The Impact of Macroeconomic Uncertainty on Trade Credit for Non–Financial Firms

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Abstract

In this paper we hypothesize that greater macroeconomic uncertainty would cause firms to increasingly turn to their suppliers as a source of finance, making greater use of trade credit. We test this hypothesis using a panel of non–financial firms drawn from the annual COMPUSTAT database and show that an increase in macroeconomic uncertainty leads to a narrowing of the cross–sectional distribution of firms' trade credit–to–sales ratios.

Keywords: Trade credit, accounts payable, macroeconomic uncertainty, time series, ARCH, non–financial firms.

1 Introduction

Corporations use trade credit extensively as a source of short–term financing. For example, in our sample of COMPUSTAT firms, the average trade credit–to–sales ratio for all non–financial firms is 8.6%. Why do firms rely on trade credit in the presence of financial intermediaries? Use of trade credit helps firms reduce their transaction costs. Also, firms that experience limited access to external financial sources, such as banks and other financial intermediaries, are likely to turn to their suppliers for trade credit. For example, Petersen and Rajan (1997) showed that firms experiencing credit rationing tend to use more trade credit. Nielsen (2002) pointed out that, during periods of monetary tightening, firms which are likely to be bank–credit constrained react by increasing their use of trade credit.

In this paper, we argue that an increase in macroeconomic volatility might sharpen information asymmetry problems and cause severe restrictions to firms' access to external finance from intermediaries. Since suppliers would have a comparative advantage over financial institutions in monitoring their clients' financial status, firms would increasingly turn to their suppliers as a source of finance. Naturally, this would in turn generate predictable variations in the cross–sectional distribution of firms' trade credit use. Hence, we show that an increase in macroeconomic uncertainty would lead to a narrowing of the cross–sectional distribution of firms' trade credit–to–sales ratios.[1]

The rest of the paper is organized as follows. Section 2 discusses motives for trade credit use and reviews the related literature. Section 3 presents our measure of macroeconomic uncertainty, while Section 4 describes the data and discusses our empirical findings. Finally, Section 5 concludes.

[1]Beaudry et al. (2001), Baum et al. (2002a) and Baum et al. (2002b) investigate the effects of uncertainty on investment, bank lending and cash holding behavior, respectively.

2 Motives for Trade Credit Use

There are two major motives for trade credit use: the transactions motive and the finance motive.

According to the transactions theory of trade credit, firms can economize on the joint costs of exchange by using trade credit (Ferris, 1981). Trade credit use permits the exchange of goods to be separated from the immediate use of money. In doing so, trade credit transforms an uncertain stream of money payments into a sequence that can be known with certainty. Obviously, during times of volatility, firms would be more likely to consider payment flexibility as an important strategy in minimizing costs of uncertainty in their transactions. Thus, as macroeconomic uncertainty increases, the transactions motive for trade credit use would be expected to strengthen.

According to the financing motive, imperfect capital markets enable suppliers to finance buyer firms at a lower cost than can financial institutions (see, for example, Schwartz (1974), Smith (1987)), mitigating the credit rationing a firm may experience in financial markets. One possible impact of macroeconomic uncertainty on firms could be to induce more severe problems of asymmetric information, which can severely limit firms' access to capital markets. Since suppliers can monitor their customers' financial status better than financial institutions, they can play a major role as a source of their customers' financing—which might be particularly important during times of greater macroeconomic uncertainty.

Given that in times of macroeconomic turmoil, all firms are faced with similar constraints, we claim that the cross-sectional dispersion of the trade credit–to–sales ratio would fall, implying more homogeneous behavior among firms. Conversely, in times of greater macroeconomic stability, problems of informational asymmetry will be less severe and credit rationing will decline, allowing firms to have more latitude to behave idiosyncratically, and leading

to a broadening of the cross-sectional dispersion of firms' trade credit–to–sales ratios.

3 Measuring macroeconomic uncertainty

In order to test our hypothesis, we use the conditional variance of a monthly measure of real gross domestic product as a proxy for uncertainty, which captures the overall stability of the macroeconomy. Furthermore, we focus on accounts payable as a measure of trade credit usage, considering the firms in our data set as borrowers (customers). Hence, using the cross sectional dispersion of ratio of accounts payable to net sales (TC) as a dependent variable, we consider the following reduced form equation:

$$Disp_t(TC_{it}/TA_{it}) = \beta_0 + \beta_1 \hat{h}_t + e_t, \tag{1}$$

where $\hat{h}_t$ is the conditional variance of real GDP evaluated at time t. The advantage of this approach is that we can relate the behavior of trade credit directly to a measurable variable for economic uncertainty. If our conjecture is supported by the data, we should obtain a negative sign for β_1.[2]

Our proxy for macroeconomic uncertainty is derived from quarterly real GDP (International Financial Statistics series $99BRZF$) using monthly industrial production (International Financial Statistics series $66IZF$) as an interpolating variable. We generated the monthly series using the proportional Denton procedure *dentonmq* (Baum, 2001), and fit a generalized ARCH (GARCH(2,2)) model to the deviations of the series from an exponential trend, where the mean equation is an AR(1) model.[3] The conditional variance derived from this GARCH model, averaged to annual frequency, is then used as our measure of macroeconomic uncertainty ($\hat{h}_t$).

[2]Although $\hat{h}_t$ is a generated regressor, the coefficient estimates for equation (1) are consistent; see Pagan (1984, 1986).

[3]Details of the estimated GARCH model are available upon request.

4 Empirical findings

4.1 The data

We use the COMPUSTAT Industrial Annual database of U.S. non-financial firms for testing our hypothesis. It covers on average 4,300 firms' annual characteristics from 1959 to 2000. We consider all firms except finance, insurance and real estate and government enterprises and utilities. We utilize COMPUSTAT data items Accounts Payable (*data70*) and Net Sales (*data12*) to construct the Accounts Payable–to–Sales ratio (TC).

We apply a number of sample selection criteria on our original sample of 182,275 firm–years. First, we marked non–positive values of accounts payable and net sales as missing. Second, we removed observations in which the accounts payable–to–sales ratio was beyond three standard deviations from the mean, or above 0.99. Third, to remove firms exhibiting substantial changes in their scale, we trimmed firms whose total assets growth rate exceed the 90th percentile or fall short of the 10th percentile of the annual distribution. Finally, to exclude firms in financial distress, we eliminated two successive negative cash flows along with observations a year before and after. These screens collectively reduced the sample to 136,014 firm–years.[4]

To test our hypothesis, we concentrate on the following data splits. A firm is considered to be LARGE if its total assets are above the 90th percentile by year. If a firm has total assets below the 25th percentile then we consider this firm as SMALL.[5] Second, we subdivided the data of the manufacturing sector firms (two–digit SIC 20–39) into producers of durable goods and producers of nondurable goods. A firm is considered DURABLE if its primary SIC is

[4]Empirical results drawn from the full sample yielded qualitatively similar findings; we prefer to use the screened data to reduce the potential impact of outliers upon the parameter estimates.

[5]These asymmetric bounds have been chosen, given the highly skewed distribution of firms' assets, in order to roughly equalize the number of firm–years in each category.

24, 25, or 32–39.[6] SIC classifications for NONDURABLE industries are 20–23 and 26–31.[7] Note that manufacturers of durable and nondurable goods make almost identical use of trade credit. Finally, we divided firms into high–growth and low–growth categories, defining those categories as above the 75th percentile and below the 25th percentile of the annual distribution of the growth in real total assets, respectively. We find that high–growth firms carry slightly more trade credit on their books, relative to net sales, than do low–growth firms. This may reflect that they are more likely to be liquidity constrained and pressed to make use of this source of financing.

4.2 The link between trade credit and macroeconomic uncertainty

The results of estimating Equation 1 are given in Tables 1–3 for three category splits of the full sample: for large/small firms, durable/nondurable goods manufacturers, and low and high growth firms, respectively. In those tables, we present OLS regression results, where the macroeconomic uncertainty proxy *Lwcvgdp* is a weighted average of lagged effects.[8] We consider the potential impact of interest rates on trade credit behavior in estimated models which include the three-month Treasury bill rate (*TB3mo*) and the three-month LIBOR rate (*LIBOR3mon*) as alternative proxies for the private cost

[6]These industries include lumber and wood products, furniture, stone, clay, and glass products, primary and fabricated metal products, industrial machinery, electronic equipment, transportation equipment, instruments, and miscellaneous manufacturing industries.

[7]These industries include food, tobacco, textiles, apparel, paper products, printing and publishing, chemicals, petroleum and coal products, rubber and plastics, and leather products makers.

[8]In our efforts to capture the combined effect of contemporaneous and lagged uncertainty on trade credit usage we imposed an arithmetic lag on the values of the proxy variable for periods $t-1$, $t-2$, $t-3$ and $t-4$ with weights 0.4, 0.3, 0.2 and 0.1 respectively. Also analysis based on contemporaneous and once lagged uncertainty as well as on conditional variance of industrial production as a regressor yielded similar results. These are available upon request.

of funds. The last two rows of each table report the estimated elasticities of the dispersion of the trade credit–to–sales ratio with respect to *Lwcvgdp*, and their estimated standard errors.

The results indicate that there are interesting differences between firm classes. In the case of large and small firms, as presented in Table 1, the estimated coefficients for large firms are negative and significantly different from zero. In contrast, the estimates for small firms are considerably smaller in magnitude, and not significantly different from zero at the 5% level. This result is consistent with Nielsen's flight–to–quality interpretation.

A quite striking contrast may be observed between durable–goods and nondurable–goods manufacturers (Table 2). As the models in columns 1 and 2 indicate, the former firms do not exhibit a significant sensitivity to macroeconomic uncertainty, while in contrast, the nondurable manufacturers (in columns 3 and 4) exhibit a significant sensitivity. Since durable goods makers' products generally involve greater time lags in production and larger inventories of work–in–progress, they may have established credit lines allowing them to forego the use of expensive trade credit, whereas non–durable goods producers will depend on trade credit to survive during periods of heightened uncertainty.

Finally, we investigate the behavior of low– and high–growth firms. Low–growth firms are likely to be more mature firms. They do not exhibit significant effects of macroeconomic uncertainty, while its impact on high–growth firms is much larger (see Table 3). The latter firms are more likely to face greater informational asymmetries, and one would expect them to have limited access to external finance. An increase in macroeconomic uncertainty might sharpen information problems causing more restrictions in their access to capital market. As a result, they would be more likely to demand trade credit from suppliers. Petersen and Rajan (1997) find that suppliers appear to have an advantage in financing growing firms, especially if their credit

quality is suspect. They provide several reasons for this. First, high–growth firms might be a major source of business, and suppliers would be willing to provide credit while expecting to capture this business. Second, as we have argued previously, suppliers are likely to have a comparative advantage over financial institutions in obtaining information they need. Third, suppliers may rely on their ability to repossess and resell the goods against which credit has been provided.

5 Conclusions

In this paper, we investigate the link between non–financial firms' use of trade credit (accounts payable) and macroeconomic uncertainty. We hypothesize that firms become more homogenous in their reliance on trade credit in response to an increase in macroeconomic uncertainty. Conversely, when the macroeconomic environment is more stable, firms have more latitude to behave idiosyncratically. We test this hypothesis by examining the behavior of the cross–sectional dispersion of firms' accounts payable–to–sales ratios as macroeconomic uncertainty varies. We find that large firms, nondurable–goods makers and high–growth firms make larger adjustments in their accounts payable in response to macroeconomic volatility than will small firms, durable–goods makers, or those firms experiencing slower growth. Our results are shown to be robust to the inclusion of the levels of macroeconomic factors such as short–term Treasury and LIBOR interest rates.

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Table 1. Dispersion of AP/Sales ratio for 1963-2000

	(1) large	(2) large	(3) small	(4) small
Lwcvgdp	-76.474	-74.429	-33.158	-32.718
	[11.839]***	[11.899]***	[17.211]*	[20.667]
TB3mo	0.027		0.369	
	[0.065]		[0.109]***	
LIBOR3mo		-0.021		0.252
		[0.040]		[0.072]***
Constant	0.095	0.097	0.083	0.087
	[0.008]***	[0.007]***	[0.010]***	[0.010]***
Observations	38	38	38	38
R^2	0.63	0.63	0.33	0.24
$\hat{\eta}$	-0.75	-0.73	-0.20	-0.20
s.e.	0.12	0.12	0.11	0.13

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

SDs based on respectively 17225 and 20926 firm-year obs.

Table 2. Dispersion of AP/Sales ratio for 1963-2000

	(1) durable–goods	(2) durable–goods	(3) nondurable–goods	(4) nondurable–goods
Lwcvgdp	-1.721	-1.144	-10.167	-10.137
	[5.517]	[5.572]	[3.893]**	[4.167]**
TB3mo	0.014		0.070	
	[0.030]		[0.027]**	
LIBOR3mo		-0.001		0.049
		[0.020]		[0.024]*
Constant	0.047	0.047	0.048	0.049
	[0.002]***	[0.002]***	[0.003]***	[0.003]***
Observations	38	38	38	38
R^2	0.01	0.00	0.13	0.10
$\hat{\eta}$	-0.02	-0.01	-0.12	-0.12
s.e.	0.06	0.06	0.04	0.05

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

SDs based on respectively 47652 and 27505 firm-year obs.

Table 3. Dispersion of AP/Sales ratio for 1963-2000

	(1) low–growth	(2) low–growth	(3) high–growth	(4) high–growth
Lwcvgdp	-5.439	-3.069	-34.760	-35.140
	[15.281]	[16.415]	[13.178]**	[16.299]**
TB3mo	0.012		0.368	
	[0.073]		[0.074]***	
LIBOR3mo		-0.038		0.267
		[0.043]		[0.062]***
Constant	0.065	0.067	0.067	0.071
	[0.008]***	[0.008]***	[0.007]***	[0.008]***
Observations	38	38	38	38
R^2	0.00	0.01	0.48	0.39
$\hat{\eta}$	-0.05	-0.03	-0.26	-0.27
s.e.	0.13	0.14	0.10	0.13

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

SDs based on respectively 27227 and 27291 firm-year obs.