Discussion of "QE 1 vs. 2 vs. 3 . . . : A Framework for Analyzing Large-Scale Asset Purchases as a Monetary Policy Tool"*

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Mark Gertler and Peter Karadi's paper is the most recent paper in a string of papers that Gertler with a number of coauthors, notably Peter Karadi and Nobu Kiyotaki, has written. All of these papers are attempts to incorporate financial frictions into quantitative macroeconomic models. These attempts are to be applauded vigorously. If we are to make serious advances in understanding the role of financial frictions, we have no choice but to pursue an agenda like the one set out in these papers: take a stand on the nature of financial frictions, incorporate them into quantitative general equilibrium models, confront the models and discipline them with macroeconomic and microeconomic data, and use the models to answer a variety of policy questions.

The paper by Gertler and Karadi under discussion here is a variant of Gertler and Karadi (2011) extended to allow intermediaries to hold government debt. In the model at hand, a key feature is that non-financial firms must use funds from financial intermediaries to finance holdings of capital. That is, they use funds from intermediaries not only to purchase investment goods but also to purchase all capital used in production. The intermediaries in turn are subject to collateral constraints. In Gertler and Karadi's model, the collateral constraints arise from the idea that managers of financial intermediaries can divert some fraction of assets under their control. They also assume that managers can divert a smaller fraction of government

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debt they hold than private assets. Thus, the collateral constraint is, in a sense, weaker on government debt held by intermediaries than on private assets. Shocks to the value of the capital stock induce the tightness of collateral constraints to fluctuate and thereby cause aggregate investment and output to fluctuate.

Gertler and Karadi show that the model can generate fluctuations in output. They also show that large-scale asset purchases, by reducing the amount of government debt intermediaries hold, can stimulate private credit creation and ameliorate the effect of shocks to the capital stock. This is a consequence of the asymmetry in collateral constraints on government debt relative to private assets.

My main concern with papers like this one is that, while they provide useful insights, the basic setup of the model, taken literally, seems at odds with the financial system of the United States. In the model, the capital stock of non-financial firms is held by financial intermediaries who issue risk-free claims to households. The most obvious intermediaries who issue apparently risk-free claims to households are banks. The problem is that the vast bulk of equity claims on non-financial firms is held either directly by households or by financial intermediaries like mutual funds, which issue equity like claims to households. So the model must be implicitly thought of as capturing some deeper type of financial friction. One possibility is that the model is meant to be thought of as one in which financial intermediaries and non-financial firms are collectively subject to collateral constraints and that disturbances to financial markets impede the ability of non-financial firms to obtain funds for investment. The problem with this view is that it seems inconsistent with data from the Flow of Funds as well as data on the use of capital markets by firms to finance investment.

To understand this problem, think of financial markets as consisting of pipes connecting non-financial firms to financial intermediaries and households, and think of financial market disturbances as clogging the flow of funds in these pipes. In models of financial frictions like the one at hand, think of funds as flowing from financial intermediaries to non-financial firms. The problem is that in the data, in the aggregate, funds flow from non-financial firms to financial intermediaries and households so that it is hard to see how financial market disturbances interfere with the ability of firms to obtain financing.

To demonstrate the sense in which funds flow from non-financial firms to households, it is useful to define a variable that I will

call *Available Funds*. In the context of the models above, I define available funds as

$$AF_t = y_t - w_t l_t - r_t b_t - T_t, \tag{1}$$

where $y_t = z_t F(k_t, l_t)$ denotes output, or value added, $w_t l_t$ denotes payments to labor, $r_t b_t$ denotes interest payments on debt, and T_t denotes taxes. The idea is that interest payments on debt and taxes are legal obligations. Note that I do not include maturing debt. In practice, most debt by non-financial firms is long-term debt and only a relatively small amount matures each quarter.

Conceptually, think of firms as obtaining revenues from operations. These revenues net of payments to other firms for materials are simply value added. Subtracting out payments to employees, interest payments on past debts, and taxes gives a measure of funds that are available either for gross investment or for financial activities. Such financial activities consist of paying dividends, issuing new debt, retiring old debt, and accumulating financial assets such as claims on households and on financial intermediaries. We can write this as

$$d_t + x_t \leq z_t F(k_t, l_t) - w_t l_t + b_{t+1} - (1 + r_t) b_t - T_t, \tag{2}$$

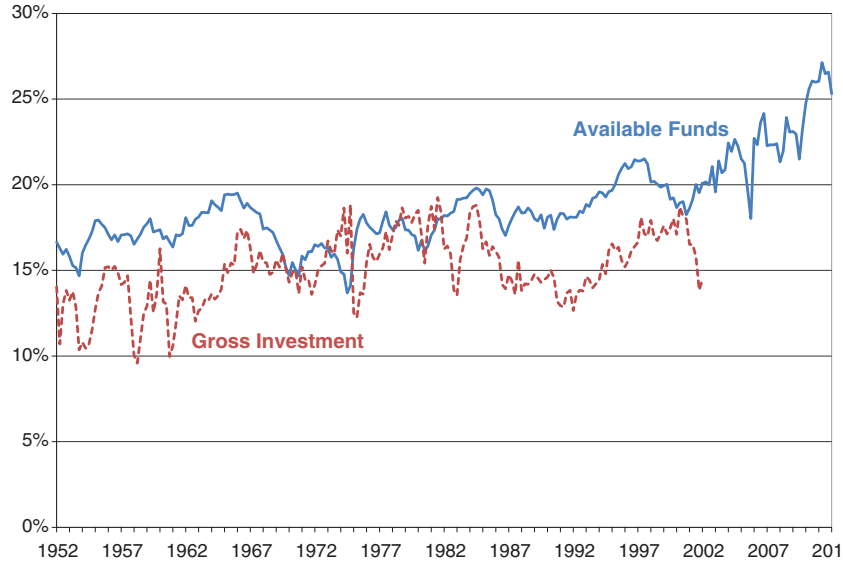
where d_t denotes payments to shareholders, either in the form of dividends or equity buybacks, b_t denotes financial liabilities net of financial assets, and x_t denotes gross investment. Substituting (1) into (2), we obtain the following accounting identity:

$$d_t - (b_{t+1} - b_t) = AF_t - x_t. \tag{3}$$

In (3), it is useful to note that if $(b_{t+1} - b_t)$ is negative, firms are effectively accumulating net financial assets.

I use Flow of Funds data for the United States to construct a comparison between available funds and gross investment. Mechanically, in the Flow of Funds, available funds are computed by adding internal funds (table F.102, line 9) and dividends (table F.102, line 3) (see Board of Governors of the Federal Reserve System 2012). Internal funds in turn mainly consists of adding retained earnings to depreciation. For gross investment, I use line 11 in table F.102. These data are for all corporations in the United States, including those whose equity is publicly traded and those for which equity is not traded in public markets.

Figure 1. Available Funds and Gross Investment, U.S. Non-Financial Corporations



Note: See text for description of data.

In figure 1, I plot available funds and gross investment scaled by GDP for all non-financial corporations for the United States for each quarter from 1952:Q1 to 2011:Q4. The figure shows that the mean value of available funds relative to non-financial corporate GDP is 19 percent and the mean value of gross investment is 15 percent. On average over the entire period, funds flow from the non-financial sector to other sectors. This finding is not surprising, since these flows constitute net payments to shareholders of non-financial firms and we should expect that the shareholders will be compensated for their investment in these firms. More striking, the figure also shows that available funds exceed gross investment for 217 of the 240 quarters in the data. That is, in over 90 percent of the quarters, available funds exceeds gross investment, and by an economically large amount. Note also that since 1982, available funds has consistently exceeded gross investment, and, in general, by a substantial amount.

Perhaps the frictions should be thought of as inhibiting the reallocation of funds across firms. In Kiyotaki and Moore (1997, 2008), Eisfeldt and Rampini (2006), Buera (2009), or Shourideh and Zetlin-Jones (2012), the key role of financial markets is that they allow funds to be reallocated from cash-rich, project-poor firms to cash-poor, project-rich firms. Disturbances in financial markets can then be thought of as affecting the reallocation of funds and therefore the efficiency with which the economy operates.

In this context, I propose a statistic that I will call the *external funding measure*. This measure is computed using the concepts of available funds and gross investment defined earlier. Specifically, suppose we have data on available funds and gross investment for a sample of firms. Let x_{it} and AF_{it} denote gross investment and available funds for firm i in period t. Then the external funding measure in period t is given by

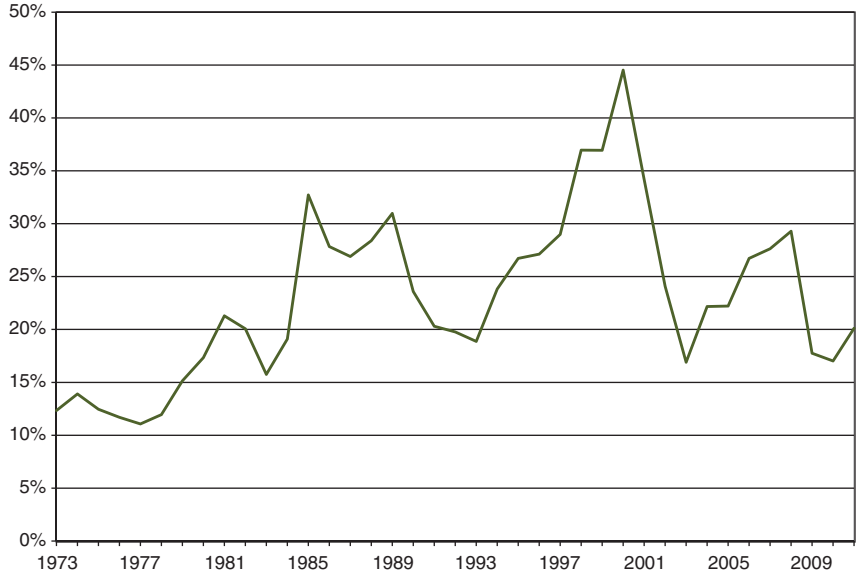
$$EF_t = \frac{\sum_i (x_{it} - AF_{it} \mid x_{it} > AF_{it})}{\sum_i x_{it}},$$

and the average over the sample period is given by

$$EF = \frac{1}{T} \sum_{t=1}^{t=T} EF_t.$$

This statistic is a measure of the extent to which firms rely on external funds to finance investment. To obtain it, I add up all investment in excess of available funds and scale it by aggregate investment. This statistic is a natural measure of the reliance of firms in making investments on financial markets. This natural measure is useful for two reasons. First, measuring the extent to which it fluctuates over time and determining its correlation with other measures of stress in financial markets provides real-time information on the extent to which real variables like investment are affected by financial market disturbances. Second, obtaining data on the business-cycle properties of this statistic can discipline the building of quantitative general equilibrium models. Shourideh and Zetlin-Jones (2012) show that this measure plays a central role in calibrating their quantitative general equilibrium model.

Figure 2. External Funding Measure, Compustat Non-Financial Corporations



Note: See text for description of data.

Like all statistics of the data, this one should be treated with caution. For example, in a world where financial markets do not function at all, no firm is able to obtain external financing, and the value of the statistic is zero. This observation suggests that the value of this statistic is to provide clues, rather than definitive answers in real time, and to discipline the construction of quantitative models.

Computing the external finance measure requires disaggregated data at the level of individual firms. For the United States, data on the balance sheets and income statements are not publicly available for all firms. Such data is available for firms whose shares are traded in public markets. Compustat offers a convenient source for these statements. Using data from Compustat, it is possible to calculate available funds and gross investment (as described earlier) for publicly traded firms. Figure 2 shows the time series for the external funding measure. The sample average is 23 percent. Note also that this measure varies considerably over time and seems to be

procyclical. While this finding is promising, Shourideh and Zetlin-Jones (2012) show that when a model is calibrated to data from Compustat, the effects of financial frictions are fairly modest.

In order to make progress on asking whether models like Gertler and Karadi's are promising, my guess is that it is essential to construct models with heterogeneous firms, calibrate funds flow in these models as in the data, and then ask whether the models can deliver large responses to financial market disturbances.

In this context, it is worth following work like that in Shourideh and Zetlin-Jones (2012). These authors obtain data from a data set called Amadeus. This data set contains financial information for a much larger set of firms for a number of European countries. The data contains financial information for both publicly traded companies and privately held ones. Using this data, they show that for the United Kingdom, the sample average of the external finance measure for the period from 2000 to 2009 is 90 percent. The observation that privately held firms are so much more reliant on external finance is promising for models which emphasize the role of financial markets in reallocating investment funds from cash-rich, project-poor firms to cash-poor, project-rich ones.

Gertler and Karadi are to be congratulated for asking important questions in quantitative general equilibrium models. Making further progress on the agenda they have laid out requires taking seriously data on the flow of funds across firms and between firms and households. Until that is done, their results must be regarded as tentative.

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