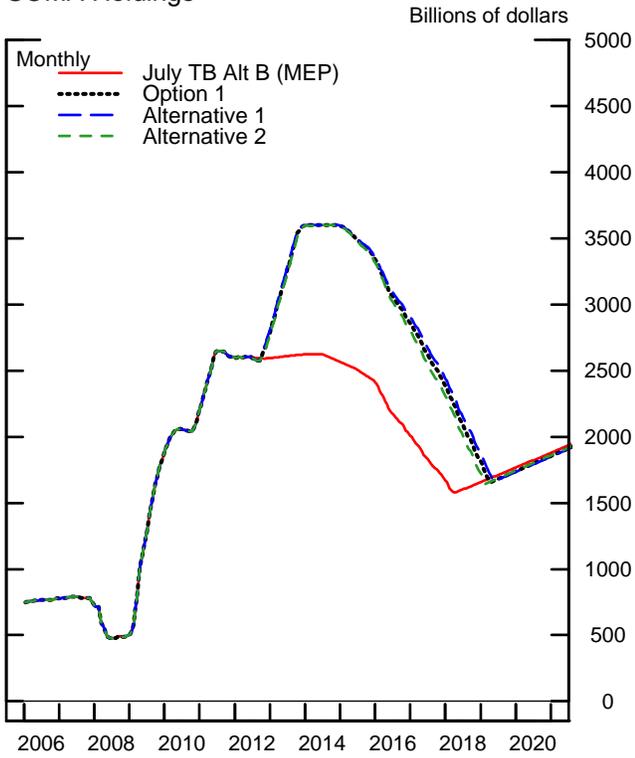Federal Funds Rate
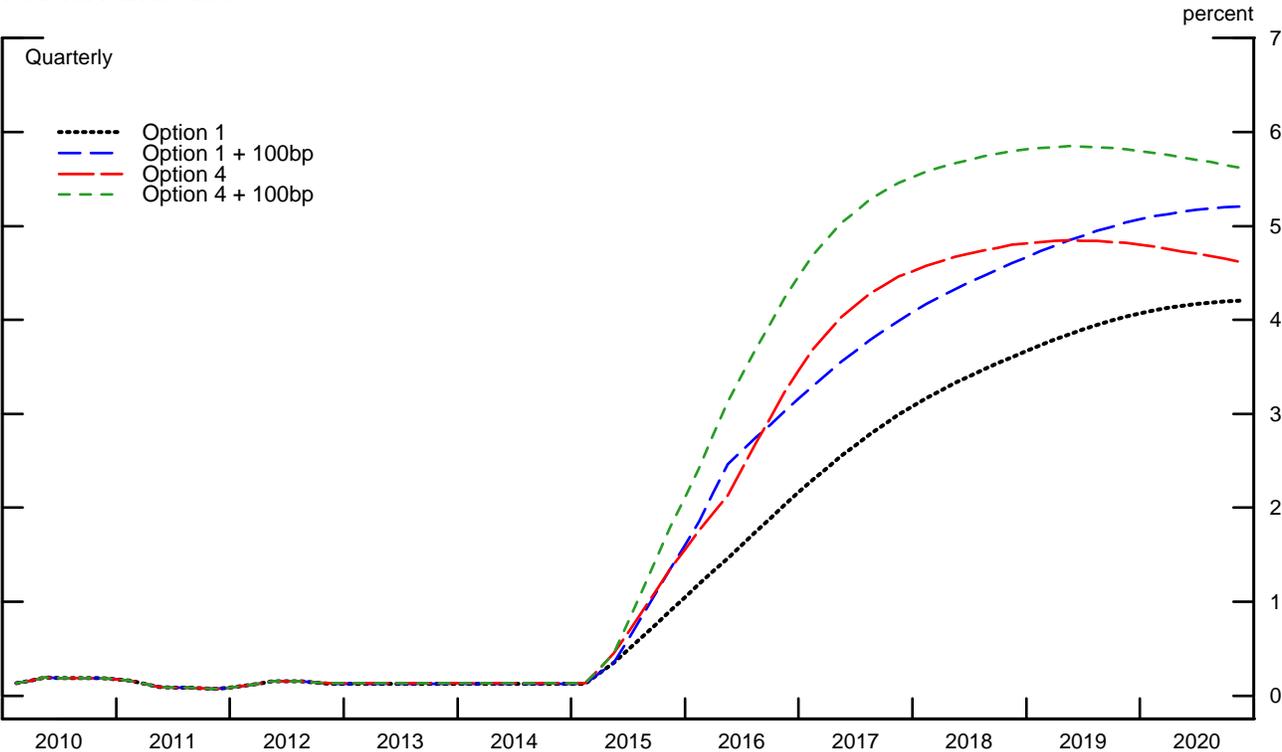
10 year Treasury Rate
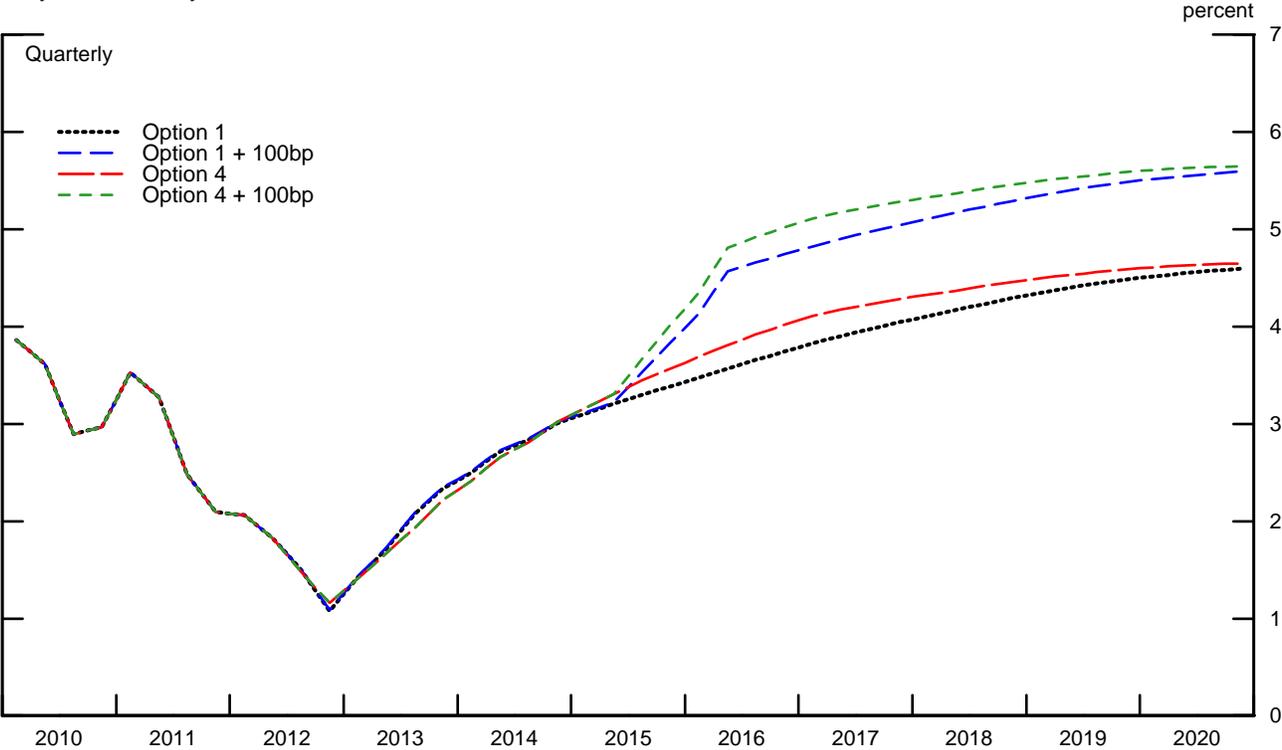
Appendix Table 1
Key Scenario Assumptions and Projections

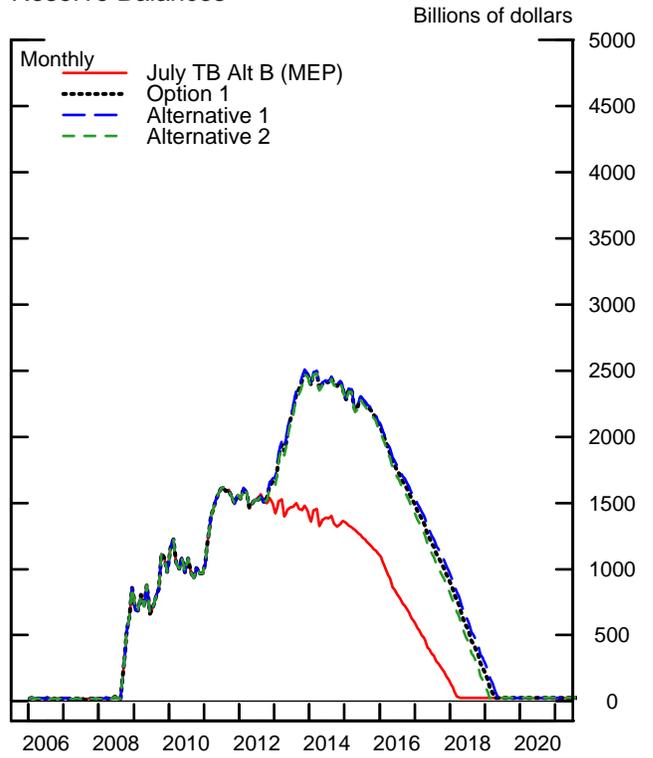|	No Policy Action Continue MEP	Option 1 $600B Treasury/ $400B MBS	Alternative 1 $750B Treasury/ $250B MBS	Alternative 2 $400B Treasury/ $600B MBS
Additional Program Details				
Program Length		13 months	13 months	13 months
Average Treasury Duration		9 years	9 years	9 years
Maximum Financial Market Impact (bp)				
Term Premium		-38	-39	-35
Maximum Economic Impact (bp)				
Unemployment Rate Over Next 2 Years		-62	-60	-60
Core PCE Inflation Over Next 2 Years		44	42	42
Exit Assumptions				
Fed Funds Liftoff	Dec-14	Jun-15	Jun-15	Jun-15
Redemptions Start	Jun-14	Dec-14	Dec-14	Dec-14
Agency MBS Sales Start	Jun-15	Dec-15	Dec-15	Dec-15
Agency MBS Sales End	May-20	Nov-20	Nov-20	Nov-20
Balance Sheet				
Reserves at Liftoff ($B)	1,363	2,296	2,309	2,278
SOMA Balance Normalization Date	Apr-18	Apr-19	May-19	Feb-19
Peak Size of SOMA ($B)	2,626	3,602	3,603	3,600
Income Metrics				
Cumulative Remittances ($B)[1]	364	322	321	323
Duration of < $5B Annual Remittances	N/A	2 years	2 years	2 years
Cumulative Agency MBS Capital Losses ($B)	-33	-73	-62	-89

[1] Cumulative remittances to the Treasury between 2012 and 2020.
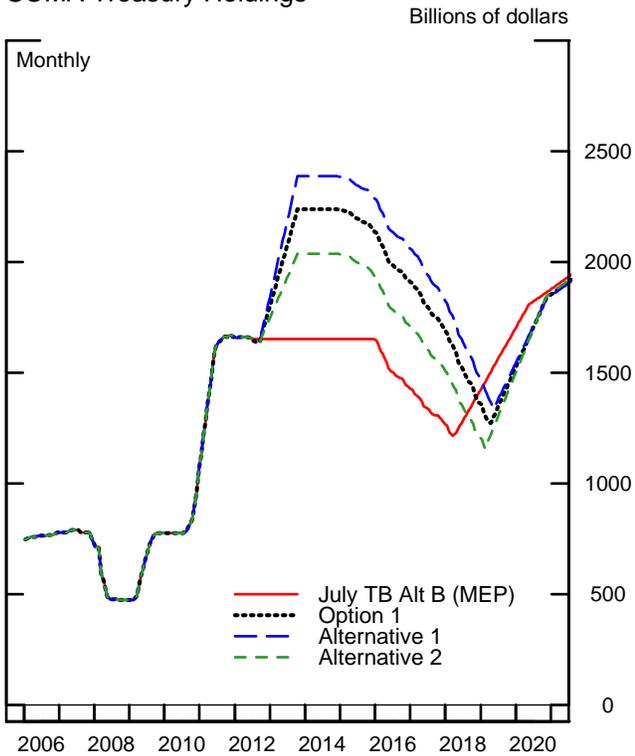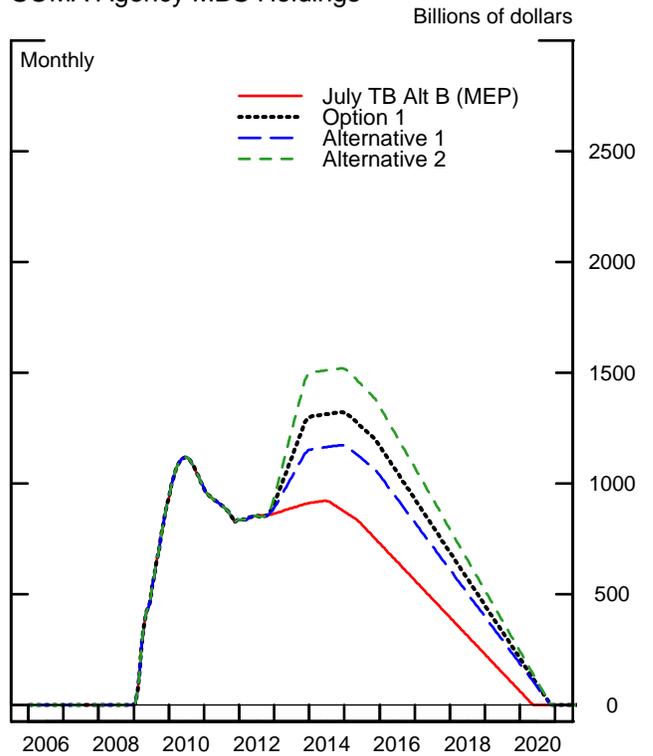
Appendix Figure 1

SOMA Holdings

SOMA Holdings
Billions of dollars

Monthly

— July TB Alt B (MEP)
····· Option 1
– – Alternative 1
– – Alternative 2

Reserve Balances
Billions of dollars

Monthly

— July TB Alt B (MEP)
····· Option 1
– – Alternative 1
– – Alternative 2

SOMA Treasury Holdings
Billions of dollars

Monthly

— July TB Alt B (MEP)
····· Option 1
– – Alternative 1
– – Alternative 2

SOMA Agency MBS Holdings
Billions of dollars

Monthly

— July TB Alt B (MEP)
····· Option 1
– – Alternative 1
– – Alternative 2

Appendix Figure 1 (cont.)

SOMA Interest Income
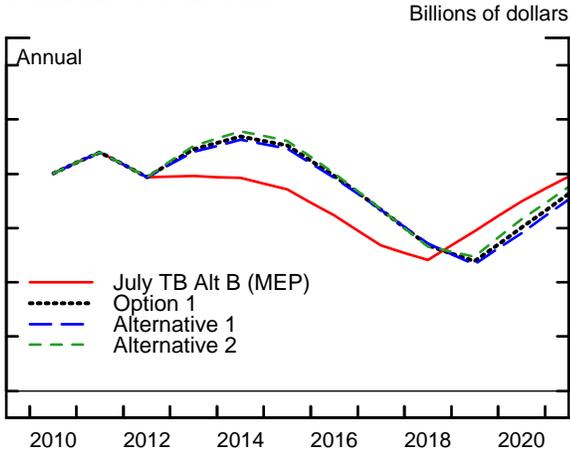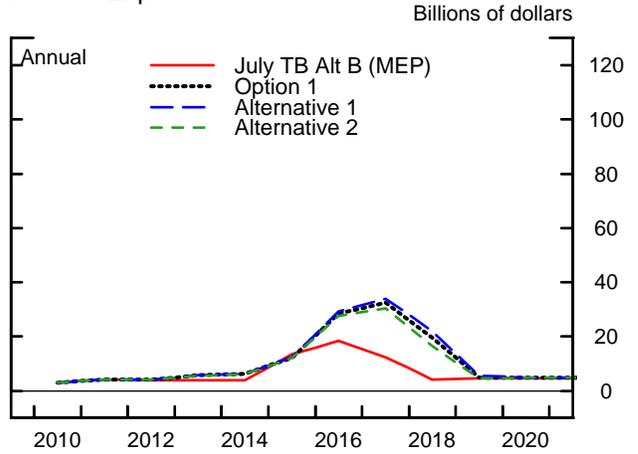
Billions of dollars

Interest Expense

Billions of dollars

Realized Capital Losses

Billions of dollars

Remittances to Treasury

Billions of dollars

Deferred Asset

Billions of dollars
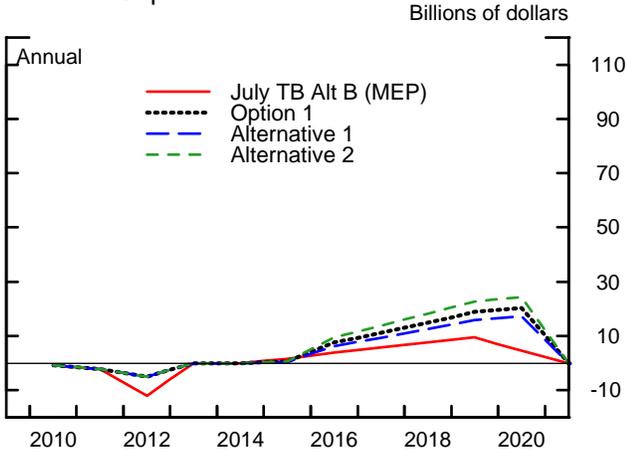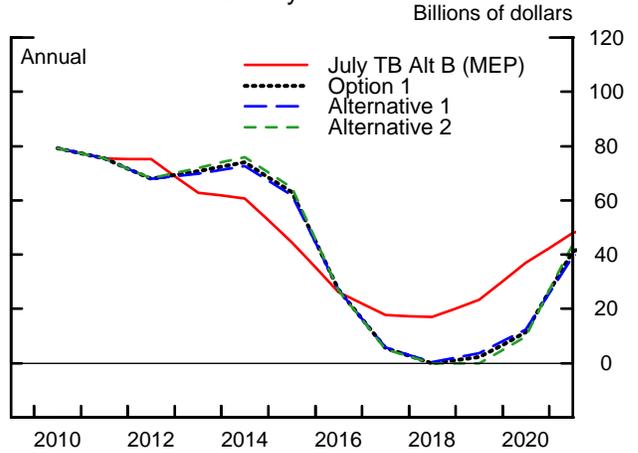
Unrealized Gains/Losses
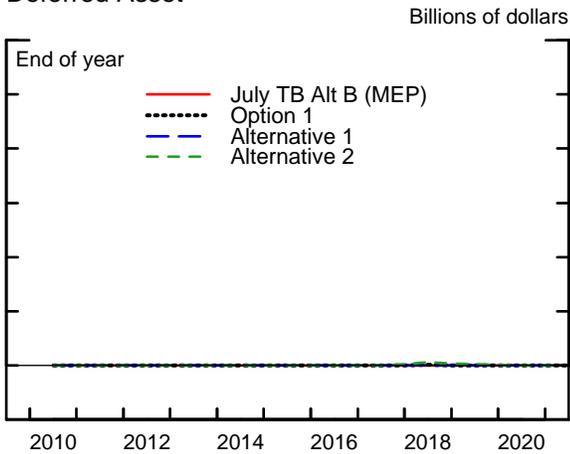
Billions of dollars
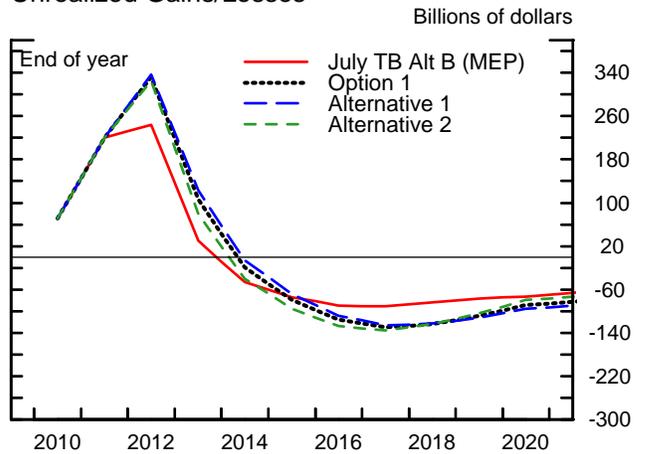
Appendix Figure 1 (cont.)

Federal Funds Rate

percent

Quarterly

——— July TB Alt B (MEP)
········· Option 1
– – – Alternative 1
– – – Alternative 2

10 year Treasury Rate

percent

Quarterly

——— July TB Alt B (MEP)
········· Option 1
– – – Alternative 1
– – – Alternative 2