



# The relevance or otherwise of the central bank's balance sheet<sup>☆</sup>



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## ABSTRACT

This paper explores the impacts on an economy of a central bank changing the size and composition of its balance sheet. One of the ways in which such asset purchases could influence prices and demand is via portfolio balance effects. We develop and calibrate a simple OLG model in which risk-averse households hold money and bonds to insure against risk. Central bank asset purchases have the potential to affect households' choices by changing the composition and return of their asset portfolios. We find that the effect is weak, and that its size depends on how fiscal policy is conducted.

That is not to say that the big expansion of central bank balance sheets in recent years has been ineffective. Our finding is rather that the portfolio balance channel evaluated in an environment of normally functioning (though nonetheless incomplete) asset markets is weak. That is not inconsistent with the evidence that large-scale asset purchases by central banks since 2008 have had significant effects, because those purchases were made when financial markets were, to varying extents, dysfunctional. Nonetheless our results are relevant to those purchases because they may be unwound in an environment where financial markets are no longer dysfunctional.

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## 1. Introduction

This paper explores the impacts on an economy of a central bank changing the size and composition of its balance sheet. Whether the central bank purchasing longer term bonds can affect the real economy is a key policy issue. Major central banks – the Fed, the Bank of England and the Bank of Japan – have massively expanded their balance sheets in recent years in an attempt to stimulate demand in the wake of the financial crisis of 2007–08 (The ECB also substantially increased its balance sheet – though less through outright purchases of securities). There is a good deal of empirical evidence that such purchases have had a positive impact – both on asset prices and on demand (For a recent review of the empirical evidence on the impact of asset purchases – or quantitative easing (QE) – see the special issue of the *Economic Journal*, November 2012. For an overview of the empirical and theoretical issues see [Joyce et al. \(2012\)](#) and [Zampolli \(2012\)](#)).

One of the ways in which such asset purchases could influence prices and demand is via portfolio balance effects – that is through the impact that changes in the relative amount of money and bonds in private sector portfolios has upon asset values and demand. It is the significance of this portfolio channel that we assess in this paper. As [Durre and Pill \(2012\)](#) note this is not the only way in which expansion of the central balance sheet can affect the economy. Some central bank policies

involve the substitution of flows of funds through the central bank balance sheet for flows between private financial firms. In times of stress this can keep credit flowing. But much recent empirical work (e.g. [Gagnon et al. \(2010\)](#) and [Joyce et al. \(2010\)](#)) focuses on the portfolio balance channel and finds that it is significant.

But the empirical evidence is not conclusive and its interpretation is clouded by the lack of a clear theoretical framework which allows one to understand how such central bank purchases might work. Indeed most of the theoretical literature has focused on why they might not work. [Wallace \(1981\)](#), [Chamley and Polemarchakis \(1984\)](#), [Sargent and Smith \(1987\)](#) and [Eggertson and Woodford \(2003\)](#), all present conditions under which asset purchases are completely ineffective. [Wallace \(1981\)](#) showed that the path of the government's stock of liabilities – that is the composition of its portfolio for a given fiscal policy – is irrelevant in a model with complete markets. In this case open market operations conducted by a central bank that purchases government bonds of any maturity in exchange for other liabilities with different maturities have no impact on real outcomes. [Chamley and Polemarchakis \(1984\)](#) showed that the neutrality result could also hold in a world with incomplete markets but only so long as the central bank purchased real assets. [Sargent and Smith](#) showed that a neutrality, or ineffectiveness, result for government financial policies (which include the kind of central bank purchases of assets we consider in this paper) could hold in a world in which government issued fiat currency is dominated in rate of return. But as in [Chamley and Polemarchakis](#), the result holds for open market operations where physical capital is exchanged for currency (and where there are simultaneously alterations in lump sum taxes and transfers). In the [Woodford and Eggertson](#) model an infinitely lived, representative household

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maximizes utility in a world with complete markets and faces no limit on borrowing against future income. It is clear that with these assumptions central bank purchases – which are essentially swaps of assets with the representative agent – can do nothing because that single representative agent owns the balance sheet of the central bank and such swaps do not change its opportunity set. But such an idealized economy is not likely to be a reliable guide to the impact of central bank purchases even in normal times, let alone in the environment of recent years and in the aftermath of a near-total collapse of financial markets and where the supply of credit was seriously disrupted.

Summarizing this literature we have the following results: with complete markets any asset purchases by a central bank in exchange for liabilities it issues and which are part of public sector overall liabilities will not affect real outcomes. With incomplete markets, open market operations in real assets (capital or indexed bonds) may have no real effects in a general equilibrium model with market clearing. That neutrality result does not depend upon complete markets or an operative bequest motive.

But what we do not have is a result that says that open market operations in which the central banks buys nominal assets in exchange for its issuing its liabilities is ineffective in affecting real outcomes in a world of incomplete markets. But that is the relevant case when considering QE because as implemented by central banks in recent years it has been the purchase of nominal assets (largely nominal government debt) for central bank liabilities (money, largely in the form of reserves). This paper explores whether such asset purchases can affect real outcomes when markets are incomplete. The question we address is whether quantitative easing provides a useful policy tool in an incomplete market setting where there is a zero lower bound constraint on the policy rate set by the central bank.

We do so using an OLG model – a set up that allows for heterogeneity amongst agents (some are old and some young) and limits to borrowing (the young and the old cannot borrow from each other). In the simplest OLG set up where there is no uncertainty the inefficiency in free market outcomes is because trade between generations as a means to smooth consumption over the life cycle of an agent is not feasible – the young will not trade goods with the old in exchange for promises which the old will not be around to honor. But in this world the introduction of fiat money (or debt) by a government can remove the inefficiency. Indeed a very simple monetary policy, or debt management policy, will allow equilibria in which welfare enhancing trade between the young and old is possible (See Weill (2008) for a very clear exposition of the arguments first developed by Samuelson (1958)). As is well known, with no uncertainty optimal policy is very simple; it can be implemented with a government run PAYGO transfer system; with issuance of public debt or with the supply of fiat money<sup>1</sup>; it would not seem to require the kind of asset purchases undertaken under QE and which we consider in this paper. Things are more interesting in the more realistic case where there are sources of uncertainty which cannot be traded in financial markets. We use such a model, where agents cannot enter into efficient risk sharing trades with those of other generations, to analyze what role conventional monetary policy (i.e. interest rate policy) and fiscal policy can have in overcoming market incompleteness and ask whether unconventional monetary policy – asset purchases by the central bank – can be useful in such a world and where the zero lower bound on the policy rate may be binding.

Our aim is to understand whether, under plausible assumptions about monetary and fiscal policy, central bank purchases of longer-term bonds – against reserves (as during quantitative easing) or against short-term bonds (as during the Federal Reserve's "Operation Twist") –

<sup>1</sup> Weill, with a simple 2 period life, OLG model with no uncertainty, concisely makes the point about how fiscal policy or the use of money or the use of a PAYG social security system can each be used to remove the inefficiency thus: Like a pay-as-you-go social security system and like public debt, Samuelsonian money "works" because it is part of a social contract: perpetual intergenerational redistribution from young to old in the case of social security, a long-lived government that does not default on its obligations in the case of public debt, or "a grand consensus on the use of ... greenbacks as a money of exchange."

can have a significant effect on real activity. In an OLG model with no bequest motive households cannot undo the variation in their portfolios that emerges as a result of central bank asset purchases. We also assume that there is no complete set of state-contingent securities. Households then have to invest in short- and long term bonds to partially insure against risk. These bonds earn different returns in equilibrium. This is because households are risk averse, and short term and long term financial assets allow them to respond to risks in different ways. In this case central bank asset purchases can – depending on how wide the range of fiscal instruments is – affect a household's wealth, and therefore its real decisions. We calibrate the model to see whether this effect is significant and whether QE can be part of optimal policy.

We find that the ineffectiveness result of Wallace and subsequent authors is, in many ways, surprisingly robust. Even when we restrict the range of fiscal tools to mean that asset purchases by the central bank are not neutral they are rarely very effective: the impact of central bank asset purchases on real variables is either exactly zero or very small.

We have three main results. First, we show that if the government can set lump sum taxes at different (non-zero) rates on different generations alive at the same time they can achieve optimal risk sharing with simple tax and monetary policy rules – there is no need for unconventional monetary policy and QE is not needed. Second, we show that the impact of asset purchases is exactly zero under a more restricted tax rule, in which the government balances its budget by adjusting taxes on the generation whose portfolio changed as a consequence of central bank asset purchases (the old). In this case, fiscal policy exactly undoes any effect asset purchases would otherwise have had on household's portfolio. Third, when taxes are levied only on the young asset purchases (QE) do have effects but these are very small. Some of these results echo the irrelevance results of Wallace (1981) and others. But they are derived in a model with finite lives, incomplete markets, and a zero lower bound constraint on the policy rate and where asset purchases are of nominal assets. Our results illustrate the importance of considering the interactions of monetary and fiscal policy when studying the impact of monetary policy (a point recently stressed by Sims (2013)).

Our overall finding is that the portfolio balance effect of central bank asset purchases is weak in a wide range of environments. That is not to say that the big expansion of central bank balance sheets in recent years has been ineffective. Our finding is rather that the portfolio balance channel evaluated in an environment of normally functioning (though nonetheless incomplete) asset markets is weak. In effect we find that with incomplete markets the use of money (which can pay interest at rates set by the central bank) and some fiscal instruments (a tax rate and debt management) leaves little role for QE to play. But that is in a world where the markets for money and bonds do work efficiently. That still leaves the potential for central bank balance sheets to offer a venue that substitutes for private intermediation when markets seize up. As one referee of this paper put it, the central bank intermediation role of balance sheet policies may be qualitatively more important than the portfolio balance channel of QE transmission.

So our results are not inconsistent with the evidence that large-scale asset purchases by central banks since 2008 have had significant effects, because those purchases were made when financial markets were – to varying extents – dysfunctional. Nonetheless our results are relevant to those purchases because they may be unwound in an environment where financial markets are no longer dysfunctional.

In the first part of this paper we describe the model. Section 2 describes the model in non-technical terms; Section 3 presents the formal structure. Section 4 contains the results. We conclude in Section 5.

## 2. Model overview

Following Wallace (1981), Sargent and Smith (1987) and others, we model the impact of central bank purchases of government bonds

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