Journal of Macroeconomics 38 (2013) 452–464

Contents lists available at SciVerse ScienceDirect

Journal of Macroeconomics

journal homepage: www.elsevier.com/locate/jmacro

Cyclical behavior of firm-level volatility: An explanation for the contrast between the United States and Japan

Koki Oikawa *

School of Social Sciences, Waseda University, 1-6-1 Nishiwaseda Shinjuku-ku, Tokyo 169-8050, Japan

ARTICLE INFO

Article history:
Received 11 April 2012
Accepted 17 June 2013
Available online 12 July 2013

JEL classification:
E32
G33
L25

Keywords:
Firm-level volatility
Medium-term business cycle
Bankruptcy cost
Entrepreneur

ABSTRACT

This study examines the cyclical behaviors of firm-level volatility, measured by real sales growth. Japanese firm-level data show that their volatility is countercyclical, whereas it is procyclical among the United States firms reported in a previous study. We formulate a theoretical model that accounts for these opposing behaviors over the business cycles. The key driving factor behind the relationship is the bankruptcy cost structure, more specifically, the relative magnitude of the fixed and marginal costs of bankruptcy. The fixed bankruptcy cost operates as an entry barrier and the marginal bankruptcy cost operates as an additional cost of hiring. These distinct impacts affect the type of firms entering/exiting the market over the business cycle. We also examine the welfare and policy implications of the model by comparing the structures of bankruptcy costs in terms of efficiency.

1. Introduction

The aim of this paper is to explain the different cyclical behaviors of firm-level volatility, measured by real sales growth, observed in the United States and Japan during the last three decades. Comin and Mulani (2006) define firm-level volatility as the weighted average of firms' standard deviations of real sales growth rates. In the final part of their paper, Comin and Mulani assessed the correlation between firm-level volatility and medium-term business cycles,[1] and documented the procyclical behavior of firm-level volatility. In other words, they found that firm-level volatility decreases in a recession. In Section 2, we similarly define firm-level volatility using firm sales data in Japan and distill the medium-term cycles of Japanese real GDP time series. Interestingly, the Japanese data reveal highly significant countercyclicality during the last three decades and support the notion that firm-level volatility increases in a recession.

In the theoretical part of this paper, we demonstrate that the opposite cyclical behaviors occur if the United States and Japan differ in terms of the structure of bankruptcy costs. Specifically, the relative size of the fixed costs of bankruptcy against the marginal cost matters the most. As pointed out by Hotchkiss et al. (2008), researchers have found that bankruptcy costs contain a fixed element and increase with firm size. In order to incorporate these observations into our model, we specify the expected bankruptcy cost as a product of the probability of bankruptcy and a bankruptcy cost function that is increasing in employment and has a fixed cost. Although the two countries share this common property, they differ in the following way. Helwege and Packer (2003) argued that managers in Japan have more incentive to avoid bankruptcy than

* Tel.: +81 3 5286 1441.
E-mail address: oikawa.koki@gmail.com

[1] Comin and Gertler (2006) introduce medium-term business cycles to capture waves with long bandwidths that usual Hodrick–Prescott filters or "short-term" band-pass filters filter out. They determined medium cycles with a band-pass filter having bandwidths of 2–200 quarters.

0164-0704/$ - see front matter © 2013 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.jmacro.2013.06.003

Table 1
Summary statistics of volatility of each firm.

	Mean	S.D.	Median	Min	Max	# Obs.
Full	0.17	1.89	0.097	0.0065	193.99	76,484
Manufacturing	0.13	0.96	0.010	0.0092	193.99	41,741
Nonmanufacturing	0.21	2.60	0.093	0.0065	167.37	34,743

those in the United States because Japanese bankruptcy law is procreditor, while United States bankruptcy law is prodebtor. Greenwald and Stiglitz (1990) showed that such levels of risk aversion could be represented by the marginal bankruptcy cost under risk-neutral decisions. According to these facts, we consider that the marginal bankruptcy cost in Japan tends to be higher than that in the United States.

When the default risk surges in a recession, firms employ fewer workers because of their lower productivity and expectation of a higher marginal bankruptcy cost. The impact of a recession affects the composition of firms in the market. As a result, some workers are crowded out of the labor market, and they are forced to open small businesses, causing an increase in the number of firms and an associated decrease in the average firm efficiency level. However, another recession impact is if the bankruptcy cost has a fixed element, then the surge in the expected fixed bankruptcy cost leads to a higher entry barrier, and causes a decrease in the number of firms and an improvement in the average firm efficiency level. This means that the fixed and marginal costs of bankruptcy affect the composition of firms in two opposing ways and the overall impact depends on the bankruptcy cost structure.

Such a compositional change should affect firm-level volatility because larger firms are less volatile, and they are able to diversify risk more easily, as noted by Hymer and Pashigian (1962). If the impact of the marginal bankruptcy cost is larger than that of the fixed bankruptcy cost, less competent entrepreneurs will be present in the market, even in a recession; therefore, firm-level volatility increases on average. Then, firm-level volatility is countercyclical. In contrast, if the impact of the fixed bankruptcy cost dominates, only competent entrepreneurs can profit in a recession; therefore, firm-level volatility decreases on average. In other words, firm-level volatility is procyclical.

These scenarios are similar to the cleansing effect theory of a recession pointed out by Caballero and Hammour (1994). If the cleansing effect has a strong impact, less efficient firms exit the market and the average firm's efficiency level increases in a recession. This scenario is consistent with the case of the United States. In contrast, Caballero et al. (2008) argued that the cleansing effect malfunctions in Japan. Moreover, Nishimura et al. (2005) documented that firms exiting the market are more efficient than those entering the market during the late 1990s.

The rest of the paper is organized as follows. Section 2 details the cyclical behavior of firm-level volatility in Japan. Section 3 presents the analytical model and main results. Section 4 is concerned with the (constrained) efficient bankruptcy cost structure, and Section 5 provides concluding remarks.

2. Cyclical behavior of firm-level volatility in Japan

This section describes the cyclical behavior of firm-level volatility measured by real sales growth in Japan. The method used to measure firm-level volatility is the one used in Comin and Mulani (2006), and the method of Comin and Gertler (2006) is used to obtain medium-term cycles.

2.1. Data

The firm-level data used in this analyses were extracted from the Nikkei Economic Electronic Databank System, which contains the annual sales data of 4962 listed and unlisted firms (2160 manufacturing firms and 2802 nonmanufacturing firms) between 1963 and 2009.[2] We converted the annual sales data into real values using the consumer price index of all commodities. Adopting Comin and Mulani (2006)s method, we calculated each firm's real sales growth rates, and then computed the standard deviations of each firm's growth rates in a 9-year window (from $t-4$ to $t+4$ for each t). Because of this 9-year window, the sample period shrunk to 1967–2005. Finally, we defined firm-level volatility in year t as the weighted average of the standard deviations across all firms within a year, where the weights are defined by the share of sales of a firm in total sales within a year. Table 1 summarizes the computed volatility of each firm.

For business cycles, we applied a band-pass filter to the Japanese quarterly real GDP time series (seasonally adjusted). Using the method of Comin and Gertler (2006), we obtained the short-term components with a bandwidth of 2–32, and medium-term components with a bandwidth of 32–200. Medium-term cycles are defined as being the sum of the short- and medium-term components.

[2] The number of firms continuously changes with time. On average, each year contains 1664 listed firms and 991 unlisted firms. Davis et al. (2006) pointed out that trends in firm-level volatility are significantly different between listed and unlisted firms. As the dataset includes both listed and unlisted firms, the analysis avoids such a sample-bias problem to a certain extent.