GENERAL DISCUSSION James Hamilton responded to comments from Eric Swanson. He argued that Swanson's theory that unconventional monetary policy can have large effects at the effective lower bound (ELB) is more related to forward guidance than to large-scale asset purchases (LSAPs). Hamilton noted that his own choice in studying the Federal Reserve's policy announcement in March 2009 was because it was the most obvious, clear example of a "true" LSAP program, not because its effects seemed to die out. Hamilton further noted that Swanson counted the March 2009 FOMC policy announcement by the Fed as a "pure" policy shock. Hamilton instead argued that disentangling the actual effect of the LSAP program from the signaling effect was quite difficult. He further clarified that his argument is not that LSAPs had no effect, but that their effects are very easy to overestimate.

Janet Yellen agreed with Eric Swanson's conclusion that the bulk of evidence does suggest that LSAPs had a significant effect on interest rates and the economy. She did, however, agree with James Hamilton that it is difficult to disentangle the direct effect of asset purchases from changes in the public's expectations of future interest rates and the public's interpretation of the Fed's outlook for the economy when asset purchases are announced. She noted that although they would not be her preferred tool, she believed that LSAPs should remain a part of the Fed's tool kit. She noted that it was difficult to see the adverse side effects of LSAPs, despite the concerns by many that these effects would be large. In addition, she noted that forward guidance also seems quite important; hence, her focus on enhancing its role as part of the Fed's framework.

Eric Swanson shared some of James Hamilton's concerns about high-frequency event study estimates of the effects of the Fed's LSAPs. Estimates of LSAP effects should not rely only on these types of studies. However, he noted that substantial evidence from a variety of methods, data sets, and countries shows similar effects. These other studies thus corroborate the high-frequency event study estimates.

Kristin Forbes asked Eric Swanson about the practicality of implementing negative interest rates in the United States. She suggested that although a number of countries implemented negative interest rates after the Great Recession, the feasibility of such a policy varied across countries. For example, in the United Kingdom, the Bank of England had worried that setting interest rates below 0.5 percent would lead to problems for building societies and other segments of the financial sector. Would other countries, particularly those with similarly large financial sectors, face similar constraints—or other types of concerns?

Second, Forbes asked Yellen about her proposed "makeup" strategy for monetary policy after an ELB episode. Though Forbes understands the intuition behind "overshooting" and providing additional monetary policy accommodation after a period at the ELB, she wonders about the time horizon for such a policy. For example, if inflation expectations are well grounded, but inflation had been below target for almost a decade, should the makeup period also extend for as long as a decade? Forbes suggested a shorter period.

Janet Yellen responded to Forbes by noting that, if such a makeup policy were put in place before a recession, significant undershooting of the Fed's inflation target might not actually occur in the first place, because the Fed would be promising to provide additional accommodation in the future, shifting the public's expectations. If such a long period of undershooting did occur, then Yellen acknowledged the risk that a long makeup policy could unanchor inflation expectations by overshooting for too long. In such a scenario, the Fed might want to temper its approach.

Raghuram Rajan noted that, as an academic and former leader of a central bank, he was surprised at how many of the basic facts about monetary policy during the global financial crisis are still in dispute. He noted debate during discussion of Ben Bernanke's paper in the panel's previous session about whether Taylor Rule residuals were positive or negative before the crisis, and consequently whether policy was too accommodative. In the context of the current discussion, he noted ongoing debate about whether the effects of the LSAPs were actually positive, and whether unconventional monetary policy had a significant effect on exchange rates and capital flows. He viewed this debate as an indicator that further research is still needed.

Rajan focused on Kristin Forbes's comments, and he noted his pleasure that someone was willing to publicly acknowledge that exchange rates matter for setting monetary policy, as many central bankers had refused to do in the past. Rajan asked Forbes whether exchange rates are an important channel for central bankers to consider when conducting unconventional monetary policy. For example, it seemed that one reason the European Central Bank (ECB) began asset purchases was because most other central banks were conducting asset purchases, even while the ECB was not, causing an unwanted appreciation of the euro. He asked whether exchange rates and the cross-border transmission of policy should be considered in future debates about unconventional monetary policy.

Joshua Hausman noted his surprise that the panel did not discuss the case of Japan's unconventional monetary policy, and he asked what lessons they would take from unconventional monetary policy conducted as part of Prime Minister Shinzo Abe's "Abenomics" policy program. Particularly, he noted the country's failure to get inflation to its 2 percent target, despite dramatic and unconventional policy actions, such as yield curve control (that is, setting the 10-year government bond yield at 0 percent).

Mark Gertler acknowledged James Hamilton's critique of event study analysis in evaluating the effects of quantitative easing (QE), but Gertler struck a more optimistic tone about the policy. Specifically, he noted that the Federal Reserve's purchases of agency mortgage-backed securities were quite effective. The mechanism through which the policy acted was to affect excess returns on long-term securities that were unusually high due to financial market frictions. Without these frictions, such a policy would not have been effective, because speculators would arbitrage away the excess returns. During the global financial crisis, however, these frictions were clearly present because excess returns persisted. For government bonds, the excess returns manifested through higher term premiums. Though term premiums are quite difficult to measure, the interest rate spreads on asset-backed securities over government bonds were quite elevated. After QE1 was first announced in December 2008 and then implemented in March 2009, these spreads compressed. The same occurred after the announcement and implementation of QE3. Gertler viewed this as evidence of QE's effectiveness. Hamilton asked a clarifying question as to whether Gertler believed these financial frictions were persistent through the end of 2014, after QE3 was implemented. Gertler expressed his confidence that frictions were present for a few years after the crisis, but that it was not clear exactly how long they persisted.

Janet Yellen commented on the difficult experience of Japan, and saw the country's experience as a warning for how important it is to get inflation up after a binding ELB period. Yellen noted that inflation expectations in Japan had likely fallen and that such a phenomenon is a very difficult process to reverse.

Eric Swanson noted that monetary policy in Japan in the early 2000s was not very good. For example, the Bank of Japan only conducted asset purchases in a very superficial way, buying very-short-term government bonds. As a result, the Bank of Japan's policies had relatively little effect and the Japanese economy seems to have fallen into a deflationary expectations equilibrium. Swanson pointed to research by S. Boragan Aruoba, Pablo Cuba-Borda, and Frank Schorfheide that shows the United States is in a "normal" equilibrium and Japan is in a deflationary equilibrium.[1] Once Japan fell into a deflationary equilibrium, Swanson argued, it became much harder for it to extricate itself and return to the normal equilibrium.

Kristin Forbes noted that Japan could be a good case study of how unconventional monetary policy works through exchange rates, perhaps to a greater degree than conventional monetary policy, as suggested by Raghuram Rajan. Japan's unconventional monetary policy resulted in large exchange rate movements that seemed to fuel much of the policy's economic stimulus. Studying this dynamic also addresses the potential spillovers of unconventional monetary policy working through different channels. Forbes expressed her surprise, when she joined the Bank of England as a Monetary Policy Committee member, about how exchange rate movements were incorporated into inflation forecasts and monetary policy decisions. Exchange rate shocks were modeled at the Bank of England as exogenous and resulting from risk shocks; little thought was given to other reasons why exchange rates might move and how this could determine the effects. Recent research, however, shows that exchange rate movements resulting from monetary policy shocks can result in much larger pass-through effects to inflation than exchange rate movements caused by other shocks. However, none of this was discussed at the Bank of England at the time. Forbes speculated that a possible reason may be that economists have been so ingrained to think that they cannot explain exchange rate movements, deterring them from attempting to model them. She argued that exchange rates should be a key part of the conversation on monetary policy, especially in countries like the United Kingdom where exchange rate pass-through effects can be large. She noted, however, that while emerging markets would also like exchange rates to be a bigger part of the conversation about the spillovers from monetary policy in other countries, this would be difficult to implement for advanced economies' central banks, whose mandates are usually politically constrained to focus on the domestic sphere.

Jeff Fuhrer made two points. He first suggested looking at different ways that monetary policy might have been constrained, or ways in which it could have done more during the Great Recession. For example, he suggested looking at central banks' loss functions in the wake of the Great Recession to measure the degree of overall welfare loss incurred across

1. Aruoba, S. Boragan, Pablo Cuba-Borda, and Frank Schorfheide, "Macroeconomic Dynamics Near the ZLB: A Tale of Two Countries," *Review of Economic Studies* 85, no. 1 (2018): 87–118, https://doi.org/10.1093/restud/rdx027.

different economies despite sizable monetary and fiscal actions. Such an analysis might suggest that monetary policy could have done more to right the economy. Of course, all these estimates of the loss function are dependent on the models used. Second, he noted the danger of monetary policy solutions that rely too much on expectations. For one, during a crisis, the public might not find policymakers' promises of action in the future to be credible compared with actual action taken at the time of the crisis. He noted that is striking how little economists know about how expectations are actually formed, given how much monetary policy depends on expectations. He pointed to research by the University of California, Berkeley, economist Yuriy Gorodnichenko and the University of Texas–Austin economist Olivier Coibion on expectations formations, as well as work by the Harvard economist Andrei Shleifer and his colleagues.

Athanasios Orphanides remarked on monetary policy at the ELB. He noted that it would be useful for central banks to cut interest rates faster as they approach the ELB, opting to reach the ELB quicker than conventional monetary policy rules would recommend. He and Volker Wieland recommended in a 2000 paper that the Bank of Japan implement this strategy, to no avail.[2] Likewise, they had difficulty convincing policymakers to implement a similar strategy in 2008. He emphasized that the idea of "saving ammunition," or waiting to cut interest rates down to the ELB during a time of crisis, should be permanently discarded.

Orphanides also asked the panel about negative interest rates. He noted that although there are no limits to the size of QE, there could be political effects of QE that are quite large. He noted that, instead, the Fed might consider announcing ahead of time how low it would be willing to cut interest rates in the next recession. Would it be willing to go to –1 or –1.5 percent? Announcing this ahead of time would change expectations about how likely it would be that the ELB actually binds in the future, and therefore might decrease the possibility that more controversial policies like QE would be needed at all.

Philipp Hartmann explained the ECB's experience in implementing negative interest rates. The ECB cut its deposit facility rate to –0.4 percent in four small steps between June 2014 and March 2016. New studies are now coming out about the effect of these policies, and most of the research suggests that negative interest rates worked in the euro area.

2. Athanasios Orphanides and Volker Wieland, "Efficient Monetary Policy Design Near Price Stability," *Journal of the Japanese and International Economies* 14, no. 4 (2000): 327–65, https://doi.org/10.1006/jjie.2000.0452.

However, negative interest rates might not be the most powerful instrument because there is a limit to how low they can go, and therefore to how much accommodation can be provided. For example, research by Markus Brunnermeier and Yann Kobe suggests that below a certain level the policy could become counterproductive.[3] The effects of the ECB's policy worked through the interest rate and bank lending channel. First, there was a "twist" and a "shift" in the yield curve. The twist was a result of negative rates acting as a charge on cash hoarding and triggering portfolio shifts toward long-term bonds compressing the term premium. The shift was simply a result of the removal of the nonnegativity constraint on future expected short-term rates. The second, and perhaps more surprising, positive effect of negative interest rates was through the bank lending channel. Several studies by ECB economists suggest that negative interest rates increased lending. Florian Heider, Farzad Saidi, and Glenn Schepens find this effect for the syndicated loans of banks with a relatively large share of market-based funding relative to retail-deposit based funding (because wholesale funding rates can go negative but retail rates do not, and therefore retail banks do not benefit from funding relief through negative policy rates).[4] Jens Eisenschmidt and Smets and Selva Demiralp, Eisenschmidt, and Thomas Vlassopoulos present evidence of positive lending effects for broader credit measures, including banks with large retail deposit bases.[5] The former research also finds the pass-through to lending rates to remain unchanged. It should, however, be kept in mind that negative rates were introduced by the ECB in parallel with other unconventional monetary policy measures, notably targeted long-term refinancing operations and asset purchase programs. Therefore, for some of the studies not all the lending effects can be associated with negative rates alone. But they can be seen as "activating"

3. Markus Brunnermeier and Yann Kobe, "The Reversal Interest Rate," working paper, Princeton University, March 2018.

4. Florian Heider, Farzad Saidi, and Glenn Schepens, "Life Below Zero: Bank Lending under Negative Policy Rates," ECB Working Paper 2173, August 2018, forthcoming in *Review of Financial Studies*, https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2173.en.pdf?de58f4c0f6cf96f0a7d99014d0ed2454.

5. Jens Eisenschmidt and Frank Smets, "Negative Interest Rates: Lessons from the Euro Area," unpublished paper, ECB, March 2018, https://cepr.org/sites/default/files/40021%20Eisenschmidt%20Smets%202017%20March%202018.pdf; Selva Demiralp, Jens Eisenschmidt, and Thomas Vlassopoulos, "Negative Interest Rates, Excess Liquidity, and Retail Deposits: Banks' Reaction to Unconventional Monetary Policy in the Euro Area," ECB Working Paper 2283, May 2018, https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2283~2ccc074964.en.pdf?fbb6d4de645fdd3ea2f6b24834bfd82c.

the excess reserves induced in the system through those other measures, which would otherwise have remained idle.

Hartmann further discussed the effect of the exchange rate and agreed that the effects are country dependent. In the ECB's case, the effects also seemed to be state dependent—sometimes, the exchange rate effects of monetary policy were larger; other times, not so much. Most of the available evidence, however, suggests that there are fewer international spillovers from ECB unconventional monetary policy, particularly to emerging markets, because the euro is less of a global currency than the dollar.

Hartmann suggested that the panel discuss the cost-benefit analysis of different unconventional monetary policies given the potential for unintended side effects. He referenced this year's economic conference sponsored by the Federal Reserve Bank of Boston, which had captured this perspective very nicely.[6] Given the lexicographic ordering of objectives in the ECB's mandate, it is somewhat hard to say with precision which weight potential side effects should receive. He wondered how the Fed evaluated the cost-benefit trade-offs of unconventional monetary policy, for example, given their potential effects on financial stability, and how this analysis pairs with the macroprudential regulation and supervision of financial institutions.

Michael Kiley agreed with many of the discussants that the evidence supported the efficacy of QE; at the same time, he argued that this evidence primarily focuses on the effect of QE on financial markets, and not on the transmission of these effects to real activity or inflation. Although research in the latter areas is limited, he thought the evidence suggested that QE may have been less effective on these dimensions—which are the ultimate objective of monetary policymakers—than Eric Swanson suggested. He expressed his support for the types of makeup policies that Yellen laid out in her presentation but wondered if they would be fully credible and appreciated by the public. He suggested, instead, consideration of the simpler approach of raising the inflation target to about 3 percent. Though he acknowledged that such a move might be unpopular, he argued that another large QE program of $2 trillion to $3 trillion might be just as unpopular.

Kristin Forbes first addressed the comments by Athanasios Orphanides. She disagreed with his comment that there are no constraints on QE. She

6. Conference on "What Are the Consequences of Long Spells of Low Interest Rates," Federal Reserve Bank of Boston, Boston, September 7–8, 2018, https://www.bostonfed.org/consequences2018/agenda/.

noted that QE is constrained by the characteristics of the assets and the size of the asset pool from which a central bank can purchase assets. Specifically, if a central bank could buy corporate bonds or other assets, it probably should not purchase corporate assets of the financial institutions that they regulate, or companies with significant risks. These restrictions—plus the size of the overall pool—place limits on the size of QE. But there are also other options to provide an unconventional stimulus than purchasing assets. She referenced an effective program implemented by the Bank of England known as the "funding for lending scheme." In this program, the Bank of England set up an incentive system where banks received a subsidized lending rate for increasing their total lending. The goal of the program was to more efficiently pass through the reduction in interest rates by the Bank of England to customers as interest rates approached the ELB. Forbes and other Bank of England officials were surprised at the level of participation in the program despite the slower growth of the U.K. economy. She noted that this type of program could merit further investigation by other countries.

Forbes also agreed with Philipp Hartmann that cost-benefit analysis is important in monetary policy. She noted that it is important not to disregard certain costs as outside the mandate of a given central bank, because these costs can accumulate over time, especially when interest rates are low.

Eric Swanson addressed the question from Jeff Fuhrer regarding whether the Federal Reserve could have provided additional monetary policy accommodation during the global financial crisis. Swanson argued that, in retrospect, the Fed definitely could have done more, particularly from 2009 to 2011. Stronger forward guidance could have brought the two-year Treasury yield down from 1 percent during this period to close to 0 percent. He contended that the only reason the Fed did not do this was because it was still figuring out how to communicate forward guidance to the markets more effectively. It took the Fed until August 2011, when it implemented date-based forward guidance, to figure out how to better lower interest rate expectations.

Regarding the idea for a higher inflation target raised by Michael Kiley, Swanson mentioned a symposium at the San Francisco Federal Reserve Bank that he attended at which every participant opposed raising the inflation target.[7] The Boston College economist Peter Ireland particularly argued

7. "A New Target for Monetary Policy," symposium at the Federal Reserve Bank of San Francisco, March 2, 2018.

at the symposium that, based on research in the 1990s by Martin Feldstein and others, inflation as low as 3 percent could still be quite costly.[8]

Janet Yellen addressed the question of negative interest rates. She noted that when the Federal Reserve was considering cutting interest rates down to 0 percent instead of the range of 0 to 0.25 percent to which it ultimately did cut rates, it was worried about the distortionary effects of very low rates. Particularly, it was concerned about the functioning of money markets and that banks would not or could not pass through very low or negative rates to retail depositors. Yellen noted her surprise that so many European countries and Japan were able to cut interest rates to as negative a level as they did. She noted that there is some research showing the effects of negative interest rates should be evaluated through the bank lending channel, and that there could be adverse side effects. She noted that this is a topic worth studying for the Fed in the future.

Regarding a higher inflation target, Yellen suggested that solving the problem of the ELB would actually require an inflation target higher than 3 percent. An inflation target that high would call into question whether the Fed would be meeting its price stability mandate, and she doubted that Congress would consider such a high inflation target as consistent with price stability. Therefore, such a policy change would be unpopular politically.

8. Martin Feldstein, "The Costs and Benefits of Going from Low Inflation to Price Stability," in *Reducing Inflation: Motivation and Strategy*, edited by Christina Romer and David Romer (University of Chicago Press, 1997).