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The Business Cycle Behavior of Working Capital

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Firms require short-term assets or liabilities in order to facilitate production and sales. Those "working capital" requirements are often incorporated in macroeconomic models designed to study the impact of monetary or financial shocks.[1] They are important for the propagation of those shocks since they affect the marginal cost of funds faced by some set of agents in the economy. If firms require working capital in order to acquire variable inputs, a change in the cost of funds faced by firms translates into immediate changes in macroeconomic activity.[2] This article investigates the cyclical properties of the three main components of working capital—inventories (raw materials, work-in-process, and finished goods), cash and short-term investments, and trade credit—aggregated across all firms and with special attention to their correlations across time with output. The key objective is to obtain stylized facts. While theory informs what kind of facts are worth examining, the uncovering of stylized facts also serves as an input for the development of new theories. The discussion above provides a couple of examples of existing theoretical models that motivate the exploration that follows, but the results stand on their own as useful

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[1] Technically, the accounting definition of working capital is the difference between the sum of short-term assets and the sum of short-term liabilities. In the article, as in the literature, I use the term more broadly to refer to the collection of short-term assets and short-term liabilities rather than the aggregate accounting concept.

[2] Examples of articles that model working capital requirements explicitly are Christiano and Eichenbaum (1992) and Fuerst (1992), who develop the canonical model of working capital in monetary economics, and Jermann and Quadrini (2012), who advance working capital as a key part of the transmission mechanism for financial shocks. Working capital also plays a prominent role in the emerging markets business cycles literature, much of which emphasizes the aggregate impact of shocks affecting the supply of foreign funds. Neumeyer and Perri (2004) is a primary example of the latter.

for potentially any theory in which working capital plays a significant role.

In the simplest models, working capital is needed in advance of production. This requirement implies that, so long as data is available at a high enough frequency, the relevant components of working capital ought to be more strongly correlated with future values of cash flows than with current values. This, however, need not be generally the case. In an environment with credit frictions, working capital could also lag production. Credit frictions commonly imply that firms have a borrowing capacity that is increasing in the size of their balance sheet. In particular, interest rates can increase with leverage, as in Bernanke and Gertler (1989), or there might be outright leverage limits, as in Kiyotaki and Moore (1997).[3] Models with credit frictions generate endogenous propagation, since profits retained in a given period increase the size of firms' balance sheets, which in turn allow firms to subsequently expand their borrowing and their acquisition of working capital.

To evaluate the lead-lag relationships, I use data from the Financial Accounts of the United States.[4] The data set is put together by the Federal Reserve Board and distributed online four times per year. The accounts are constructed based on a variety of data sources to provide a comprehensive view of how different sectors of the economy (households and different types of corporations) interact with one another, as well as providing a breakdown of the assets and liabilities held in each one of those sectors. The time series span most of the post-WWII period, from 1952 onward, and I use all of the data in my analysis. The advantage of using this data set over firm-level data, such as COMPUSTAT, is that it provides a comprehensive view of the economy, including noncorporate businesses, whereas COMPUSTAT data only include the largest firms. For all the time series, I compare correlations before and after 1984. This marks the end of the 1981 recession and the beginning of the "Great Moderation." The motivation for splitting the sample follows Lubik, Sarte, and Schwartzman (2014), who find that around the same time as the onset of the Great Moderation there was a marked change in key business cycle properties of the U.S. economy. Strikingly, these changes in correlations survive the end of the Great Moderation after 2008. Since the focus of the article is on correlations

[3] These two articles also correspond to the two most widely used microfoundations for credit frictions, which are costly state verification and imperfect commitment, respectively

[4] These data were previously called the "Flow of Funds Accounts of the United States."

and not on volatilities, I treat the whole period from 1984 onward as a single one.

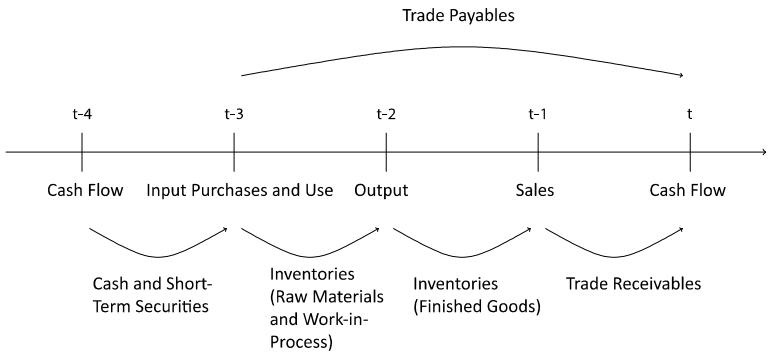
The findings are as follows: First, inventories lag business cycles in the years before 1984 by about three quarters but by only one or two quarters in the more recent period. This is consistent with the view that before 1984 inventory accumulation was determined by previous cash flow accumulation by firms but less so afterward. The second finding is that cash holdings broadly defined to include short-term investments commonly lead the business cycle, consistent with the cash-in-advance model for short-term production decisions. This echoes classic results by Sims (1972) and updated in Stock and Watson (1999) showing that monetary aggregates are a good leading indicator of output. However, and in contrast to monetary aggregates, the lead-lag relationship between cash holdings and output is considerably more robust, remaining in place in the past 30 years, a period in which the relationship between conventional monetary aggregates and output has broken down. Finally, I find that trade credit lags output, although less markedly than inventories.

This article has a very simple structure. I first discuss in more detail how decisions made by a firm over time can give rise to the various components of working capital. The following three sections examine in turn each of the three major components of working capital (inventories, cash and short-term investments, and trade credit). I provide for each component additional background information about existing theories explaining why firms are willing to hold them, as well as some broad descriptive statistics about how relevant those components are on firms' balance sheets, the long-run trends in those holdings, if any, and the cyclical properties of those different components. The last section concludes.

1. WORKING CAPITAL DEMAND

In models, working capital requirements often arise out of timing restrictions. As an example of such restrictions, consider a firm whose production and sales process follows a seasonal flow, so that cash flows are only realized every four periods $\{..., t-4, t, t+4, ...\}$. As an example of a real activity, one could think of this as a Christmas decorations producer that only sells its products in the last quarter of the year. However, in order to receive a cash flow at t, the firm needs to perform several activities throughout the year that result in accumulating working capital between $t-3$ and t. If one were to look at the balance sheet of this firm, one would see working capital peaking in the quarters

Figure 1 Timeline



between cash flow accumulation periods and the cash flows peaking in periods $\{..., t-4, t, t+4, ...\}$.

Figure 1 shows a detailed breakdown of the production cycle, depicting the different components of working capital. The flows are depicted by the vertical lines and stocks are described by the arrows. In the example, the firm starts the year with some cash flow that it receives in $t-4$. It may choose to distribute some of this cash flow to shareholders as dividends, to use it to pay outstanding debts or to dedicate it to long-term investments. It may also choose to retain some of the cash for future use, an option that is attractive if external funds are costly to acquire.

The production cycle starts in the spring, in $t-3$, with the acquisition and use of inputs, including materials and labor. These can be paid for using the cash that the firm has on its balance sheet or with credit. The typical "cash-in-advance" assumption is that a subset of the inputs that firms acquire in $t-3$ require it to have cash available from the previous period, $t-4$, onward. The required cash may be a leftover of period $t-4$ cash flows that were not put to alternative uses, raised through financial intermediaries, or acquired by issuing new shares. Alternatively, the firm might choose to defer payment for inputs to which the cash-in-advance constraint does not apply, acquiring an account payable. In the example, those accounts payable remain on the firm's balance sheet until it receives new cash flows in t and uses those to pay the accounts payable out.

The raw materials that the firm purchases in the spring, in $t-3$, are incorporated into raw materials inventories. Some part of it is processed right away, and the combination of the cost of those materials with

labor and overhead costs involved in the processing are incorporated into work-in-process inventories. Raw materials and work-in-process inventories remain on the firm's balance sheet until production is finalized in the summer, in $t-2$. At that point, all the inventories become finished goods inventories, which remain on the balance sheet until the fall in $t-1$, when the Christmas decorations producer sells the goods to wholesalers. However, since wholesalers will only sell those goods to final customers in the last quarter of the year, the producer may agree to let them delay the payment, acquiring an account receivable, which is canceled at t. Firms can then use the associated cash flows to cancel outstanding accounts payable and restart the production cycle.

The assumption of a seasonal pattern may be appropriate for certain firms and industries but not for others. Some models of working capital requirements such as in Christiano and Eichenbaum (1992) incorporate a seasonal-like pattern. However, instead of taking place over the year, the seasonality takes place within each period, with working capital being required in the beginning of the period so that cash flows can be realized in the end of the period. Since model periods are chosen to correspond to periods in the data, the seasonality is not observable to an econometrician. A perhaps more natural case (although not usually explicitly modeled in the literature) is for firms to run multiple production processes simultaneously, with working capital being accumulated in any point in time for the sake of production in the following period.

The different forms of working capital assets require the firm to commit funds ahead of cash flows. The marginal cost of those funds can be determined in different ways depending on the details of the environment in which the firms find themselves. In the simplest case in which there are no credit market frictions, the marginal cost of funds dedicated to working capital assets is given simply by the interest rate on financial assets of similar maturity. If, however, credit frictions impose a wedge between the interest rate on borrowing and the return on financial assets, the marginal cost of funds will depend on whether the firm is a borrower. More generally, if the firm faces credit rationing, the marginal cost of funds is given by the return on alternative uses of those funds, for example in illiquid, long-term investment projects.

Finally, note that the demand for different components of working capital emerges for very different reasons. The demand for inventories arises because of a discrepancy between the timing of purchase and use of inputs, production, and sales that is likely to arise largely for technological reasons. However, the demand for cash and trade credit is largely a function of the type of access that the firm and its trading

partners have to payment and credit institutions. We will examine each component of working capital in the following sections.

2. INVENTORIES

There is a large literature on inventories, some of it summarized in Ramey and West (1999), but it is still evolving. Hornstein (1998) also provides a detailed overview of stylized facts associated with inventory investment. Holding inventories is inherently costly, because by dedicating funds to the purchase of inputs that will only result in cash flows in the future, firms forgo the return on financial investments. Furthermore, they might have to incur storage costs. Given those costs, there are two dominant views of why firms hold inventories. One emphasizes firms' desire to avoid stockouts, i.e., situations in which customers desire to purchase some good or the firm desires to use some input but cannot because it is not available at that moment.[5,6] The second view points to fixed costs of moving goods between locations, which leads firms to purchase inputs or deliver output to retailers in batches.[7]

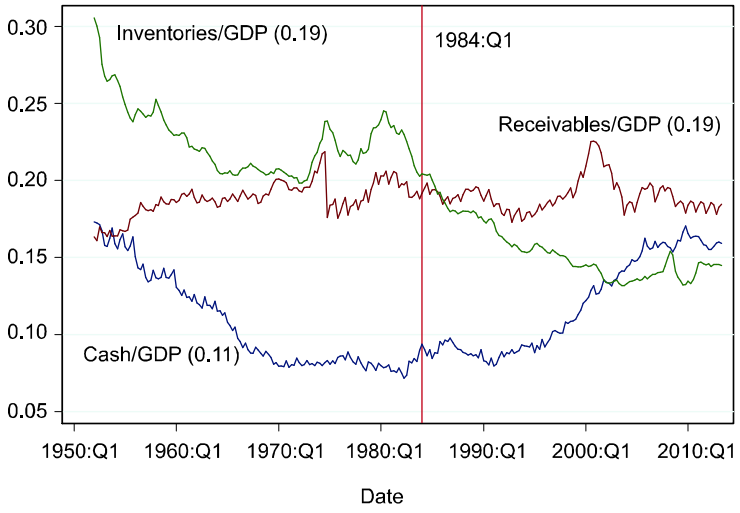
In both views, inventories are a pre-condition for sales and, to the extent that these theories also explain the holding of raw materials inventories, they are a pre-condition for production. Given either stockout avoidance or fixed delivery costs, firms choose the inventory/sales ratio to balance out the costs associated with very low inventories against the opportunity cost of funds and storage costs associated with holding those inventories. For a given target inventory/sales ratio, changes in the economic environment that lead firms to increase their prospective sales are, therefore, likely to be accompanied by a prior buildup of inventories. Likewise, changes in the opportunity cost of holding inventories due to less expensive bank credit or lower return on financial investments might also lead firms to build up inventories and, subsequently, increase their cash flow. In both cases, a buildup in inventories precedes increases in cash flows. Alternatively, to the extent that reduced cash holdings are associated with a higher

[5] For a recent article analyzing the implications of this view for the macroeconomy, see Wen (2011).

[6] A closely related view is that firms hold inventories in order to smooth production in the face of erratic demand shocks. While still an important building block of inventory models, production smoothing is, by itself, at odds with the fact that production is generally more volatile than sales (Ramey and West 1999).

[7] See Khan and Thomas (2007) for an analysis of the implications of this view for macroeconomic dynamics.

Figure 2 Components of Working Capital/GDP



Notes: Share of GDP averages are in parentheses.

opportunity cost of funds for the firm, a reduction in output or sales may precede reductions in inventories holdings.[8]

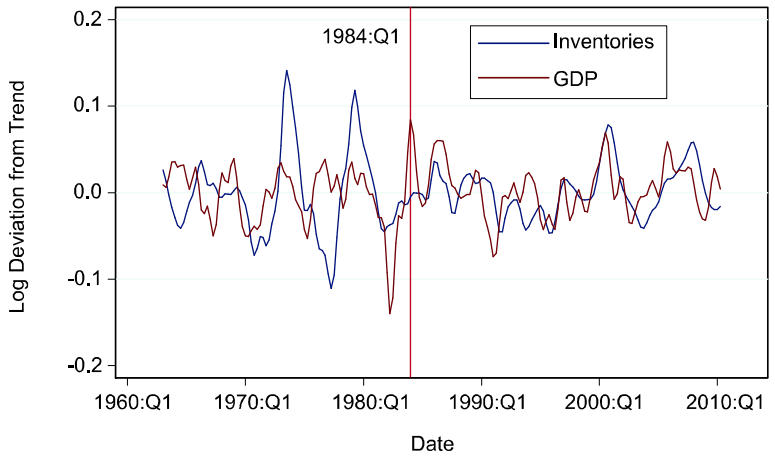
Figure 2 shows the evolution of the different components of working capital, as calculated using the Financial Accounts of the United States all normalized by gross domestic product (GDP). The normalization is chosen to control for underlying trends, and to give a sense of the importance of inventories in production. In the specific case of inventories, we can see that between 1952 and 2013 nonfinancial businesses have held an amount of inventories equal to around 19 percent of GDP. Furthermore, from the early 1980s onward there is a well-documented secular decline in the inventories/GDP ratio (Ramey and West 1999).[9]

Figure 3 shows the cyclical component of inventories together with the cyclical component of GDP, where both GDP and inventories were

[8] More complicated dynamics are certainly possible. For example, if demand for products increases unexpectedly and firms need time to ramp up production, final goods inventories might decline momentarily with an increase in output and sales following that decline.

[9] When calculating ratios, I use nominal values in both the numerator and the denominator.

Figure 3 Cyclical Components of GDP and Inventories



deflated using the GDP deflator. The cyclical component of the deflated series is extracted using the band-pass filter to isolate variation in the data corresponding to cycles with amplitude between four and 32 quarters. Thus, it excludes seasonal variation (which have an amplitude of four quarters) and fluctuations at lower than what is typically considered business cycle frequencies (which have amplitudes of eight years or fewer), including long-run trends. From the figure, it is almost immediate that inventories have lagged business cycles before the mid-1980s, but that the lead-lag relationship becomes less salient afterward.

Table 1 confirms the visual impression. For each column, the first line of the table shows the correlation of the cyclical component of GDP at t with the cyclical component of inventories in some $t + k$, with each column corresponding to a different value of k. We say that inventories lead output if the peak correlation occurs for $k < 0$ and that it lags output if it occurs for $k > 0$. The table omits standard errors for simplicity, but as a rule of thumb correlations above 0.2 in absolute value are statistically significant. The table shows that before 1984 GDP correlated most with inventories three quarters in the future. After 1984, the peak of the lead-lag difference shortens from three quarters to one quarter, and the difference between the peak and the contemporaneous correlation becomes less salient. The result provides a different perspective on the stylized facts pointed out by Lubik, Sarte, and Schwartzman (2014), who show that inventory/sales

Table 1 Correlations Between Inventories and Measures of Economic Activity

	$t-4$	$t-3$	$t-2$	$t-1$	t	$t+1$	$t+2$	$t+3$	$t+4$
					1952–1983				
GDP	−0.48	−0.31	−0.11	0.13	0.39	0.61	0.76	0.81	0.77
Final Sales	−0.50	−0.32	−0.11	0.13	0.38	0.61	0.78	0.84	0.82
Cash Flow 1	−0.56	−0.53	−0.44	−0.29	−0.09	0.15	0.37	0.53	0.60
Cash Flow 2	−0.52	−0.43	−0.29	−0.11	0.11	0.35	0.55	0.66	0.66
					1984–2013				
GDP	0.06	0.22	0.40	0.57	0.70	0.78	0.77	0.63	0.40
Final Sales	0.23	0.40	0.55	0.67	0.73	0.77	0.75	0.60	0.37
Cash Flow 1	−0.36	−0.23	−0.09	0.03	0.11	0.21	0.36	0.50	0.58
Cash Flow 2	−0.11	0.05	0.23	0.38	0.47	0.51	0.54	0.52	0.48

ratios were strongly countercyclical prior to 1984 but became acyclical or even somewhat pro-cyclical afterward.

As Figure 1 suggests, production begets inventories, thus implying mechanically the possibility of a lead-lag relationship. The bottom rows of each of the panels in Table 1 examine this possibility by investigating whether the lead-lag relationship uncovered for GDP is also present for final sales and cash flows. Final sales are defined as being equal to GDP with inventory investment excluded from it. For cash flow, I use two alternative definitions. The first one defines cash flows to be equal to net income plus the consumption of capital of both corporate and noncorporate firms. Adding the consumption of capital back to net income is necessary in order to obtain a sensible measure of cash flow since the consumption of capital (which is closely related to depreciation) does not reduce firm cash flows even if it reduces the economic income. The second one adds interest payments, thus separating the ability of the firm to generate cash flow from the financial position of the firm and the timing of interest payments. These definitions of cash flow are imperfect in that net income is recognized at the time of sale, not at the time in which trade receivables are paid out. Thus, in terms of the diagram in Figure 1, the measured cash flow might be recognized closer to time $t-1$ than to t. In all cases, inventories lag the particular flows considered, demonstrating that the lead-lag relationship with output is not an artifact of timing restrictions.

3. CASH AND SHORT-TERM INVESTMENTS

Cash and short-term investments represent cash and all securities readily transferable to cash. This includes, apart from cash on hand,

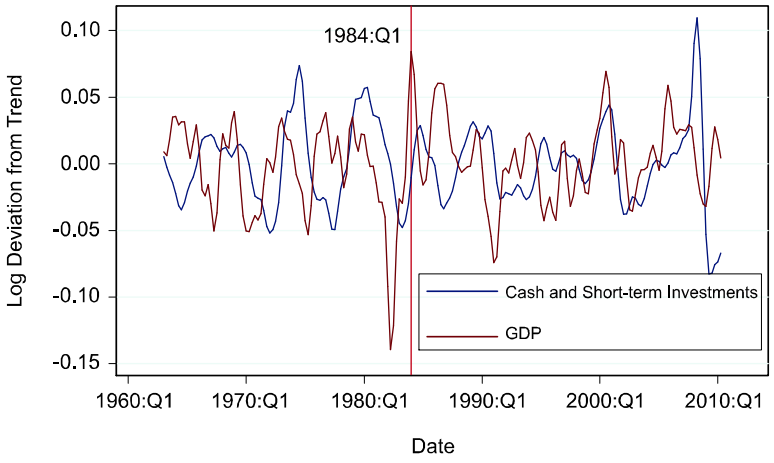
certificates of deposits, commercial paper, government and other marketable securities, demand deposits, etc. Firms hold cash and short-term investments for many reasons, including to facilitate day-to-day payments of variable inputs (Christiano and Eichenbaum 1992), to serve as cushions to allow firms to insure against negative cash flow shocks (Bates, Kahle, and Stulz 2009), to help firms take advantage of fleeting investment opportunities (Kiyotaki and Moore 2012), or to help them with their tax management (Foley et al. 2007). Of those motives, business cycle models in which firms demand cash typically focus on the first, which is the payments for variable inputs. These models are normally posited as "cash-in-advance" models, in which firms need to have cash at hand for a nontrivial period of time before the time in which they use the cash.

For cash-in-advance constraints to play a meaningful economic role, it must be the case that cash pays a rate of return below the opportunity cost of funds for firms. This is trivially the case if cash is understood to include only currency, which pays no interest rate and the value of which declines with inflation. In that case, the opportunity cost of holding cash is given by the nominal rate of interest on bonds. However, firms also hold a variety of assets that are "as good as cash," in the sense that they either mature very quickly or can be converted into cash at very short notice. The opportunity cost of holding these "short-term" investments is given by their liquidity premia, that is, by the difference between the rate of return on those securities and the rate of return on alternative, illiquid investments.

Using the Financial Accounts of the United States data, I calculate cash and short-term investments for both corporate and noncorporate nonfinancial businesses. For noncorporate businesses, these are the sum of checkable deposits and currency, time and savings deposits, money market fund shares, Treasury securities, and municipal securities. For nonfinancial corporate businesses, cash includes, in addition to those just listed, foreign deposits and agency and GSE-backed securities. From Figure 2, we can see that between 1952 and 2013 corporate businesses have held on average 11 percent worth of GDP in cash. Furthermore, in the last few decades there has been a secular increase in the shares of cash and short-term investments, a fact pointed out in articles by Foley et al. (2007) and Bates, Kahle, and Stulz (2009), among others, who have found firms holding increasing amounts of cash in the last three decades.

Figure 4 shows the cyclical component of cash and short-term investments held by corporate businesses together with the cyclical component of GDP, with both series deflated by the GDP deflator, and

Figure 4 Cyclical Components of GDP and Cash and Short-Term Investments



filtered using the band-pass filter for variations at cycles with amplitudes between four and 32 quarters. As Table 2 makes clear, cash leads business cycles throughout the period under analysis, although the relationship weakens after 1984. The relationship is only hard to discern when cash flow 1 (incoming profits plus depreciation, net of interest expenses) is used as a measure of economic activity, but it is again apparent with cash flow 2 (incoming profits plus depreciation, gross of interest expenses). Such a lead-lag relationship echoes the old monetarist view that money is a good leading indicator for business conditions, as well as formal analysis by Sims (1972), updated by Stock and Watson (1999). Table 3 revisits these results by showing the lead-lag relationship between M2 (which includes currency, demand deposits, money market mutual funds, and other time deposits) and GDP, both deflated by the GDP deflator and band-pass filtered, for the whole sample and broken down before and after 1984. The lead-lag relationship of M2 with GDP is very strong before 1984, but disappears afterward. Given the comparison with the behavior of M2, it is remarkable that the lead-lag relationship between cash and short-term investments held by firms with output is as robust as it is.

The finding goes along with the assertion by Lucas and Nicolini (2013) and Belongia and Ireland (2014) that traditional monetary aggregates do not measure adequately the amount of liquidity in the economy, and that more carefully constructed measures of aggregate

Table 2 Correlations Between Cash and Short-Term Investments and Measures of Economic Activity

	$t-4$	$t-3$	$t-2$	$t-1$	t	$t+1$	$t+2$	$t+3$	$t+4$
					1952–1983				
GDP	0.46	0.60	0.69	0.70	0.61	0.42	0.18	−0.09	−0.32
Final Sales	0.47	0.60	0.68	0.70	0.62	0.44	0.21	−0.04	−0.28
Cash Flow 1	0.17	0.34	0.48	0.57	0.61	0.56	0.40	0.19	−0.01
Cash Flow 2	0.35	0.48	0.55	0.59	0.56	0.44	0.24	0.02	−0.17
					1984–2013				
GDP	0.25	0.41	0.54	0.57	0.51	0.43	0.31	0.19	0.09
Final Sales	0.33	0.42	0.48	0.49	0.46	0.41	0.33	0.22	0.11
Cash Flow 1	0.08	0.08	0.07	0.08	0.12	0.20	0.28	0.33	0.34
Cash Flow 2	0.20	0.26	0.28	0.24	0.20	0.18	0.17	0.16	0.17

liquidity have retained the ability to forecast output. Of course, a measure of liquidity based on cash and short-term investments held by firms is distinct from measures such as M2 or others in that it does not include cash held by households. A closer investigation of whether liquid assets held by firms are specially correlated with future output as compared to those held by households is an interesting avenue for future work.

4. TRADE CREDIT

The third major component of working capital is trade credit, with trade receivables as part of the assets and trade payables as part of the liabilities. Trade receivables represent amounts owed by customers for goods and services sold in the ordinary course of business. Conversely, trade payables represent trade obligations due within one year, or the normal operating cycle of the company.

Trade credit is an active area of research in corporate finance, with an abundant theoretical and empirical literature. To a large degree, theories of trade credit emphasize the fact that, relative to financial institutions, suppliers often have advantages in securing repayment from their customers. Among other reasons for that advantage, the literature mentions information advantages for suppliers (Mian and Smith 1992), incentives for customers to preserve their relationship with suppliers (Cuñat 2007), and the fact that, since goods are harder to divert than cash, borrowers have less incentive to default (Burkart and Ellingsen 2004).

The opportunity cost of holding trade receivables is given by the difference between the rate of return on alternative investments and

Table 3 Correlations Between M2 and Short-Term Investments and Measures of Economic Activity

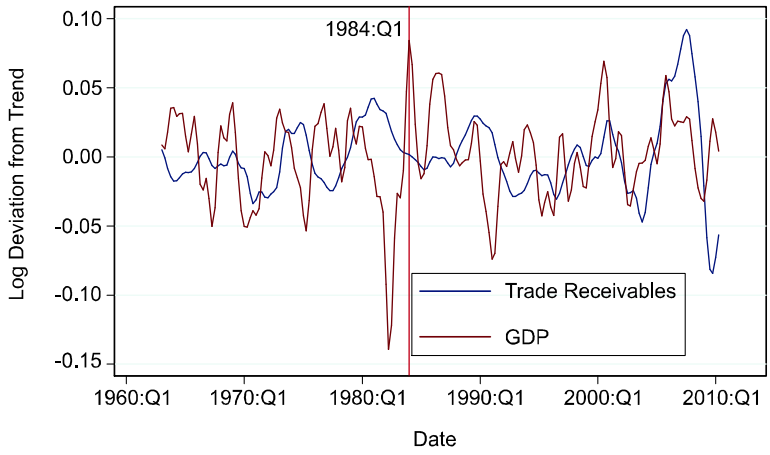
	$t-4$	$t-3$	$t-2$	$t-1$	t	$t+1$	$t+2$	$t+3$	$t+4$
					1952–1983				
GDP	0.66	0.77	0.82	0.78	0.65	0.46	0.23	−0.01	−0.22
Final Sales	0.66	0.76	0.80	0.78	0.67	0.47	0.22	−0.02	−0.23
Cash Flow 1	0.24	0.44	0.62	0.75	0.80	0.74	0.61	0.43	0.23
Cash Flow 2	0.45	0.60	0.71	0.77	0.74	0.62	0.43	0.22	0.02
					1984–2013				
GDP	−0.02	−0.08	−0.14	−0.22	−0.29	−0.32	−0.27	−0.15	−0.01
Final Sales	−0.14	−0.20	−0.23	−0.26	−0.29	−0.30	−0.25	−0.14	0.01
Cash Flow 1	0.06	0.01	−0.08	−0.19	−0.31	−0.42	−0.49	−0.52	−0.50
Cash Flow 2	−0.07	−0.13	−0.21	−0.31	−0.38	−0.41	−0.38	−0.30	−0.20

the interest rate paid by customers. If the latter is smaller than the former, it will be costly for firms to hold trade receivables. Conversely, there is a cost associated with issuing trade payables if the interest rate on trade payables is higher than the rate of return on real or financial investments.

When analyzing trade credit, I focus on trade receivables, which I define to include consumer credit held by corporate and noncorporate nonfinancial firms. Including consumer credit follows the spirit of including in trade receivables all short-term credit conceded by the firm to other parties in order to facilitate production and sales. I focus only on receivables rather than payables since, in a closed economy, whenever a firm issues a trade payable, the counterpart acquires a trade receivable. Because the U.S. economy is not closed, the two numbers do not exactly coincide. Furthermore, even after accounting for foreign holdings and issuance of trade credit, the difficulties in collecting accurate data are significant enough that there exists a nontrivial discrepancy between aggregate trade payables and aggregate trade receivables. Finally, trade payables do not include consumer credit. In spite of those differences, both measures of trade credit behave very similarly, so that for brevity I will only discuss trade receivables.

From Figure 2 we can see that between 1952 and 2013 corporate businesses hold a value of trade receivables equal to 19 percent of GDP. Furthermore, unlike inventories and cash, there is no clear trend in the ratio of trade receivables to GDP. Figure 5 shows the cyclical component of receivables together with the cyclical component of GDP, both deflated using the GDP deflator and extracted using a band-pass filter for frequencies between four and 32 quarters. Table 4 presents the cross-time correlation. Trade receivables lag output by a quarter both

Figure 5 Cyclical Components of GDP and Trade Receivables



before and after 1984. This is in line with the diagram depicted in Figure 1, which predicts that firms accumulate trade receivables after production and sales have taken place. A comparison with final sales and the different measures of cash flow shows a similar pattern. This is still in line with the diagram, since net income is recognized at the time of sale, not at the time in which final payment is received. Thus, to the extent that firms tend to provide financing for their customers, one would expect trade receivables to lag cash flows defined using data from income.

5. CONCLUSION

Working capital is an important part of many macroeconomic models that emphasize the impact of fluctuations in the cost of capital on firm decisions. I find that the cyclical properties of the different components are quite different. In particular, cash holdings consistently lead the business cycle, whereas inventories and trade receivables are lagging. Interestingly, the lead-lag relationships for inventories appear to weaken after 1984. To the extent that those relationships are indicators of payment and financial frictions, the reductions in the lead-lag relationships between inventories and economic activity are consistent with the view, argued by Jermann and Quadrini (2006), that financial markets became more efficient after the early 1980s. A second set of interesting facts concerns cash holdings, which are particularly

Table 4 Correlation of Trade Receivables with Different Measures of Economic Activity

	$t-4$	$t-3$	$t-2$	$t-1$	t	$t+1$	$t+2$	$t+3$	$t+4$
					1952–1983				
GDP	−0.25	−0.03	0.25	0.53	0.73	0.81	0.78	0.68	0.52
Final Sales	−0.22	−0.03	0.23	0.50	0.73	0.84	0.83	0.74	0.58
Cash Flow 1	−0.55	−0.49	−0.32	−0.04	0.25	0.47	0.59	0.63	0.60
Cash Flow 2	−0.40	−0.29	−0.08	0.18	0.45	0.64	0.70	0.62	0.48
					1984–2013				
GDP	−0.04	0.13	0.32	0.50	0.64	0.71	0.71	0.64	0.54
Final Sales	0.08	0.25	0.41	0.56	0.67	0.72	0.71	0.65	0.53
Cash Flow 1	−0.47	−0.35	−0.22	−0.07	0.09	0.25	0.38	0.47	0.50
Cash Flow 2	−0.14	0.04	0.19	0.31	0.40	0.45	0.47	0.47	0.45

noteworthy because the facts are robust over time. This is in contrast to the lead-lag relationship between M2 and GDP, which broke down after the 1980s. The results suggest that availability of cash is an important precursor of economic activity, giving some credence to models that emphasize cash-in-advance type constraints.

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