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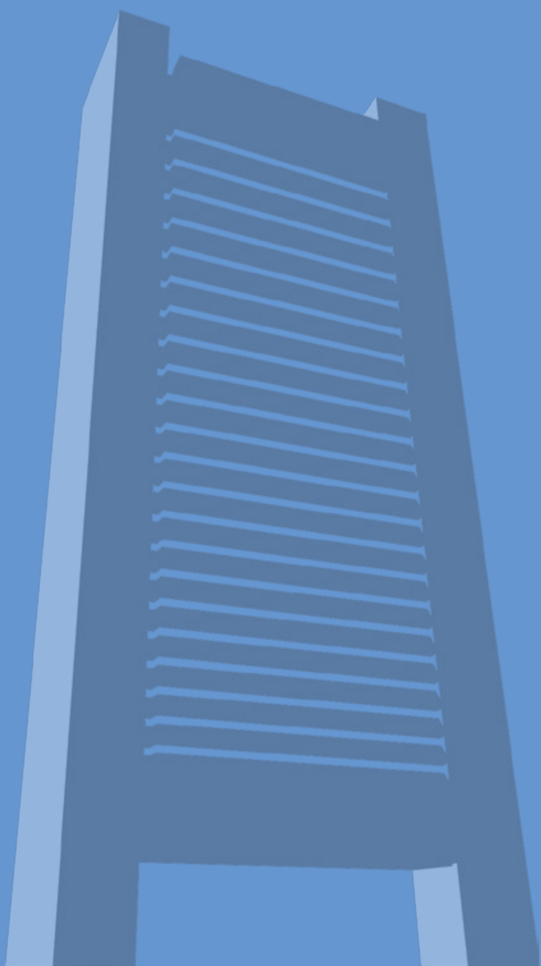

Lessons from the U.S. Experience with QE

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Federal Reserve Experience with QE

- Too soon to make a full assessment in the U.S. – full evaluation will require a successful return to a normalized monetary policy
- While the tapering process is complete, we still are a long way from normalizing either short-term interest rates or our balance sheet
- However, it is still appropriate to evaluate which design features were effective, and which were less successful in achieving our monetary policy goals
- An important lesson is that the communications strategy is equally important

Central Bank Differences

- Important caveat – institutional, structural and governance differences across central banks can make comparisons of policy actions difficult
- An important difference between the Fed in the U.S. and most central banks in developed countries is the Federal Reserve’s dual mandate (maximum sustainable employment as well as stable prices)
- Another important difference involves restrictions on securities the Fed can purchase – we are limited to securities that have the full backing of the U.S. government

Role of Energy Shocks

- Oil supply shocks have been associated with major monetary policy changes before
- Negative oil shock factored into failure to control inflation in the U.S. in the 1970s
  - Former Chairman Volcker is recognized for taking forceful action and ultimately taming inflation
- Positive oil shock now – mirror image of the problem in the 1970s
  - Failure to quickly address a significant undershooting of inflation targets could potentially leave economies stagnant at the zero lower bound

Lessons Learned

- Significant *under*shooting of the inflation target should be treated with the same policy urgency as a significant *over*shooting
- *Open-ended* quantitative easing tied to policy goals is likely to be much more effective than limited quantitative easing programs
- Clarity on monetary policy communications is difficult to achieve, but critically important for the success of the program
- Communication is as critical to how we *normalize* policy as it is to how we *initiate* quantitative easing policies

Figure 1: Monetary Policy: Large-Scale Asset Purchase Programs – QE1, QE2, QE3, and Operation Twist

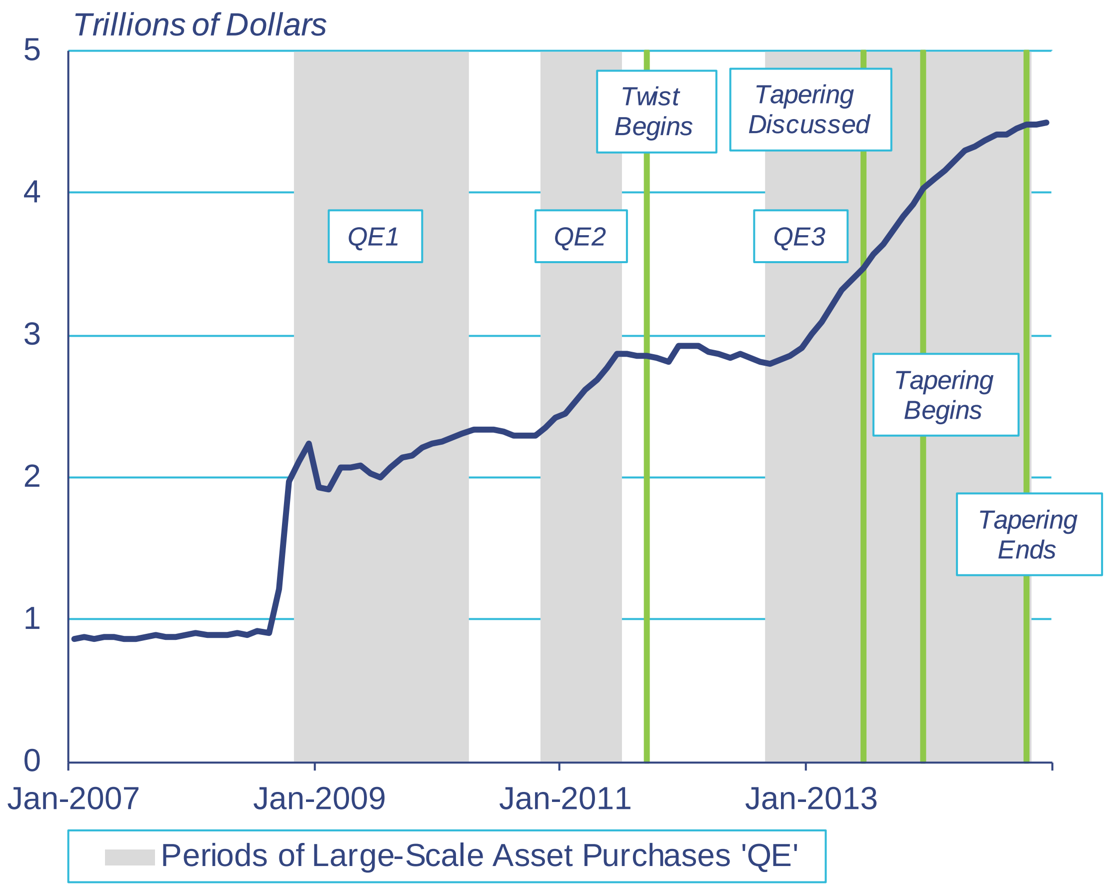
Program	Announcement Date	Targeted End Date	Targeted Total Purchase	Composition of Purchases	Program Details as Announced
Quantitative Easing 1 (QE1)	November 25, 2008	Over Several Quarters	Agency Debt: Up to $100 bil Agency MBS: Up to $500 bil	Agency Debt and Agency MBS	Purchase up to $100 bil of agency debt and up to $500 bil of agency MBS. Purchases expected to take place over several quarters.
	March 18, 2009	Treasury Securities: September 30, 2009 Agency Debt and MBS: December 31, 2009	Agency Debt: Additional $100 bil Agency MBS: Additional $750 bil Longer-Term Treasuries: $300 bil	Agency Debt, Agency MBS, and Longer-Term Treasury Securities	Total purchases of agency MBS will now be to up to $1.25 trillion, and agency debt up to $200 bil. Purchase up to $300 bil of longer-term Treasury securities over next 6 months.
Quantitative Easing 2 (QE2)	November 3, 2010	June 30, 2011	$600 bil	Longer-Term Treasury Securities	Purchase $600 bil of longer-term Treasury securities by the end of the second quarter of 2011, a pace of about $75 bil per month.
Maturity Extension Program (Operation Twist)	September 21, 2011	June 30, 2012	$400 bil	Longer-Term Treasury Securities[1]	Purchase, by the end of June 2012, $400 bil of Treasury securities with remaining maturities of 6-30 years and sell an equal amount of Treasury securities with remaining maturities of 3 years or less.
	June 20, 2012	December 31, 2012	Amount Limited by Remaining Shorter-Term Treasury Securities[1]	Longer-Term Treasury Securities[1]	Purchase Treasury securities with remaining maturities of 6-30 years at the current pace and sell or redeem an equal amount of Treasury securities with remaining maturities of approximately 3 years or less.
Quantitative Easing 3 (QE3)	September 13, 2012	None Given	None Given	Agency MBS and Longer-Term Treasury Securities	Purchase agency MBS at pace of $40 bil per month and continue Twist through yearend, increasing holdings of longer-term securities in aggregate by $85 bil.
	December 12, 2012	None Given	None Given	Agency MBS and Longer-Term Treasury Securities	Purchase agency MBS at a pace of $40 bil per month and longer-term Treasury securities initially at a pace of $45 bil per month after Twist ends at yearend.

[1] Shorter-term Treasury securities are sold or redeemed while an equal amount of longer-term Treasury securities are purchased, resulting in no net increase in balance-sheet size.

Source: Federal Open Market Committee (FOMC)

Figure 2: Federal Reserve System Assets

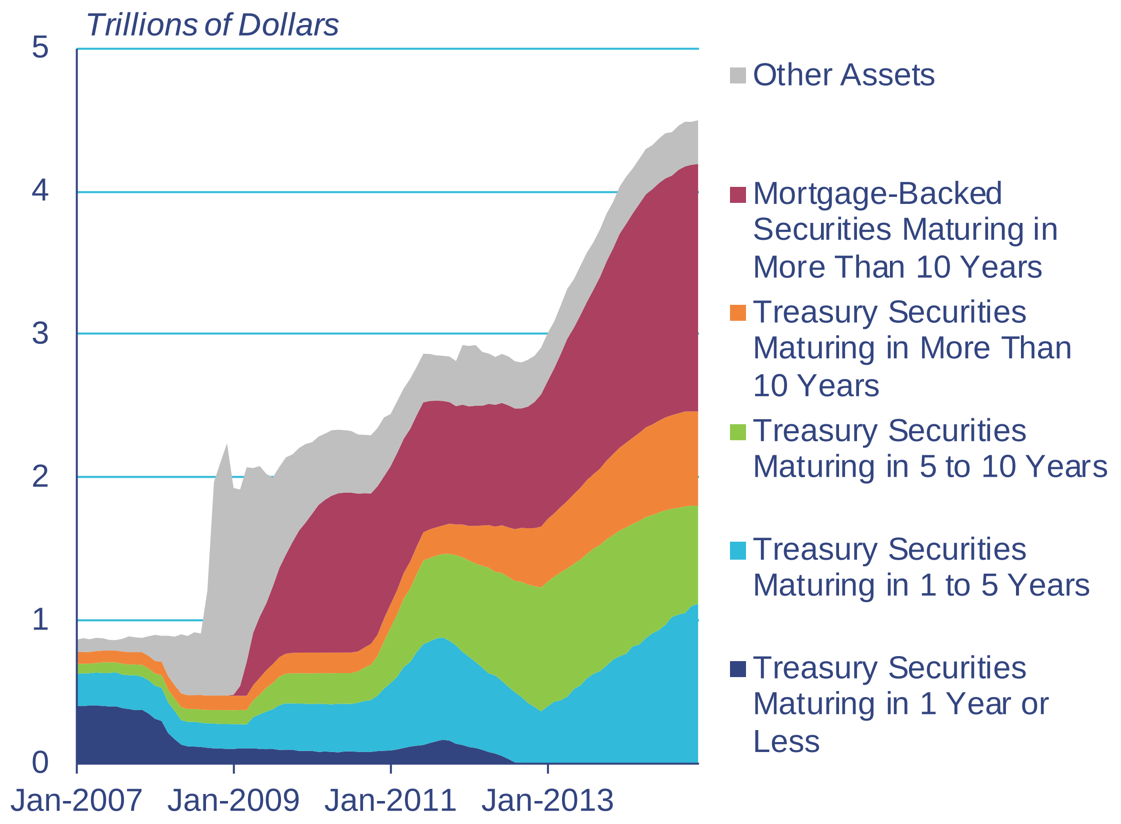
January 2007 - December 2014



Source: Federal Reserve Board, Haver Analytics

Figure 3: Federal Reserve System Assets

January 2007 - December 2014



Source: Federal Reserve Board, Haver Analytics

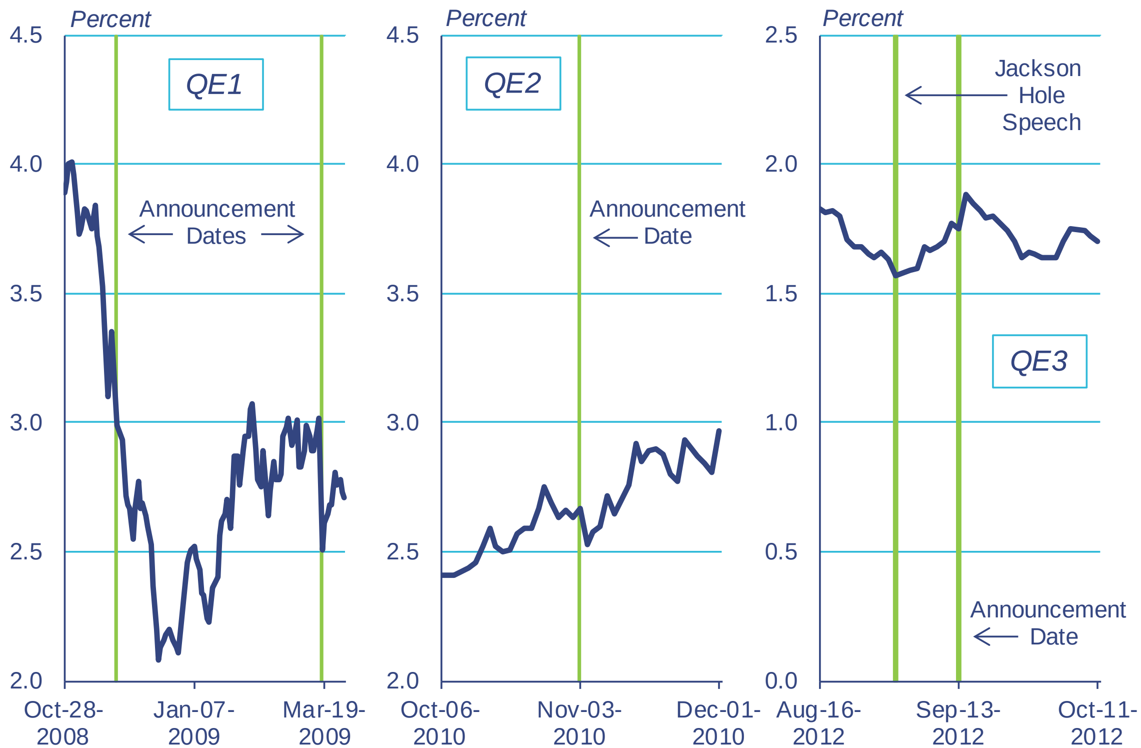
Impact of Programs

- Event Studies – Gagnon, Raskin, Remache and Sack (2011), Hancock and Passmore (2011), Hamilton and Wu (2010), Krishnamurthy and Vissing-Jorgensen (2011)
- Imprecisely estimated, but roughly a 20-25 basis point reduction in long-term rates associated with a purchase of $500 billion in long-term assets
  - Numerous Federal Reserve officials were publicly discussing possible policy options
  - Timing of *exactly when the market came to expect* a new program is hard to pinpoint

Broader Impact

- Statements at various times emphasized that program would:
  - “Put downward pressure on longer-term interest rates”
  - “Support mortgage markets”
- Examine broad differences in QE2 and QE3 impact

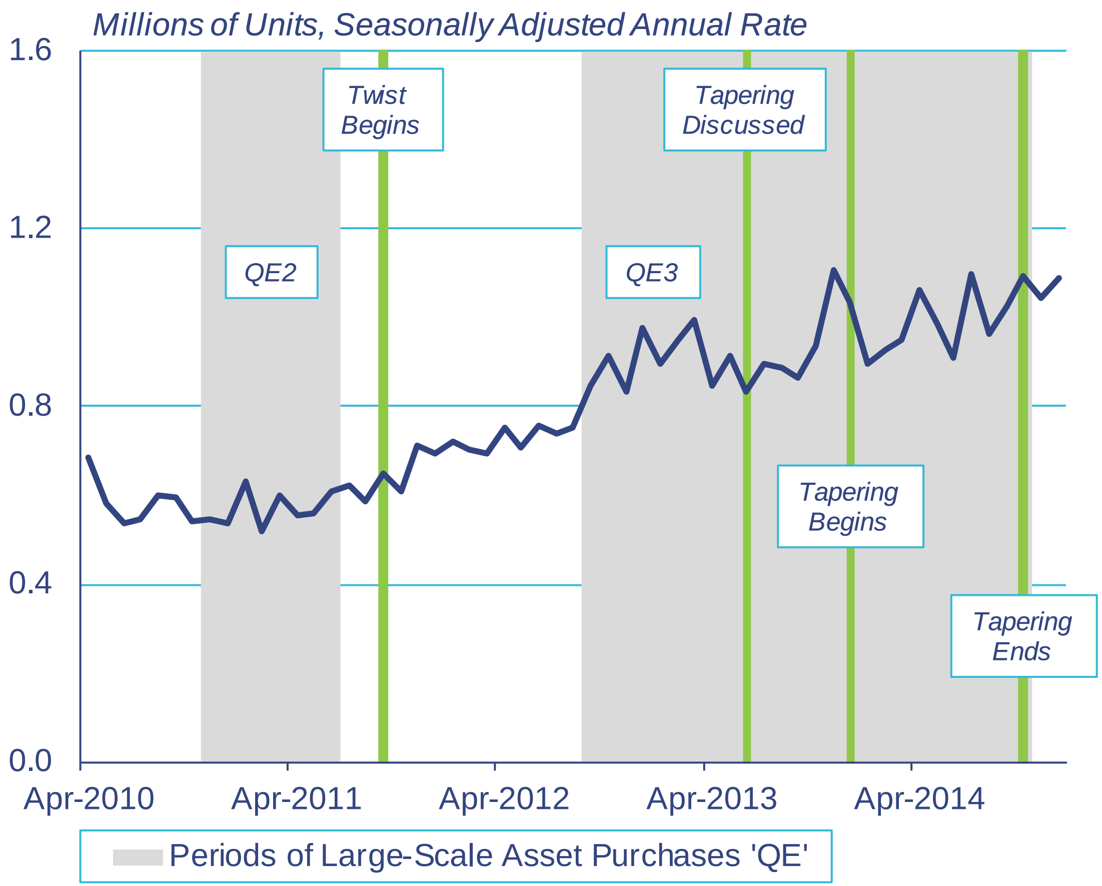
Figure 4: Quantitative Easing Announcements and Ten-Year Treasury Yields



Source: Federal Reserve Board, Haver Analytics

Figure 5: Housing Starts

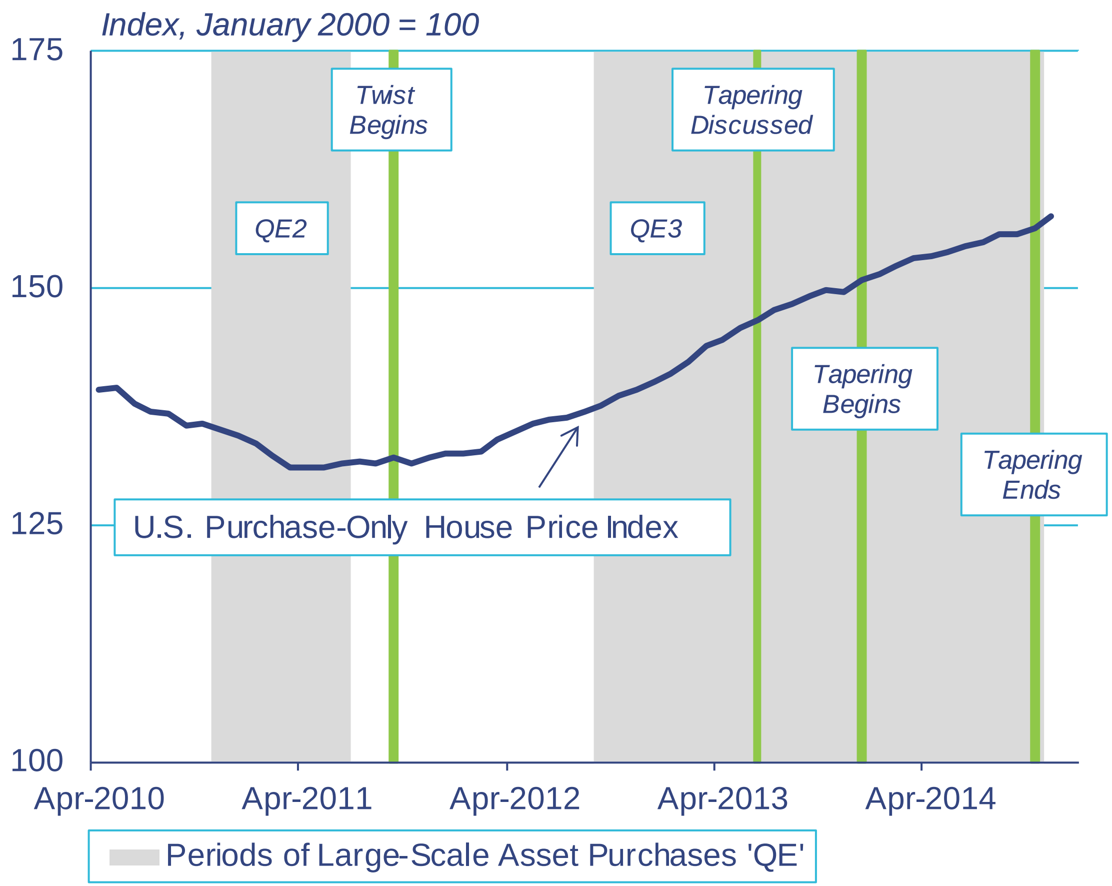
April 2010 - December 2014



Source: Census Bureau, Haver Analytics

Figure 6: U.S. House Price Index

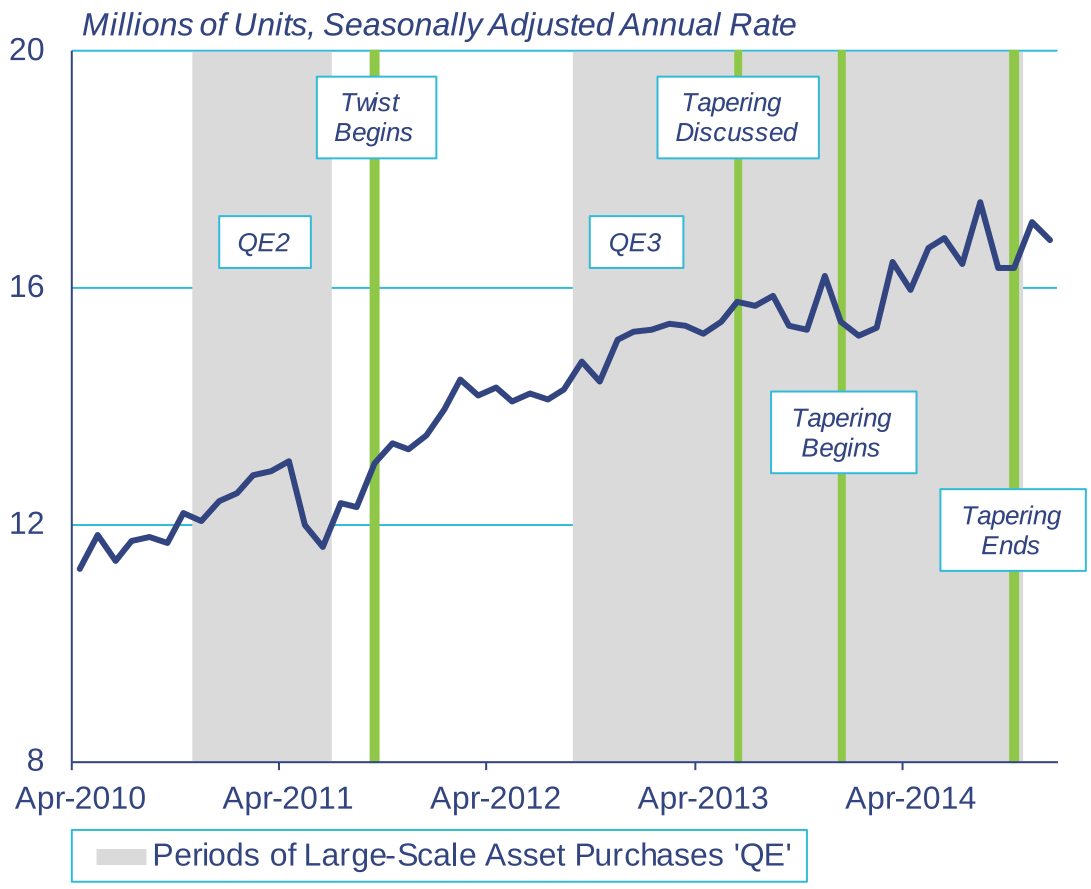
April 2010 - November 2014



Source: FHFA, Haver Analytics

Figure 7: Auto and Light-Weight Truck Sales

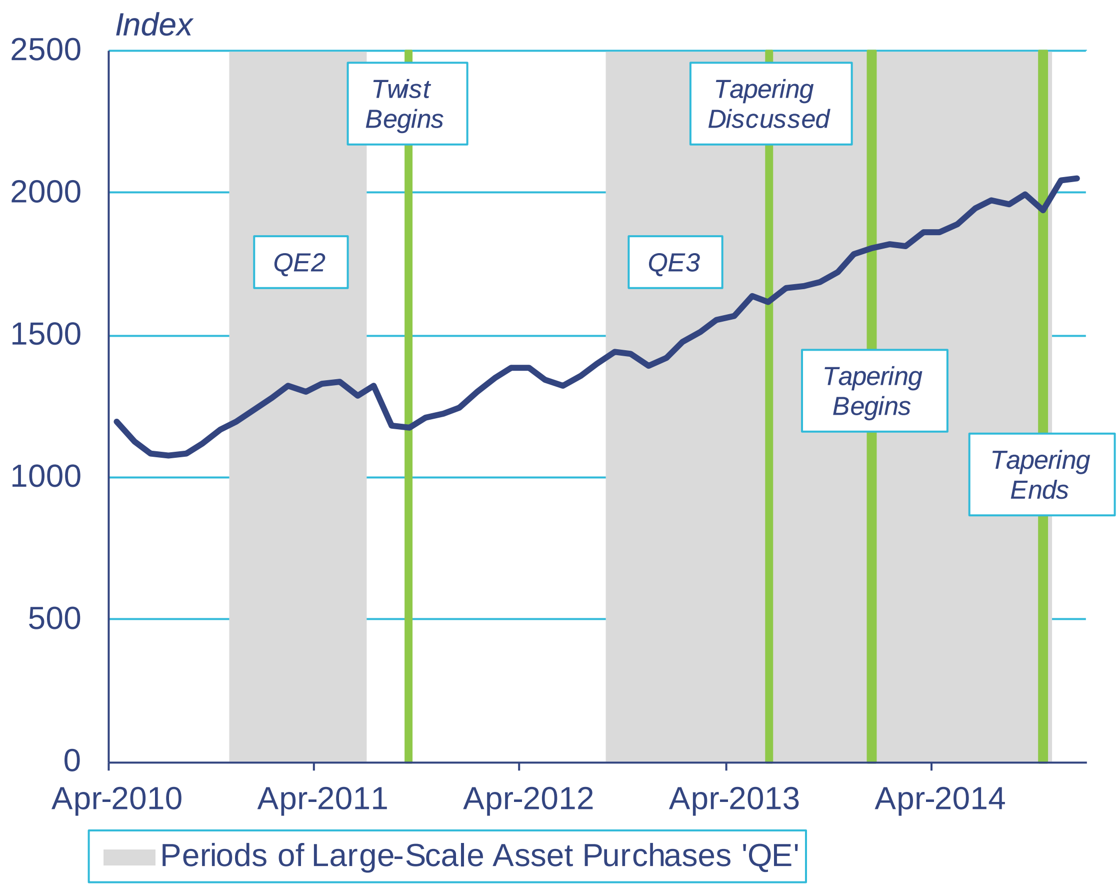
April 2010 - December 2014



Source: BEA, Haver Analytics

Figure 8: S&P 500 Composite Stock Price Index

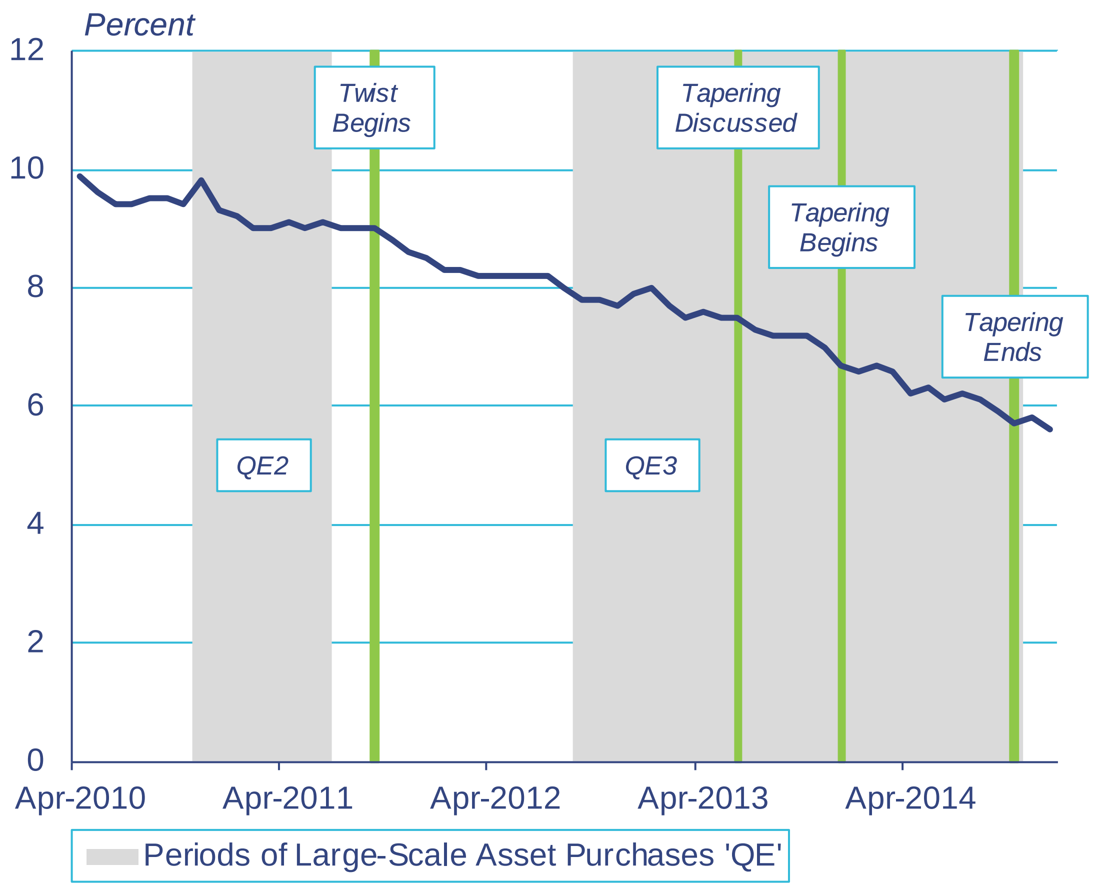
April 2010 - December 2014



Source: S&P, Haver Analytics

Figure 9: Civilian Unemployment Rate

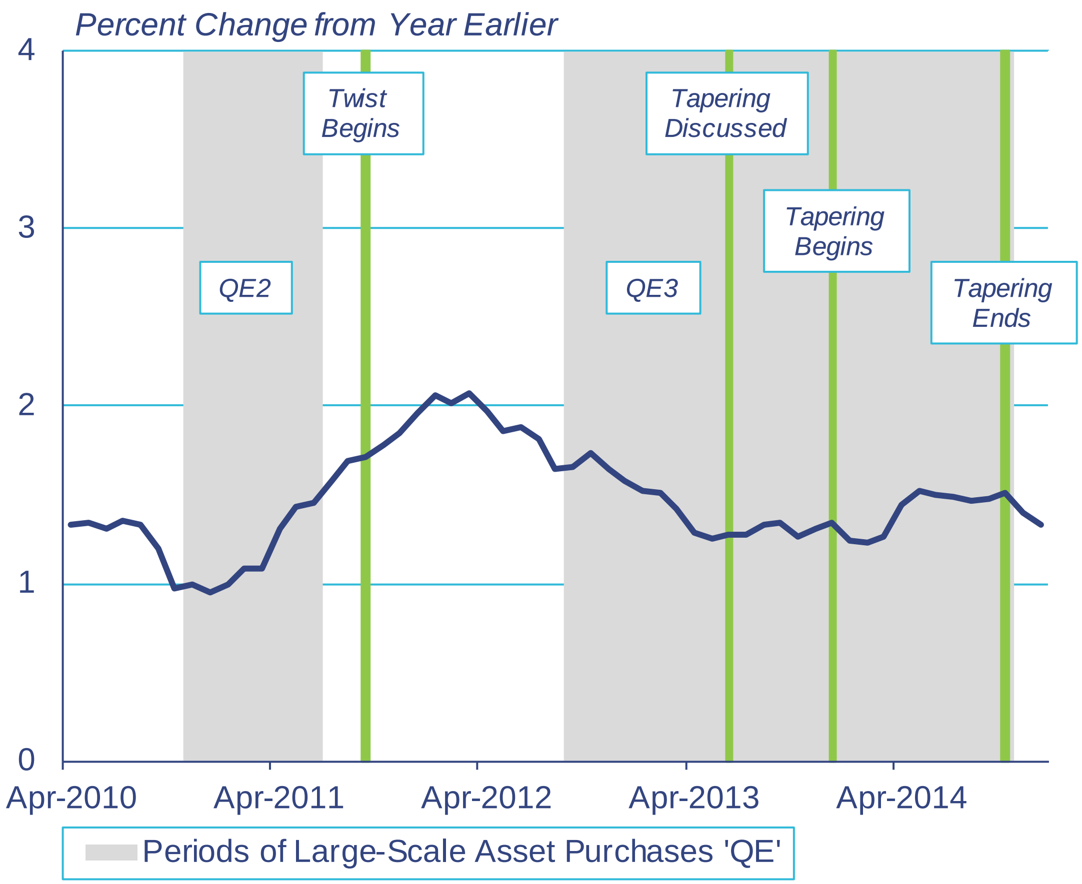
April 2010 - December 2014



Source: BLS, Haver Analytics

Figure 10: Inflation Rate: Change in Core Personal Consumption Expenditures Price Index

April 2010 - December 2014



Source: BEA, Haver Analytics

Observations

- The presence of full employment in the Fed's dual mandate, and the pain felt in U.S. labor markets, coupled with core inflation below 2 percent, provided plenty of support for aggressive policy actions
- QE2
  - Limited in scope – fixed purchase amount
  - Not communicated in a manner tied to goals
  - Focused on Treasury securities rather than areas with larger spreads, such as mortgages
  - As a result – limited impact

QE3

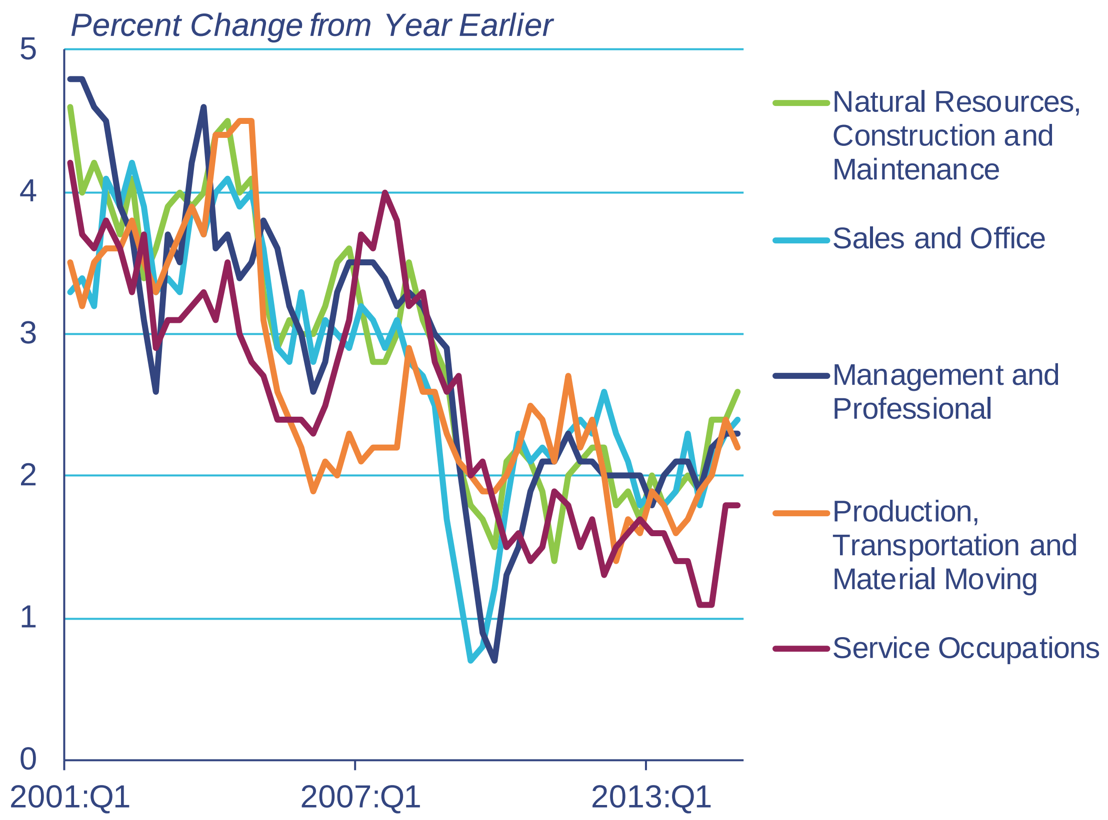
- QE3 was limited only by the progress made against goals
  - Purchases were open-ended
  - Communication was firmly tied to goals
  - It included areas with larger spreads, such as mortgages
- Both financial variables and real variables showed improvement with this program

Exit Strategy

- Policy should not be focused on progress from where we have been
- Policy should instead be focused on meeting the ultimate goals in a timely fashion
- At this time, there is insufficient evidence that U.S. inflation is clearly trending toward the 2 percent goal
- A policy of patience in the U.S. continues to be appropriate
- There are asymmetric costs and challenges, given that the U.S. remains at the zero lower bound

Figure 11: Employment Cost Index for Total Compensation for Private Industry Workers by Occupational Group

2001:Q1 - 2014:Q4



Source: BLS, Haver Analytics

Concluding Observations

- Focus has been on the U.S. experience
  - Japanese experience of raising the rate of inflation with a broad open-ended program tied to its policy goal is encouraging
  - We will also learn from recently announced programs being initiated in Europe
- The focus among central banks around the world on persistently low inflation rates is encouraging
- Problems generated by low inflation and interest rates settling at the zero lower bound were underestimated by professional economists and central bankers alike
- Actions being taken to achieve inflation targets should result in a more robust global economy