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New Keynesian models, durable goods, and collateral constraints ☆

Tommaso Monacelli *

Università Bocconi, IGIER and CEPR, IGIER Bocconi, Via Salasco 5, 20136 Milan, Italy

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ABSTRACT

Econometric evidence suggests that, in response to monetary policy shocks, durable and non-durable spending co-move positively, and durable spending exhibits a much larger sensitivity to the shocks. A standard two-sector New Keynesian model with perfect financial markets is at odds with these facts. The introduction of a borrowing constraint, where durables play the role of collateral assets, helps in reconciling the model with the empirical evidence.

1. Introduction

New Keynesian (NK) models of the last generation, featuring imperfect competition, and price stickiness as central building blocks, have recently become a workhorse reference for the analysis of business cycles and monetary policy.[1] Surprisingly, most of these models have largely ignored the role played by durable goods.

In the data, the evolution of durable spending in response to monetary shocks is characterized by two main features. First, durable spending co-moves positively with non-durable spending. Second, the sensitivity of durable spending to monetary shocks is significantly larger than the one of non-durable spending.

A baseline two-sector NK model with perfect financial markets is generally at odds with those facts: if price stickiness is asymmetric in the two sectors, whenever consumption contracts in one sector it tends to expand in the other. The intuition for this theoretical anomaly lies in a distinctive feature of durable goods under perfect financial markets: namely, that their shadow value (which corresponds to the discounted stream of marginal utilities of the durables) is almost constant.[2] This is due to the stock-flow ratio of durables being particularly high, so that a unit of durables does not add much to overall utility at the margin. As a result, durable consumption is very sensitive to variations in the user cost of durables. Hence if durable prices are flexible (sticky) and non-durable prices sticky (flexible), a monetary contraction lowers (increases) the relative price of durables, and almost invariably the user cost, leading consumption to rise in the flexible-price sector and to fall in

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* Tel.: +39 0258363330; fax: +39 0258363332.
E-mail address: tommaso.monacelli@unibocconi.it
URL: http://www.igier.uni-bocconi.it/monacelli

[1] To name a few, Goodfriend and King (1997), Rotemberg and Woodford (1997), Claridan et al. (1999), Woodford (2003).

[2] See also Barsky et al. (2007).

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the sticky-price one. In a nutshell, a positive correlation between the user cost and the relative price of durables is at the heart of the co-movement problem.

This paper shows that the presence of credit market frictions can reconcile an otherwise standard NK model with the empirical evidence of monetary policy shocks on durable and non-durable spending. In our economy, agents with heterogenous discount factors trade nominal private debt in equilibrium, with the borrowers being subject to a collateral constraint. As a result, the latter do not act as full consumption smoothers, but exhibit preferences tilted towards current consumption. Importantly, their borrowing limit is endogenously tied to the (expected future) value of the stock of durables. This feature has a twofold implication: first, the shadow value of durables is now linked to the shadow value of borrowing (a marginal unit of durables provides an additional service: it allows to expand borrowing); second, the ability of borrowing depends also on the evolution of the asset price, i.e., the relative price of durables.

To understand the implications of a borrowing constraint for the transmission mechanism, consider a monetary policy contraction, and let (for the sake of exposition) durable prices be more flexible than non-durable prices, so that the relative price of durables falls in response to the shock. By increasing the shadow value of borrowing, an interest rate hike alters the dynamics under perfect financial markets in two main respects: first, it breaks the quasi-constancy of the shadow value of durables. This happens because the latter is now a function not only of the (current and future) marginal utility of durables (which is roughly constant, as under perfect financial markets), but also of the shadow value of borrowing, which varies in response to shocks. Second, a policy rate hike *increases* the user cost of durables, producing a substitution towards non-durable consumption. In fact, the user cost and the relative price of durables are negatively correlated under credit market imperfections, in stark contrast with the case of perfect financial markets. The latter effect also helps in reconciling the model with the evidence that durable consumption is a more sensitive component of spending to monetary policy shocks.

Asset price movements reinforce the collateral-constraint channel described above. When a monetary policy contraction lowers the relative price of durables, it also lowers the collateral value of the durable stock, thereby affecting the borrowing capability also on the extensive margin. The latter effect is at work, for instance, when durable goods prices are assumed to be relatively more flexible than non-durable prices.

The role of durable goods in NK models has only recently received some attention. Erceg and Levin (2006) study optimal monetary policy in a sticky-price model with durable and non-durable goods, but without a borrowing constraint. In a similar environment, Barsky et al. (2007) analyze the transmission of monetary shocks and argue that it is largely affected by the assumption on the degree of stickiness of durable goods prices. Our analysis is related to their work, in that it shows that the critical role played by the stickiness (or lack thereof) of durable goods prices can be de-emphasized by the introduction of credit market imperfections. Campbell and Hercowitz (2006) study the role of collateralized debt in a business cycle model, but their analysis is confined to a one-sector, real business cycle model.[3]

2. Monetary shocks and durable spending: the evidence

In this section we document two stylized features that characterize the dynamic evolution of durable and non-durable spending in response to (identified) monetary policy shocks. First, durable spending co-moves positively with non-durable spending in response to those shocks. Second, the sensitivity of durable spending to policy shocks is significantly larger than the one of non-durable spending. This evidence complements the one in Erceg and Levin (2006) and Barsky et al. (2007) by documenting also the behavior of household debt.

To assess the impact of monetary policy shocks we estimate a quarterly VAR model for the U.S. economy specified as follows:

$$\mathscr{Y}_t = \sum_{j=1}^{L} A_j \mathscr{Y}_{t-j} + B\mathscr{E}_t \tag{1}$$

where $\mathscr{E}_t$ is a vector of contemporaneous disturbances. The vector $\mathscr{Y}_t$ comprises six variables: (i) real *GDP*, (ii) real *durable* consumption, (iii) real *non-durable* consumption and services, (iv) the *GDP deflator*, (v) total real *household debt* (the sum of mortgage and consumer credit debt), and (vi) the *federal funds* rate. Except for the funds rate, all variables are in logs and have been deflated by the GDP deflator.[4] The VAR system features a constant, a time trend, and four lags, and is estimated over the sample 1952:1–2007:2.

To identify a monetary policy shock, we resort to a standard recursive identification scheme (Christiano et al., 1999). Fig. 1 displays estimated responses of real GDP, real non-durable spending, real durable spending, and total private debt to a one-standard-deviation innovation in the federal funds rate. Dashed lines represent two-standard error bands. Hence we see that both components of spending and GDP react negatively to the policy tightening. The smooth and persistent response of these variables is in line with a recent widespread empirical evidence (Rotemberg and Woodford, 1997; Christiano et al., 1999). Household debt is also observed to fall very gradually in response to the shock. Importantly, the fall

[3] Most recently a paper by Carlstrom and Fuerst (2006) addressing the co-movement problem, although written independently, has been brought to my attention. That paper differs from mine in that it emphasizes the possibility that sticky wages, coupled with adjustment costs in the durable sector, may be a candidate explanation for the co-movement problem.

[4] The source of data are FRB Flow of Funds and FRED.