



Essential concepts necessary to consider when evaluating the efficacy of quantitative easing[☆]

Bluford H. Putnam^{*}

Chief Economist, CME Group, United States

ARTICLE INFO

Article history:

Received 1 October 2012

Accepted 1 December 2012

Available online 22 December 2012

JEL classification:

E5

E6

Keywords:

Monetary policy

Quantitative easing

Central banking

Deleveraging

ABSTRACT

The economic impact from quantitative easing (QE) may be much less than assumed by the Federal Reserve. One focus is on the effectiveness of QE to stabilize a failing banking system, and the judgment here is largely positive. A second focus, especially in the US, is on evaluating subsequent rounds of QE that were implemented after the economy had resumed growth and after the banking sector had recapitalized and returned to profitability. For these subsequent rounds of QE, the reviews are decidedly mixed and heavily dependent on the assumptions embedded in the economic models used by the researchers. Researchers willing to assume that the US is a closed domestic economy tend to find a large impact on long-term interest rates from QE. If the US is part of a highly integrated global economy, a smaller effect is presumed. Then there is the more important and controversial evaluation of whether there is any impact on real GDP growth and job creation from QE once the economy is growing again, even if unemployment rates remain historically elevated. What one chooses to ignore or assume does not exist can be more important to the conclusions of QE evaluations than may meet the eye. Inappropriate assumptions can lead to poor decisions.

© 2012 Elsevier Inc. All rights reserved.

1. Introduction

Since the 2008 financial panic, central banks in the US, UK, Europe, and Japan have experimented with the aggressive use of their balance sheets to stabilize their financial markets and encourage a return to higher rates of economic activity. These activities have become known as quantitative easing or QE. This research focuses mostly on balance sheet activities employed by the US Federal Reserve (Fed), and distinguishes between the initial round of quantitative easing (QE1) in late 2008, with later rounds of balance sheet activity to purchase more US Treasury securities or mortgage-backed securities (QE2 & QE3) and to adopt the maturity extension program (i.e., Operation Twist). With respect to certain ideas presented here, in a few cases we also consider European Central Bank (ECB) activities that were relevant to the discussion.

[☆] All examples in this presentation are hypothetical interpretations of situations and are used for explanation purposes only. The opinions expressed in this report are those of the author and do not necessarily represent those of CME Group or affiliated institutions. This report and the information herein should not be considered investment advice or the results of actual market experience. An earlier version of this research was published in September 2012 on CME Group's web site in its "Market Insights" section. The author wishes to thank D. Sykes Wilford for his extensive and thorough comments on earlier drafts of this research as well as an anonymous referee for some extremely helpful suggestions.

^{*} Tel.: +1 301 872 5200.

E-mail address: BLU@BAYES1.COM.

Our first priority is to present a generalized set of theoretical ideas to guide our assessment of quantitative easing and to identify the conditions under which it is likely to achieve the desired economic and financial market results. We recognize that some of these ideas may be controversial. There is considerable value, however, in explicitly recognizing the embedded assumptions in models designed to assess the impacts of quantitative easing. By making key assumptions explicit, we better understand why different quantitative models see quantitative easing in such varying lights, and we can better interpret their likely robustness as a tool to guide either policy decisions or market participant actions. Finally, as we link our theoretical ideas with the actual quantitative easing that has occurred, we want to draw some tentative conclusions about when it is most appropriate to use QE and, in addition, to evaluate whether future QE policies are likely to achieve their objectives. To enhance the flow of the arguments made here and increase the value of this research as a road map for the evaluation of quantitative easing, relevant research from the academic literature is cited at the appropriate point in the discussion rather than in a separate review of the literature section.

To highlight and anticipate our conclusions, this research suggests the following:

- QE is a very effective tool for central banks to use when combating a failing banking system facing systematic solvency and liquidity challenges.
- Central bank purchases of securities held by a weakened or failing banking system may be more effective in encouraging a rapid return

to economic growth than other forms of QE such as outright loans to the banking system.

- QE in the form of purchases of securities with long-term maturities can have a meaningful effect in terms of lowering long-term interest rates.
- QE may have little impact on economic activity and job creation once the banking system has been recapitalized and returned to profitability.
- QE applied to an economy that has returned to positive growth, even with elevated unemployment, has the distinct potential to be counter-productive in terms of achieving the objectives of the central bank due to the fact that the use of QE in non-emergency situations sends a powerful signal from the central bank of economic pessimism to market participants.
- Exit strategies from QE by central banks may be extremely challenging to implement and have the potential, if not the certainty, to delay a return to the normal conduct of monetary policy to the detriment of longer-term economic growth, currency values, and potential future inflation.

1.1. Quantitative easing and the case of a failing banking system

Virtually all equilibrium models of economic activity and market behavior start from the presumption that money is fungible and that the domestic money and credit markets, generally characterized as the banking system, are functioning normally, whether these models explicitly recognize the embedded assumption or not. What we mean by functioning normally is that banks are willing to pay and receive payments from each other and to make and take short-term loans from each other on essentially a no-name basis. This requirement is essential for payment systems to work properly and grease the wheels of commerce.

The financial panic of 2008 was triggered by the bankruptcy of Lehman Brothers and the next day's relatively messy bailout of AIG. Bankers were so scared that they were afraid to take each other's credit risk, even overnight. The interbank market nearly froze, and spreads for interbank loans rose dramatically relative to similar maturity Treasury bills. That is, the sharp widening of the TED spread (i.e., LIBOR minus Treasury bill rates) was a reflection of a failing banking system. The spread between 3-month US dollar denominated deposits (LIBOR) and 3-month US Treasury bill rates averaged under 30 basis points over the period from 2002 to 2006, before the subprime crisis began and before the financial panic of 2008. In September 2008, with the failure of Lehman Brothers, the TED spread widened sharply and briefly to over 400 basis points as financial panic began. (See Fig. 1.)

As thoroughly examined by Reinhart and Rogoff (2009), recessions triggered by a financial crisis are fundamentally different from cyclical recessions that do not involve a breakdown of the banking system. Recessions related to banking system breakdowns are characterized

by a sharp drop in asset values which puts bank solvency into question and leads to extensive deleveraging by consumers, corporations, and local governments. Consumers seek to reduce their liabilities to better match the lower value of their assets. Corporations seek to rapidly shed costs, including workers, to better match future production with the likely lower demand. Local governments face a sharp drop in tax and fee revenue, and thus seek to cut costs by reducing services, laying-off workers, and avoiding new projects that would require additional debt issuance.

In a financial crisis, the banking system faced liquidity and/or solvency challenges because it was widely perceived as being vastly over-extended. In the face of a failing banking system, central banks can use their balance sheets to make loans to banks to ease their liquidity issues or to purchase securities from banks which potentially allows for a smoother reduction in banking assets.

We note historically that the Federal Reserve System was established in 1913, following a series of financial panics of which the one in 1907 was especially severe. The Fed was specifically given extensive powers to use its balance sheet and serve as a lender of last resort to prevent financial panics turning into severe recessions or depressions. Virtually all central banks that control their own currencies have similar powers, even if they have been given different long-term economic objectives regarding inflation, currency stability, or economic growth and job creation. As an aside, the national central banks inside the Euro-Zone no longer control their own currencies and can lend to their domestic banking system only in so far as the ECB lends to them — which the ECB has done in considerable size in the 2009–2012 period.

In terms of economic modeling, there are several points to consider here. Reinhart and Rogoff's (2009) arguments can be interpreted in terms of a regime shift which depends on whether the banking system is functioning normally or breaking down. Economies with failing banking systems are likely to undergo severe deleveraging by all sectors during and immediately after the crisis period. During the period of deleveraging, interest rates largely do not matter to the decision process of consumers, corporations, and local governments (i.e., governments without access to a printing press). That is, the need for consumers to reduce liabilities, for corporations to reduce costs and shed workers, and for local government to cut services dominates any potential stimulatory effect implied by equilibrium macro-economic models from near-zero short-term interest rates. Decisions, by consumers to spend, by corporations to invest in new plant and equipment or to hire new workers, by local governments to expand services, are no longer interest rate sensitive. The path back to a regime involving market equilibrium depends critically both on the banking system recovery and recapitalization as well as the time it takes for consumers, corporations, and local governments to deleverage.

During QE1, most of the immediate balance sheet expansion by the Fed was concentrated in a very short period of time after September 17, 2008, with over US\$ 1.3 trillion of troubled security purchases, loans, and other credit facilities implemented mostly in a matter of weeks and all before the end of 2008. In effect, during the emergency period when the financial panic first started, the Fed was plugging holes in the financial system wherever they found them, from AIG to money market funds, from the commercial paper market to troubled assets on bank balance sheets. Please note that QE1 did not involve the purchase of US Treasury securities. Subsequent programs were conducted in relative calm and focused solely on US Treasuries, as in QE2 and the maturity extension program, as well as more mortgaged-backed securities in QE3, while at the same time the emergency purchases during QE1 of troubled assets and special facility investments were cleaned-up. See Table 1.

Analyzing the recovery of the banking system, interestingly, is one place where the different forms of QE as practiced by the Fed in the US and the ECB in Europe appear to have had varying impacts. The Fed bought assets from the banking system, and this did two things. It provided liquidity and it allowed the banks to shed assets without a fire sale into an imploding market. In turn, shedding assets reduced the banks need to raise new capital, so that the amounts of new

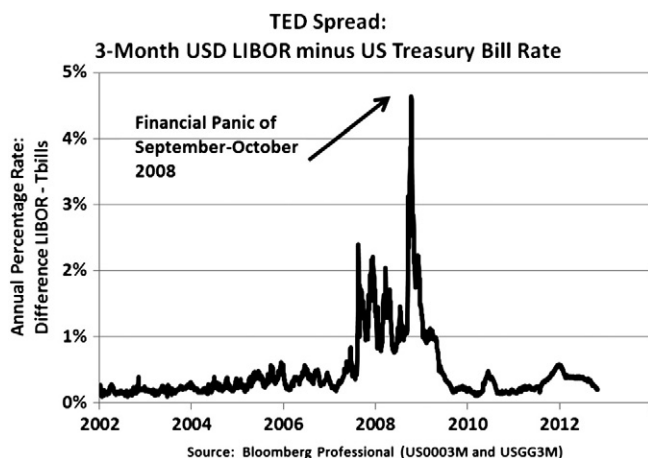


Fig. 1. TED spread.

Table 1

Factors supplying reserves to the US banking system.

Source: Federal Reserve Statistical Release H.4.1 – Table 1 – factors affecting reserve balances of depository institutions.

Federal Reserve factors affecting reserve balances (US \$ millions)				
	Averages of daily figures for week ended (\$ millions)			
	17-Sep-2008	31-Dec-2008	29-Dec-2010	31-Oct-2012
US Treasury securities	\$479,818	\$475,961	\$1,010,285	\$1,650,297
Mortgage-backed & agency securities	\$ –	\$20,266	\$1,148,892	\$933,915
Repurchase agreements, term auction credit, and other loans	\$322,469	\$717,989	\$45,112	\$1,317
Special facilities	\$29,333	\$407,433	\$92,945	\$2,500
All other sources of credit	\$151,721	\$676,976	\$170,310	\$283,572
Total factors supplying reserve funds	\$983,341	\$2,298,625	\$2,467,544	\$2,871,601

capital required for the now smaller bank balance sheets were manageable in a reasonably rapid fashion. The US financial sector returned to profitability relatively quickly, as shown in Fig. 2.

By contrast, initially as the financial panic developed in 2008 and in the first stages of the European sovereign debt crisis in 2010 and 2011, the ECB focused on long-term liquidity facilities rather than asset purchases, although there were some asset purchases. The loans from the ECB relieved the immediate liquidity issues, but did not assist in helping banks to shed assets and raise capital, so solvency challenges remained in play. The result was that the European banking system lagged far behind the US banking system in adjusting its capital ratios and returning to a reasonable level of profitability. Moreover, the use of bank loans rather than asset purchases kept the pressure on banks to sell assets to reduce their own balance sheets to meet required capital ratios. Asset sales by banks, including sales of sovereign debt, tended to keep downward pressure on the prices (upward pressure on the yields), such that government fiscal solutions to the sovereign debt crisis were more complex, challenged, and drawn-out than might have been the case had the ECB aggressively purchased sovereign debt directly from banks from day one of the crisis.

Our conclusions about quantitative easing under conditions of banking system failure are that QE is extremely effective medicine, and secondarily that asset purchases may work better than direct loans to the banking system. While we are sure that academic economists and policy makers will try to put a number on the quantity of jobs saved, this will not be easy. We would argue that the balance sheet expansion

from September 2008 through December 2008 by the Fed, known as QE1, stabilized a failing US banking system and prevented the recession from spiraling downward into a very deep depression. The US economy still had to go through a multi-year deleveraging phase, but at least the return to a normally functioning banking system was relatively rapid. We would also argue that the ECB's bank lending approach tackled bank liquidity issues but not solvency challenges, and thus was not nearly as effective in containing the sovereign debt crisis as asset purchases would have been. Since the ECB decided in September 2012 to expand sovereign debt purchases, this hypothesis can be reevaluated in a few years after more experience has been gained.

2. Quantitative easing when the banking system is functioning normally

Once the banking system is back on its feet, by which we mean consistently profitable and well capitalized, then the analysis of quantitative easing shifts to the linkages from asset purchases by the central bank to questions of the impact on longer-term interest rates and to the interest rate sensitivity of the economy. The portfolio balance linkage from asset purchases (and later asset sales when QE is unwound) is relatively straightforward, while the macro-economic transmission process from interest rates to real GDP growth, job creation, and potential inflation is highly controversial.

As Fed Chairman Ben Bernanke described in his speech and accompanying research paper, "Monetary Policy since the Onset of the Crisis", presented at the Federal Reserve Bank of Kansas City Economic Symposium, Jackson Hole, Wyoming, on 31 August 2012, the mechanism from QE to market interest rates and also stock prices runs through the portfolio balance effect. As noted above, this is not the controversial part of QE. There is little doubt in anyone's mind that the Fed's purchases of trillions of dollars of US Treasuries and mortgage-backed securities raised debt prices, lowered rates, and supported stock prices. Studies cited by Bernanke (2012) have attempted to quantify the interest rate effects. These studies include Li and Wei (2012), both economists at the Federal Reserve Board in Washington, and Christensen and Rudebusch (2012), economists at the Federal Reserve Bank of San Francisco. The Li and Wei estimate is that the first and second large scale asset purchase programs had a combined effect of pushing the 10-year Treasury yield about 100 basis points lower than it otherwise would have been.

What is interesting about the studies cited by Bernanke (2012) concerning the impact of quantitative easing on US long-term interest rates is that these empirical studies are US-centric and do not consider the potential effects coming from two international sources that were happening at the same time. First, many central banks around the world, especially emerging market central banks such as China, were purchasing large quantities of US Treasury securities as part of their policy to stabilize their exchange rates. Second, because of the worsening sovereign debt debacle within the European Union, US Treasuries were a popular flight-to-quality investment vehicle when fear gripped the financial markets. While difficult to quantify, both of these effects would have also lowered US Treasury yields. Thus, the Federal Reserve studies of the impact of quantitative easing probably overstate the case, even though the direction of the effect is not in question.

The next bit is the tricky part. Did the reduction in Treasury yields have any impact on economic activity or job creation? The asset purchases as part of QE1, as discussed in the section above, are definitely thought to have saved job losses and prevented a much worse recession or depression by the stabilization of the banking system. But did further asset purchases that occurred after the banking system was stabilized and had returned to substantial profitability have any further impact in terms of actually increasing job creation, as opposed to preventing job losses as in the QE1 phase of a failing banking system?

The answer to this question depends on assumptions about the interest rate sensitivity of various sectors of the economy, especially

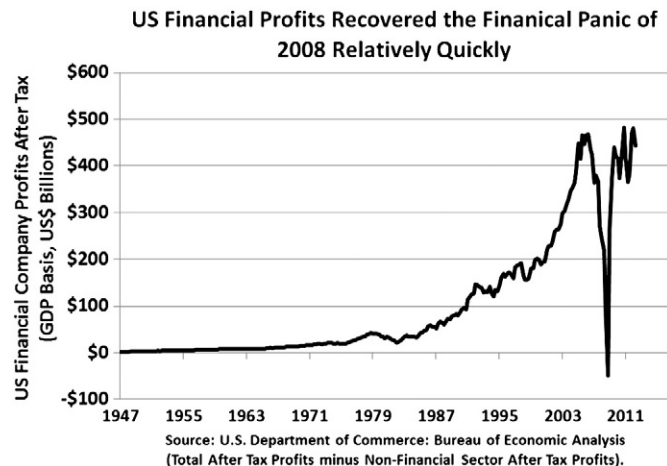


Fig. 2. US financial system profitability.

consumers and corporations in the aftermath of a financial crisis. There are several issues to address.

First, if consumers and corporations are still in a deleveraging phase caused by the drop in asset values that also sunk the banking system, then it is highly unlikely that they are interest rate sensitive. That is, when deleveraging is the order of the day, near-zero short term rates and reduced long-term rates would probably not make any difference to economic decision making by consumers, corporations, and local governments.

Historically, the cyclical interest rate sensitivity of the US economy has depended in no small part on the housing sector. But in the aftermath of a financial crisis, housing prices can be severely depressed, and the route from lower rates to an expanding housing sector is completely short-circuited. In the US, there was no sign of life in the housing sector until the year 2012, four years after the crisis began.

Second, even after the deleveraging phase has ended (See Fig. 3), if consumers and corporations have little confidence in the likelihood of future economic progress, regardless of the rationale for their lack of confidence, it is also likely that the lack of confidence would trump lower rates in any decision about future consumption or corporate expansion. Put another way, for there to be a material link between lower bond yields and economic activity, there needs to be a strong expectation that consumer and corporate decisions will be impacted by the lower rates, given the state of the economy, banking system, and confidence in the future. We have seen no convincing evidence of a link between lower interest rates and consumer or corporate decision making during the deleveraging period from 2009 through approximately the middle of 2011 before consumer credit and bank commercial and industrial loans began to rise again.

Also, the continuation zero short-term interest rates and expanded QE to lower long-term rates after the economy has started to grow again can have a very depressing impact on certain segments of the population in terms of their savings and consumption behavior in the aftermath of a financial crisis. Demographically, the US is an aging country, and the role of retirement planning in the 45–65 year old segment and the actual retirement situation of the over 65 segment puts the impact of an emergency low rate monetary policy into question. Many retirees and pension funds depend in no small way on fixed income investments as a source of income. Reducing this source of income from the rates paid on short-term and cash equivalent investments can force current and future retirees into reducing consumption so as to increase savings, given the lower expected returns from their retirement portfolios. In essence, zero short-term rate policies coupled with QE to lower long-term rates imply a redistribution of wealth away from savers (current and future retirees) and in the direction of borrowers, including corporate borrowers, who are not likely to expand their businesses during periods of heightened uncertainty regardless of the low level of rates.

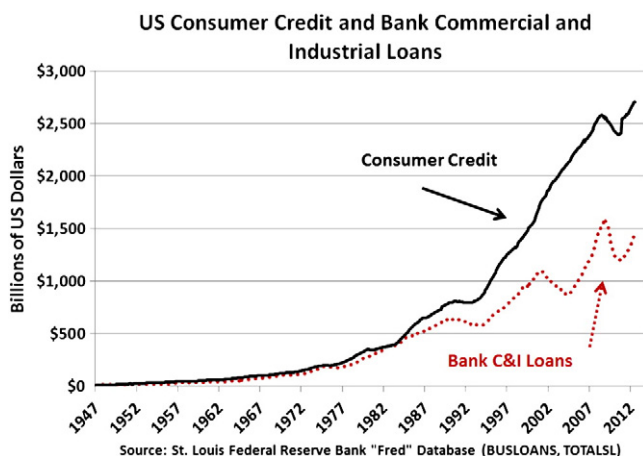


Fig. 3. US consumer credit and bank C&I loans.

These challenges to traditional assumptions about the degree of interest rate sensitivity of the economy in the post-crisis recovery phase must be at the heart of any evaluation of the efficacy of quantitative easing. That is, we note that most domestic large country macro-economic equilibrium models are extremely comfortable with assuming a constant and material degree of interest rate sensitivity for consumers and corporations through all phases of the business cycle. This assumption is not nearly so obviously appropriate in the aftermath of a financial crisis with significant deleveraging activity. Tellingly, Bernanke (2012, p. 7) makes the cautionary statement: "If we are willing to take as a working assumption that the effects of easier financial conditions on the economy are similar to those observed historically, then econometric models can be used to estimate the effects of LSAPs (Large Scale Asset Purchases) on the economy." Bernanke displays his apparent willingness to make this critical assumption since he goes on to cite several research studies that follow this path. There are many in the economic analysis fraternity, however, who would refer to Reinhart and Rogoff (2009), and emphatically assert that "this time is different"! (Kiley (2012, p. 4), last paragraph), an economist at the Federal Reserve Board in Washington, DC, for example in a paper cited by Bernanke, notes in his research that "the analysis herein stops before" the period of zero rates "because it is likely that the binding zero-lower bound on nominal interest rates implies that the linear rational expectations structure of the model ... may be problematic."

Our suggestion and intuition is that there are four phases involved in analyzing a financial panic and the recovery process, and they are as follows:

- *Phase one* is about outright *financial panic* involving a failing banking system (September 2008–March 2009), with the shift into recession coming abruptly and much more sharply than with typical business cycle recessions.
- *Phase two* sees the *recovery of banking profitability* and return to normal functioning, but consumers, corporations, and local governments are still in a deleveraging phase brought on by the initial decline in asset values (April 2009–June 2011, perhaps).
- *Phase three* (July 2011–?) involves a functioning banking system, but economic growth remains constrained because economic confidence is missing or there are *long-lasting changes to risk preferences* from the shock of the earlier financial panic.
- *Phase four* completes the *return to some form of economic equilibrium* in which the standard macro-economic assumptions about interest rate sensitivity might begin to apply again.

That is, even if an economy has arrived at phase three with deleveraging being completed and the banking system functioning normally, this is only a necessary and not a sufficient condition to re-apply assumptions about the interest rate sensitivity of consumption and investment. The reason involves confidence or the potential lack of it. We have to remember that financial panics, even those that do not spiral into depression, can leave a lasting and negative impression on confidence that is not necessarily easily or quickly restored. If long-term return expectation is reduced, then risk-taking will also be reduced, and this could last for a decade or more if the lasting effects from the Great Depression of the 1930s or the Inflationary 1970s are any guide.

Take corporations for example, if they are unsure about tax policies, fiscal spending policies, new regulations, etc., coming out of a financial crisis, they may well hold back on expansion and hiring plans due to their lack of confidence in the future. What this means in terms of traditional macro-economic econometric models is that the historical parameters associated with interest rate sensitivity for consumption and investment may be much too high, causing the models to erroneously suggest the possibility of much higher growth rates and job creation rates than are actually likely to occur. This type of corporate behavior appears to have been especially prevalent in the 2010–2012 period after corporation profits had recovered, but job creation was modest. During what we might consider phases two and three of the post-crisis recovery, US corporations

have built huge cash hoards, much of which have been kept overseas due to the peculiar nature of how foreign-earned profits are taxed under US tax law.

In short, in evaluating the efficacy of quantitative easing we would definitely *not* be willing, as Bernanke suggests, “to take as a working assumption that the effects of easier financial conditions on the economy are similar to those observed historically,” and we would expect econometric models using historically estimated constant parameters to materially overestimate the effects of LSAPs (Large Scale Asset Purchases) on the economy. Practically speaking, we would strongly suggest that the estimation models aimed at evaluating quantitative easing need to use dynamic techniques with time-varying parameters or at least regime-shifting approaches to have even a fighting chance of producing relevant estimates of the potential effects of quantitative easing on economic activity and job creation in the various phases of recovery after a severe financial shock and deleveraging episode.

3. Impact of global economic context

Global context matters when evaluating the impact of any policy action. The question of evaluating quantitative easing in terms of its impact on real GDP growth and job creation is whether there have been significant changes in the structure of the world economy compared to the period during which the baseline econometric model was developed relative to the current global environment. This takes us into issues related to the nature of an interconnected global economy and whether simplified domestic-oriented economic models from the 1950–2000 period are still robust enough to use in this new age.

The simplest macro-economic models focus on trade linkages, but these approaches do not do justice to international capital flows that swamp trade flows. There are feedback effects from currency markets, bond markets, equity markets, and commodity markets. Large multinational corporations may have a domicile in one country but get half or more of their cash flow from outside their domestic base. Pension funds, asset managers, and hedge funds manage global portfolios, not domestic ones.

What we can say with confidence is that if large parts of the world are struggling economically in terms of their economic performance, then no country is likely to be an island and not feel some of the effects. While there are many possible approaches to modeling international influences and feedback loops from global markets, what is clear is that there is a need for these effects to be tackled directly and not relegated to simplifying assumptions. This is especially true given the changes in the relative size of various economies over the past decade, especially the relative growth of emerging market nations compared to the mature industrial economies. See Fig. 4.

For example, in 2000, the BRIC nations of Brazil, Russia, India, and China made up only 8% of global GDP, and by 2010 this had expanded to 25%. While one can argue about the nature of international linkages, it would seem an obvious starting point to take the perspective that the relative influence of emerging market nations, such as China, has dramatically increased. From a modeling point of view, this again points to the need for dynamic estimation approaches that allow for time-varying parameters, and to carefully avoid assuming constant parameters associated with international feedback effects in this ever-changing world.

There are also concerns regarding the impact of the European sovereign debt crisis during 2010–2012 on evaluating how effective QE2 and Operation Twist were in the US. The European crisis displayed aspects of both a sovereign debt crisis and a banking capital adequacy crisis. As such, the probable impact of the financial uncertainties in Europe may have magnified the direct trade effects emanating from this region in recession or stagnation. Further study is certainly required in this regard, as the “headwinds” from Europe during 2010–2012 for the rest of the world economy, from the US to China as well as other emerging market countries, may have been much more severe due to the impact on

capital markets and risk-taking appetites than the real GDP and trade numbers from the Euro-zone would initially suggest if these were more normal and cyclical events. That is, in light of the stagnation in Europe and the rapid deceleration of economic growth in emerging markets in 2011–2012, one could build a case that the US economic performance from Q3/2009 through Q3/2012 was quite impressive given the international headwinds, even if real GDP growth averaged only 2.2%.

4. Demographics, technological progress, and fiscal policy shifts and the potential for structural change in labor markets

Observing demographic changes is like watching paint dry, but the effects can be truly huge when taken in decades and not years. This presents a serious problem for quantitative economic modeling, since slow moving, yet potentially tectonic effects do not show up in the month-to-month or quarter-to-quarter variations that are the focus of macro-economic statistical models relying on historical data. Yet we know that the policy choices between young and older countries are likely to be strikingly different. Countries with aging populations or where the number of new retirees equals or exceeds the number of young people entering the work force might focus more on wealth maintenance and health care, such as might be the case for Japan and other older, mature industrial countries. Younger countries with rapidly expanding work forces might focus on job creation and exports with less emphasis on pensions and health care systems, such as Brazil and other relatively young emerging market countries. (See Figs. 5 and 6.) An aging nation's policy focus on pensions and health care may well lead to higher labor costs, which possibly develops over time and with the building of a more comprehensive social safety net, partly through mandated charges on workers.

Demography is not the only issue that is powerful in the long-term and hidden in short-term data. Technology can move in jumps, but progress over the decades has been impressive. In particular, the advent of the information age has dramatically improved labor productivity for those firms willing to make the investments in new capital and equipment to take advantages of the leaps forward. A period of rapid technological change, especially of the variety that can increase labor productivity as the world has experienced since the 1980s and is still continuing, can alter the job creation cycle associated with recessions. In particular, recessions tend to weed out the weaker firms that have not taken advantage of technological changes. During decades of rapid technological change, the stronger firms coming out of recessions may not need as many workers for a given level of output, due to their enhanced use of improved labor-productivity capital and equipment. See Fig. 7.

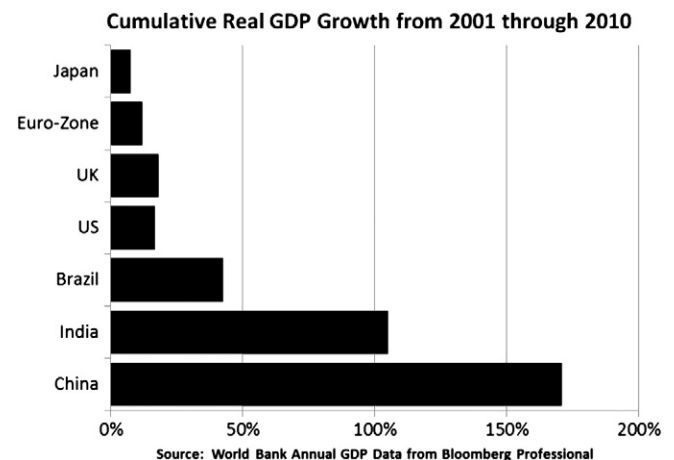


Fig. 4. Cumulative real GDP growth of various countries from 2000 to 2010.

The quantitative macro-economic question is whether characterizations of how labor markets perform during economic cycles changes with demographic shifts and technological progress or whether it can be safely assumed that structural change does not exist in labor markets. This is highly relevant to the QE debate in the United States because the Fed's objective with QE2, Operation Twist, and QE3 was ultimately to stimulate job creation. If structural changes in labor markets have been important, as argued by Putnam and Azzarello (2012), then these developments need to be taken explicitly into account, which was not done in any of the studies evaluating QE and cited by Bernanke (2012) that were conducted within the Federal Reserve System.

When we examine the response of job growth after recessions in the US since WWII, we note a consistency in the patterns during the 1950s, 1960s, 1970s, and through the recession of 1980–82. From the mid-1980s onward, however, there is a new pattern. After each recession, the growth of employment is slower than in the previous recession. Also, it takes longer and longer to return to the previous, pre-recession peak level of employment. Our interpretation of the historical data is that in the US there has been material and substantial structural change in the amount of job growth that is likely for a given recovery in real GDP after a recession, when financially-induced as 2008 or of the more cyclical variety.

5. The role of central bank signaling

Central banks can influence rates through signaling their policy intentions as well as through actual asset purchases. Christensen and Rudebusch (2012) compare interest rate responses to quantitative easing in the UK and US, and they explicitly consider central bank signaling. Interestingly, they note that “We find that declines in US Treasury yields mainly reflected lower policy expectations, while declines in UK yields appeared to reflect reduced term premiums. Thus, the relative importance of the signaling and portfolio balance channels of quantitative easing may depend on market institutional structures and central bank communications policies.” Certainly, the Fed under Bernanke's chairmanship has made considerable strides to improved communications and signaling.

We note that the signals from the Fed about its intentions for future quantitative easing policies in the period 2009 through mid-2012 were predicated on the potential for weakness in the US economy and a general view that progress in reducing the unemployment rate was insufficient. That is, QE signals and a relatively pessimistic view of the US economic progress went hand in glove. This view is also reflected in White (2012) in his excellent discussion of the myriad potential unintended consequences of ultra-easy monetary policies. The argument is that while the

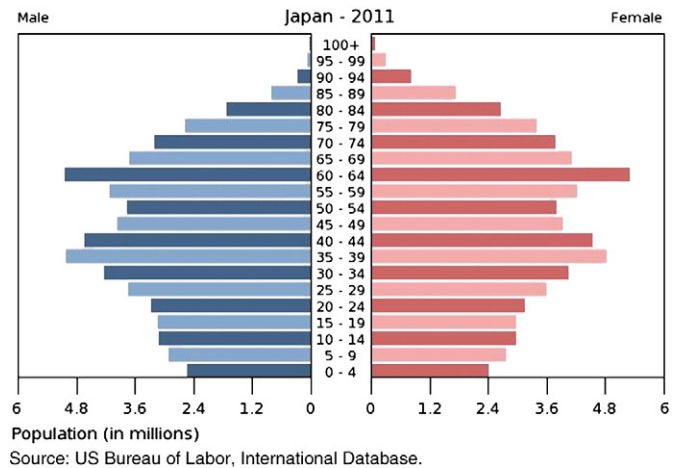


Fig. 6. Population pyramid for Japan.
Source: US Bureau of Labor, International Database.

signaling of future QE policies might have caused a more rapid transmission to rates, it came with the potential negative side-effect of depressing consumer and business confidence. Our contention is that the when QE signals embody a pessimistic view of the economy, the signals contribute to breaking the link between rates and economic activity because they reduce consumer and investor confidence in the future.

Moreover, in the post banking crisis phases of a financially-induced recession, rebuilding confidence in the future is critical to reestablishing a link between lower rates and consumption and business decisions. This view has not gone unappreciated. There were discussions among FOMC members of extending the guidance for the time period for a near-zero federal funds rate regardless of the economic context, so the market would know that accommodative policies would remain in place to support the recovery. Alternatively, and as adopted by the FOMC in December 2012, the near-zero federal funds rate guidance was made conditional, with caveats, on the unemployment rate declining to 6.5%.

6. Exiting QE

We now turn to our final set of observations, which is to consider exit strategies, also a key topic in White (2012). No investment strategy should be entered into without a plan of exit, and the same applies to policy approaches. The Fed and the ECB both consider their forays into QE as temporary and that the exit from QE is manageable. While we do not doubt that the exit from QE is manageable, we do think it will be highly challenging and contains the distinct possibility, if not certainty, of delaying a return to normal monetary policies.

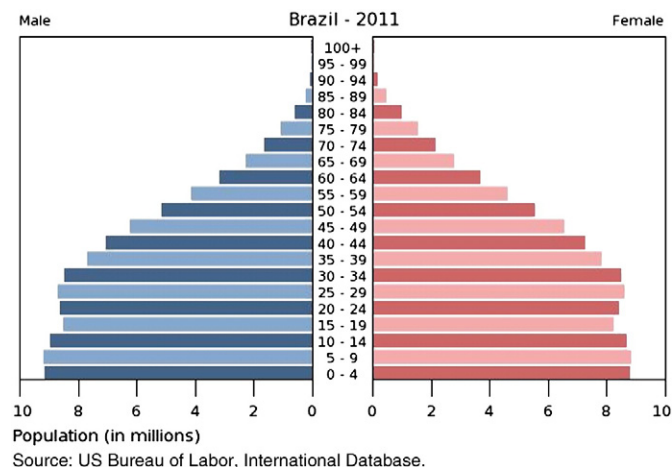


Fig. 5. Population pyramid for Brazil.
Source: US Bureau of Labor, International Database.

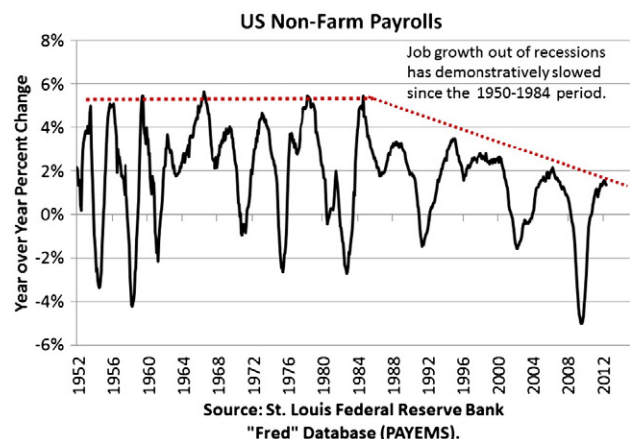


Fig. 7. Slowing job growth out of successive recessions since 1984.

To the extent that QE has reduced rates, the exit from QE is equally likely to raise rates. But the economic context will be totally different. That is, the entry into QE occurred during the deleveraging phase and lack of confidence phase following a severe financially-induced recession. These are the periods during which the interest rate sensitivity of consumers and corporations is likely to be very low and even perhaps non-existent. By contrast, the exit from QE is most likely to occur only when the economy has returned to a stable and positive growth path. This means that the exit from QE is likely to occur when the economy has regained a degree of interest rate sensitivity. But in the exit from QE, rates will be rising as assets are sold into the market, and that in turn could spell trouble for a now more interest rate sensitive economy.

There is a strong possibility, although not a necessity, that central banks will delay the exit from QE or extend its time frame to minimize the impact on the economy from high rates. The potential implication of delays from exiting QE once the economy has regained its strength is a weaker currency and the possibility of feedback effects into inflation. In addition, large scale asset sales have the potential to cause price volatility in bond markets. Central bank signaling may be able to reduce the volatility, but at the cost of having the downward price (upward yield) effects occur even faster. Our conclusion is simply that it is much easier to enter QE than to exit QE, and we fear that the long-term costs of QE for the economy and market volatility are easy to under-estimate.

7. Conclusions

Evaluating QE involves considerable quantitative challenges and our hope is that this research can provide a road map to the problems that are essential to tackle explicitly and avoid the route of assuming that they do not exist. In particular, quantitative macro-economic models designed to evaluate quantitative easing need to explicitly deal with the following issues:

- QE1 was applied to an economy with a failing banking system is a totally different use of QE than the subsequent QE2, Operation Twist, or Q3 applied to an economy already growing again and in recovery. Evaluations of QE must separate Q1 from subsequent applications of QE or their results will be effectively meaningless.
- There is evidence of structural change in US labor markets. Can it be safely assumed not to exist? Probably not.
- There has been an historic increase in the role of emerging markets in the world economy since 2000. Can domestic economy models without explicit international linkages be used to evaluate QE in the US or elsewhere in this day and age? Probably not.
- Internationally, central bank buying of US Treasuries has been measured in the trillions of dollars. The European sovereign debt crisis in 2010–2012 created a number of bouts of market fear and flight to quality behavior that may have also lowered US Treasury yields. Research evaluating the impact of QE on US bond yields needs to at least address the possibility that there were material international influences that also worked to lower yields. Domestic-only models of bond yields are totally inappropriate in this context.
- There was a material amount of deleveraging by consumers and corporations from 2008 into 2011. Can one safely assume that the 2008–2009 recession was typical of other post-WWII recessions? Certainly not, if one accepts the premises of Reinhart and Rogoff. Even if one rejects

the implications of the Reinhart and Rogoff suggestion that “this time is different”, one seems obligated to explain why the deleveraging did not materially reduce the interest rate sensitivity of the economy.

Our conclusions from our theoretical considerations and our interpretations of Fed and ECB actions from 2008 through mid-2012 yield the following points:

- *QE1 was effective.* Quantitative easing is a very effective tool for central banks to use when combating a failing banking system facing systematic solvency and liquidity challenges.
- *Asset purchases are more effective than loans.* Moreover, central bank purchases of securities held by a weakened or failing banking system may be more effective in encouraging a more rapid return to economic growth than other forms of QE such as outright loans to the banking system.
- *QE impacts rates.* Quantitative easing in the form of purchases of securities with long-term maturities can have a meaningful effect in terms of lowering long-term interest rates. The opposite effect on rates will occur, however, if and when central banks unwind their expanded portfolios and return to normal monetary policies.
- *QE does not necessarily impact economic activity.* Under conditions of deleveraging and a general lack of confidence by market participants, and even in the context of a relatively sound, profitable, and well capitalized banking system, quantitative easing may have little to no positive impact on economic activity or labor markets despite its impact on interest rates. Indeed, using QE when the likely effects are centered on rates and not on economic activity has the distinct potential to be counterproductive in terms of achieving the objectives of the central bank due to the fact that the use of QE sends a powerful signal of economic pessimism to market participants.
- *QE exit strategies are likely to be exceedingly challenging.* Exit strategies from QE by central banks may be extremely challenging to implement and have the potential, if not the certainty, to delay a return to the normal conduct of monetary policy to the detriment of longer-term economic growth, currency values, and potential future inflation. That is, the long-term costs to economic activity and financial market stability of QE have the potential to be quite large.

References

- Bernanke, Ben S. (2012). Monetary policy since the onset of the crisis. *Speech at the Federal Reserve Bank of Kansas City Economic Symposium, Jackson Hole, Wyoming, 31 August 2012*.
- Christensen, Jens H. E., & Rudebusch, Glenn D. (2012). *The response of interest rates to U.S. and U.K. quantitative easing*. Federal Reserve Bank of San Francisco working paper series.
- Kiley, Michael T. (2012). *The aggregate demand effects of short- and long-term interest rates*. Federal Reserve Board, Finance and Economics discussion series.
- Li, Canlin, & Wei, Min (2012). Term structure modeling with supply factors and the federal reserve's large scale asset purchase programs. *Preliminary and incomplete version: May 7, 2012, also presented at the 2012 FRBNY SOMA Portfolio Workshop*.
- Putnam, Bluford H., & Azzarello, Samantha (2012). A Bayesian interpretation of the Federal Reserve's dual mandate and the Taylor Rule. *Review of Financial Economics*, 21(3), 111–119.
- Reinhart, Carmen M., & Rogoff, Kenneth (2009). *This time is different: Eight centuries of financial folly*. Princeton University Press.
- White, William R. (2012). *Ultra easy monetary policy and the law of unintended consequences*. Federal Reserve Bank of Dallas Globalization and Monetary Policy Institute, working paper no. 126.