

Analysis of Alternative Simple Rules for Large-Scale Asset Purchases

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Executive Summary

- The FOMC has stated that it will continue its purchases of Treasury and agency mortgage-backed securities until the outlook for the labor market has improved substantially. The Committee also has indicated that decisions about the pace of purchases will depend, in part, on the extent of progress toward the Committee's economic objectives. To guide market expectations regarding its future asset purchases, the FOMC may wish to link the pace of asset purchases to observable indicators of labor market performance. In this memo, we specify three simple rules for setting the pace of asset purchases, one as a function of the unemployment rate (unemployment-based rule, henceforth), and two variants of a rule that responds to payroll employment gains (employment-based rules, henceforth). Under the unemployment-based rule, purchases would end when the unemployment rate declines to 6.8 percent, whereas the two employment-based rules are calibrated such that, under the September Tealbook baseline, they lead to similar total amounts of purchases that are completed at about the same time as under the unemployment-based rule.
- We then consider the evolution of asset purchases and economic performance under two alternative scenarios in which the unemployment rate and payroll employment growth follow different paths than in the baseline. If the labor force participation rate were to decline further, possibly reflecting some structural labor market damage, the unemployment-based rule would likely reduce asset purchases sooner than the employment-based rules. If, conversely, the decline in the participation rate since the recession was the result of cyclical factors to a larger extent than assumed in the baseline and is reversed going forward, the unemployment-based rule would likely result in substantially larger total asset purchases than the employment-based rules.
- Should the FOMC wish to tie its communications about the pace of its future asset purchases to a single labor market indicator, these results suggest that Committee expectations regarding the likelihood of alternative scenarios for the evolution of labor market indicators should be an important consideration in the selection of the indicator used.
- In principle, of course, the Committee could adopt a rule based on multiple indicators. Such rules are not considered here, partly because of the additional time that would have been required to analyze them thoroughly, and partly because of the additional communications challenges they would pose.

Since the start of its current asset purchase program, the FOMC has stated that it will continue its purchases of Treasury and agency mortgage-backed securities until the outlook for the labor market has improved substantially, but that the pace of purchases will be adjusted in response to the extent of progress toward the Committee's longer-run goals of maximum employment and 2 percent inflation. Although this formulation expresses the intent of the program, the public has had some difficulty understanding and predicting the FOMC's choice of the path of future asset purchases. If the Committee wished to provide further guidance to the public regarding its future asset purchases, it may wish to link the pace of asset purchases explicitly to one or more observable indicators of labor market performance.¹

A recent memo to the FOMC examined outcomes for the economy and the Federal Reserve's balance sheet when the future pace of asset purchases is set as a simple rule based on the unemployment rate.² The simple rule was calibrated to correspond closely to the illustrative scenario laid out by the Chairman in his June press conference. Using stochastic simulations of the FRB/US model, the memo showed that there was a fairly wide distribution of outcomes for the peak size of the SOMA portfolio. Even after truncating this distribution by assuming that purchases would not continue beyond the end of 2014 regardless of the economic conditions at that time, the distribution of the size of the balance sheet and conditions projected to prevail at the time when purchases end were still widely dispersed.

Although the simplicity of the rule analyzed in that memo would likely improve the public's ability to predict future asset purchases and to understand their conditionality, recent developments illustrate that such a rule may well dictate changes in the pace of asset purchases that the Committee might view as inconsistent with appropriate monetary policy. In particular, the unemployment rate has continued to decline to a surprising extent given the readings on other dimensions of the recovery. In response to the 0.2 percentage point decline in the unemployment rate in August, the simple rule would have called for a reduction in the monthly pace of asset purchases of \$30 billion. However, the decline in the unemployment rate occurred in conjunction with a sizeable decline in the labor force participation rate and tepid payroll employment gains, thereby calling into question whether the decline reflected an improvement in labor market conditions. The main purpose of this memo is to illustrate the extent to which the tension between the simplicity of the rule and its capacity to prescribe appropriate policy in a range of circumstances is inherent in any rule that responds to only one labor market indicator.

Three Simple Rules

In reaction to the recent constellation of steady declines in the unemployment rate and uneven employment gains, we compare a slight variant of the unemployment rule presented in the earlier memo to two variants of simple rules that set the pace of asset purchases as a function of payroll employment gains. Under the unemployment-based rule purchases would end when the unemployment rate declines to 6.8 percent, and the two employment-based rules are calibrated such that, under the September Tealbook baseline, they lead to similar total amounts

¹ In normal circumstances, labor market indicators such as the unemployment rate and payroll employment are observable monthly, on a highly predictable schedule. The recent experience of the shutdown highlights that there would be some operational risk in adopting a simple rule predicated on the availability of such indicators on a specific, predetermined schedule.

² Bora Durdu, Eric Engen, and John Roberts, "Economic conditions and the Federal Reserve's balance sheet under a simple rule to guide large-scale asset purchases," memo to the FOMC, September 6, 2013.

of purchases that are completed at about the same time as under the unemployment-based rule. The unemployment-based rule would call for additional purchases of \$85 billion per month as long as the average unemployment rate in the previous quarter is 7.3 percent or higher. Once the unemployment rate falls below this level, the monthly pace of purchases declines by about \$20 billion for each 0.1 percentage point decrease in the unemployment rate; purchases stop when the unemployment rate reaches 6.8 percent. The first variant of the employment-based rule would call for a \$10 billion reduction in the monthly pace of purchases for each 200,000 increase in payroll employment relative to the September 2013 level of payroll employment (currently estimated at 136.3 million). The second employment-based rule would respond to payroll employment gains only above the level that staff estimate is roughly consistent with an unchanged unemployment rate in the presence of a constant labor force participation rate. Relative to the first employment-based rule, this feature would diminish the probability that the pace of purchases would be reduced in a situation in which the unemployment rate was rising. In particular, the third rule would call for a \$10 billion reduction in monthly asset purchases for each 100,000 cumulative increase in payroll employment since September 2013 beyond a trend rate of increase of 100,000 per month that is intended to accommodate trend growth in the labor force.³

Performance under Two Alternative Scenarios

The upper panel of Table 1 summarizes the total amount of purchases in 2013 and 2014, the peak size of the SOMA balance sheet, and the quarter in which purchases end under the three asset purchases rules using the September Tealbook baseline. Under the September baseline, purchases under all three rules start to slow in the first quarter of next year, are completed by the end of the third quarter, and lead to cumulative securities purchases in 2013 and 2014 of between \$1.3 and 1.4 trillion. They lead to nearly identical economic outcomes, which are shown for the unemployment-based rule by the black lines in Figure 1; the outcomes under the two employment-based rules are visually indistinguishable and therefore not shown in the figure.

The three rules will continue to deliver similar outcomes relative to each other in response to a wide range of shocks to the baseline outlook that move the unemployment rate and payroll employment in equal proportion relative to the point at which purchases end under each of the three rules. Instead of analyzing the relative performance of these three rules using stochastic simulations of the FRB/US model, we therefore focus on only those shocks that affect the performance of the rules relative to each other.⁴ In particular, there might be some developments, notably in labor force participation, that could lead to noticeable differences in the

³ Although the Committee would likely wish to make changes to the purchase program based on the timing of FOMC meetings, in the simulations reported in this section we can only allow for quarterly adjustments. We discuss issues related to the practical operation of these rules in the following section. To account for data release lags, purchases under these rules respond to average labor market conditions in the previous quarter. With the unemployment-based rule, the monthly pace of purchases (*PURCH*) in quarter *t* is prescribed by: $PURCH(t) = 85 - 200 \times [7.3 - UR(t-1)]$, where *UR* is the unemployment rate, and $0 \leq PURCH(t) \leq 85$. Under the first employment-based rule, *PURCH* is set according to: $PURCH(t) = 85 - 50 \times [PE(t-1) - 136.3]$, where *PE* is the quarterly average level of payroll employment (in millions). The second employment-based rule sets *PURCH* as: $PURCH(t) = 85 - 100 \times [PE(t-1) - 136.3 - NG(t-1)]$, where *NG*, the cumulative employment gains needed to keep the unemployment rate unchanged, is initialized at 0 in 2013Q3 and grows at 0.3 (i.e. 300,000 jobs) per quarter.

⁴ Except for the adjustment of the values in the unemployment-based rule at which purchases are assumed to begin to slow and to end, the results from the stochastic analysis of the unemployment-based rule in the earlier memo (see footnote 2) apply here as well.

purchases implied by these rules. Motivated by the unexpected behavior of the labor force participation rate, which has declined more than we expected in recent years, we assess the relative performance of the asset purchase rules under two alternative scenarios that assume that the degree of comovement between the unemployment rate and payroll employment differs from that in the baseline:⁵

1. In the first scenario, the reduction in the labor force participation rate following the recession turns out to be structural to a greater extent than assumed in the baseline. Additionally, the reduction in the participation rate is assumed to mostly take the form of unemployed workers leaving the labor force, with little effect on aggregate demand and the level of employment.⁶ As shown in the left panels of Figure 1, under all three rules, the unemployment rate declines a little faster than in the baseline, but payroll gains are little changed relative to the baseline. With faster declines in the unemployment rate, the unemployment-based rule calls for asset purchases to stop in the second quarter of 2014, one quarter earlier than in the baseline, and cumulate to \$120 billion less purchases than in the baseline (Table 1, middle panel). The employment-based rules, however, call for purchases to continue through the third quarter of 2014, with total purchases virtually unchanged relative to the baseline.

2. In the second scenario, the reduction in the labor force participation rate that has occurred since the recession turns out to largely reflect an unusually large cyclical movement. In particular, in this scenario the trend participation rate is assumed to have declined since 2007 at its pre-recession rate of only 5 basis points per year instead of 20 basis points as in the baseline. Thus, the participation rate currently stands nearly 2 percentage points below its trend. Going forward, the participation rate is assumed to rise about ½ percentage point a year for the next three years or so, thereby closing this gap by late 2016. In line with the historical 10-year average employment rate of labor-force entrants, we assume that 60 percent of the labor force entrants become employed, with the rest entering unemployment. As shown in the right panels of Figure 1, the unemployment rate remains persistently higher than in the baseline, running close to 6½ percent through late 2016. At the same time, employment gains run persistently above the baseline throughout the simulation period. In this scenario, the unemployment-based rule calls for a continuation of asset purchases through early 2015, with cumulative purchases exceeding their baseline value by \$316 billion. By contrast, in response to the stronger payroll gains, the employment-based rules call for purchases to stop in early 2014 or by the end of the current quarter, with cumulative purchases running \$240 billion and \$390 billion below the baseline, respectively. As noted earlier, the second employment-based rule reduces the probability of cutting the pace of purchases while the unemployment rate is rising, but in return it reduces the pace of purchases more rapidly than the first employment-based rule in situations in

⁵ As in the earlier memo on this subject (see footnote 2), the simulations are run under the assumption that financial market participants know the asset purchase rule in place and correctly anticipate the path of asset purchases in each of the scenarios. As in the baseline, the federal funds rate is set according to the inertial version of the Taylor (1999) rule subject to the unemployment and inflation thresholds.

⁶ The September Tealbook baseline assumed that the labor force participation rate is reverting back to the staff's judgmental estimate of the trend participation rate around the end of 2016. The current gap of about ½ percentage point between the participation rate and its trend is being closed by the participation rate remaining essentially unchanged through 2016, whereas the trend declines by about 20 basis points per year. However, the participation rate has been running below our judgmental trend estimate for several years now, which might suggest that the trend rate is lower than the baseline path. In the scenario, the participation rate is already closer to this lower trend and declines by about 0.2 percentage point per year going forward, but with labor demand and employment roughly unchanged relative to baseline, the unemployment rate declines more rapidly.

which employment growth runs noticeably higher than in the baseline. The greater amount of purchases under the unemployment-based rule leads to somewhat faster improvement in labor market conditions compared to the employment-based rules.

Issues Related to Implementation and Communications

The simulation results presented above are conducted at a quarterly frequency and abstract from several issues that are of relevance if the Committee wished to implement any of these rules on a meeting-by-meeting basis and wanted to communicate the rule it selected to the public. We briefly discuss three issues: Potential language that could be used in the FOMC statement to communicate these rules, the actual determination of the purchase amounts at any given FOMC meeting, and issues related to data reliability and revisions.⁷

For the *unemployment-based rule*, the Committee could choose to include in its statement the following description:

“The Committee intends to continue asset purchases until the level of the unemployment rate is $\frac{1}{2}$ percentage point below its value in September 2013, and expects to reduce the monthly pace of purchases roughly in proportion to observed progress toward that level.”⁸

In practice, to avoid having to communicate excessively precise purchase amounts, the reduction in the pace “roughly in proportion to observed progress toward that level” might be implemented by responding to changes in the unemployment rate rounded to the first decimal place as reported by the BLS, and by reducing the purchase amount by \$20 billion for each 0.1 percentage point reduction in the unemployment rate.⁹ Assuming the pace of asset purchases is set at each FOMC meeting, and that the Committee would respond to the latest available data, such a rule would—under the September Tealbook projection—call for a reduction in the monthly pace of asset purchases to about \$65 billion at the December 2013 meeting, with further reductions at subsequent meetings and purchases ending at the end of July 2014.¹⁰ Because the unemployment rate is revised only once a year to take on board new estimates of seasonal factors, revisions to the unemployment rate should have minimal implications for purchase amounts. But because the unemployment rate could increase as well as decrease, it would be important to clarify whether the pace of purchases would be increased if the unemployment rate were to rise following prior declines.

⁷ The discussion in this section assumes that the Committee announces a rule prior to the first reduction in the pace of purchases, such that the monthly pace of purchases at the time of the announcement is still \$85 billion.

⁸ This memo was written using the September Tealbook outlook as baseline, which projected the unemployment rate in September to be 7.3 percent, and thus a reduction in the unemployment rate by $\frac{1}{2}$ percentage point from its September value to imply a stopping point of 6.8 percent, as is assumed in the analysis in the previous section.

⁹ Under this rule, the final step in reducing purchases would be only \$5 billion.

¹⁰ As in the directive language provided in recent Tealbooks, the Committee might choose to reduce the pace of purchases at the start of the month following the FOMC meeting at which the reduction was decided. Such an approach would allow the Desk to complete its announced purchase plan for the month of the meeting before making a change.

The *first employment-based rule* could be described in the FOMC statement with the following words:

“The Committee intends to continue asset purchases until the level of nonfarm payrolls is 1¾ million above its value in September 2013, and expects to reduce the monthly pace of purchases roughly in proportion to observed progress toward that level.”

The reduction in the pace might be implemented by reducing the monthly purchase amount by \$10 billion for each 200,000 cumulative gain in nonfarm payrolls above the level of nonfarm payroll employment in September 2013, with cumulative gains rounded down to the nearest 100,000. The September 2013 level is currently estimated to be 136.3 million, but if this level were to be revised in the future, the cumulative increase would be calculated from the revised level. Under such an approach, purchases would end when the level of payroll employment has increased by 1.8 million, which according to the September Tealbook projection would be approximately by June 2014, the same time that the unemployment rate is projected to reach 6.8 percent. Under the September Tealbook projection such a rule would approximately call for a reduction in the monthly pace of asset purchases to \$65 billion at the December 2013 meeting, with further reductions at subsequent meetings and purchases ending at the end of July 2014. In the case of an employment-based rule, revisions to previously reported data, in the context of both monthly revisions and annual benchmarking, could lead to sizeable adjustments in the purchase amounts at subsequent meetings. Although outright declines in payroll employment are not currently projected, downward revisions to previous months' employment gains might necessitate a decision whether the pace of purchases would increase if the latest monthly level of employment is reported to be below the prior month's level reported in the previous release.

The *second employment-based rule* would raise more substantial communications issues, as the Committee would need to convey its estimate of the level of monthly payroll gains that it would consider to be neutral, on average, with respect to the unemployment rate. A possible description in the FOMC statement might be as follows:

“The Committee intends to continue asset purchases until the level of nonfarm payrolls is 1 million above monthly gains of 100,000 starting from the value of nonfarm payroll employment in September 2013, and expects to reduce the monthly pace of purchases roughly in proportion to observed progress toward that level in excess of the 100,000 per month trend.”

The reduction in the pace “roughly in proportion to observed progress toward that level in excess of the 100,000 per month trend” might be implemented by reducing the monthly purchase amount by \$10 billion for every 100,000 by which the cumulative gain in nonfarm payrolls exceeds a trend or baseline level of employment, which itself would be calculated as the level of nonfarm payroll employment in September 2013, augmented at the rate of 100,000 per month starting in October 2013. If the September 2013 level of payroll employment is revised in the future, the trend level of employment would be calculated from the revised level. Under the September Tealbook projection such a rule would call for the same sequence of reductions in the monthly pace of asset purchases as the first employment-based rule, with purchases ending at the end of July 2014.

Conclusions

Tying the future pace of asset purchases to a single labor market indicator would improve the public's ability to predict how the FOMC would adjust purchases in light of future employment reports. However, a number of tradeoffs might arise with the use of such simple rules. For example, the results discussed in this memo suggest that alternative scenarios for the evolution of labor market indicators and the assumed probability of realizations of such scenarios should be important considerations in the choice of that indicator. Any such simple rule might effectively lead policy makers and the public to treat the variable to which that rule responds to as the main measure—perhaps the only relevant measure—of improvement in labor market conditions. In case different labor market indicators send conflicting signals, the prescriptions from such a rule might appear inconsistent with appropriate monetary policy.¹¹ Given this concern, the Committee might want to include language providing for some flexibility, perhaps along the lines of “In determining adjustments to the pace of asset purchases, the Committee will also take into account other economic and financial developments as appropriate.” However, including such wording could undermine the credibility of the rule, and so reduce the expected benefits of providing a rule to the public.

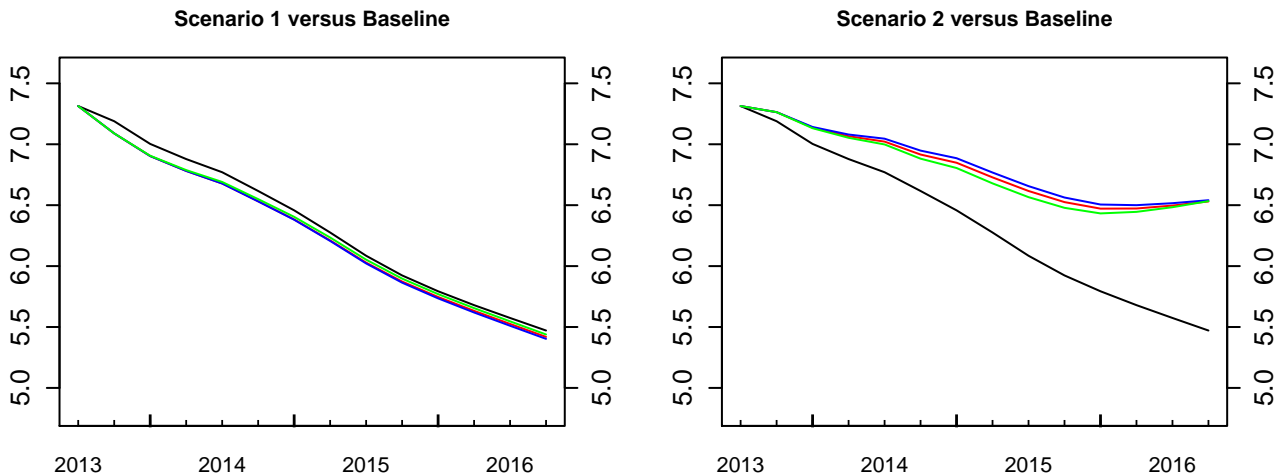
¹¹ While beyond the scope of the simulations, the differences in financial conditions and thus economic outcomes generated by different paths for asset purchases under the various rules, such as in the second scenario, could be substantially larger if the public drew conclusions from the paths of asset purchases about the future course of the federal funds rate that are different from the procedure for setting the funds rate path assumed here.

Table 1. Balance Sheet Implications of Different Purchase Rules

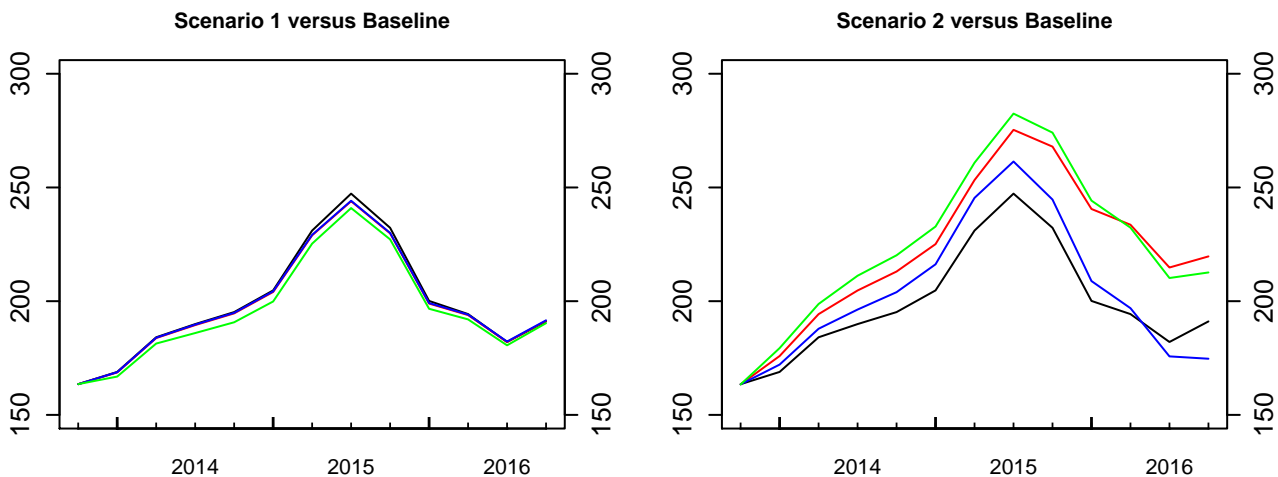
	Unemployment-based Rule	Employment-based Rule 1	Employment-based Rule 2
		Baseline	
Total purchases in 2013-14	1,287 billion	1,329 billion	1,411 billion
Peak balance sheet size	4,043 billion	4,085 billion	4,167 billion
Stopping date	2014:Q3	2014:Q3	2014:Q3
		Alternative Scenario 1	
Total purchases in 2013-14	1,167 billion	1,330 billion	1,413 billion
Peak balance sheet size	3,923 billion	4,086 billion	4,169 billion
Relative to baseline	-120 billion	1 billion	2 billion
Stopping date	2014:Q2	2014:Q3	2014:Q3
		Alternative Scenario 2	
Total purchases in 2013-15	1,603 billion	1,089 billion	1,020 billion
Peak balance sheet size	4,360 billion	3,845 billion	3,776 billion
Relative to baseline	316 billion	-240 billion	-391 billion
Stopping date	2015:Q1	2014:Q1	2013:Q4

Figure 1 – Macroeconomic Outcomes Under Different Purchase Rules

Unemployment Rate



Employment Growth (Thousands)



Four-Quarter Headline PCE Inflation

