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Leasing and business cycles

Na Zhang
Fudan University

Abstract

This paper demonstrates that leasing, one of the most important sources of external finance, is countercyclical over business cycles. Leasing is easier to finance and provides operational flexibility, although it costs more in the long run. The benefits of leasing are particularly important to firms with financial constraints and high uncertainty. Also, firms face tighter financing conditions and higher uncertainty during recessions. Therefore, leasing is more attractive during recessions than booms.

1. Introduction

How firm financing varies over business cycles is an important research question. An increase or decline in the amount of external funds that firms can raise is directly related to firm investment, and thus in turn further alleviates or worsens the recession. Research often focuses on debt and equity finance (Covas and Den Haan (2011)), but it is important to include leasing finance. This paper explores the role of business cycle in determining firms' leasing decisions. It empirically documents the countercyclical behavior of leasing, and provides some plausible explanations for this countercyclical pattern.

A lease is an agreement between two parties, the lessor and the lessee, in which the lessee pays a rental fee and acquires the right to use the asset for a specified period of time, but the assets belong to the lessor. Leasing is of first-order importance as a source of financing. According to the Compustat data[1], nearly all listed firms in the U.S. report their usage of operating leases, whereas 71.6 percent of firms have long-term debt. In addition, operating leases account for 7.4 percent of firms' total assets, and the value of long-term debt equals 11.3 percent. On average, publicly traded firms in the U.S. lease more than 35% of their capital. As a source of external financing, leasing is comparable to long-term debt. Moreover, Zhang (2017) finds that leasing has a measurable impact on both firm growth and GDP growth in terms of increasing the availability of capital and improving operational efficiency. Therefore, leasing is particularly important for understanding the capital structure and investment of firms, which have been argued to play a key role in determining business cycle fluctuations and economic growth.

This paper uses firm-level panel data of listed firms in the U.S. from 1955 to 2014. I find a significantly negative correlation between the cyclical components of lease-share series and the cyclical component of real GDP. I also use panel regressions and estimate that the lease share increases approximately 4% when the economic condition changes from the best to the worst. Both results demonstrate that leasing is countercyclical over business cycles: Firms prefer to lease more of their capital during economic downturns, and are more willing to buy capital during up cycles.

Why do firms lease more capital when the economy is bad? Leasing is easier to finance and provides operational flexibility, although it costs more in the long run. The benefits of leasing are particularly important to firms with financial constraints and high uncertainty (Eisfeldt and Rampini (2009), Zhang (2012)). Jermann and Quadrini (2012) show that firms face more severe financing conditions during recessions than booms. Bloom *et al.* (2016) and Gilchrist *et al.* (2014) find that uncertainty is strongly countercyclical. As a result, tighter financing conditions and higher uncertainty make leasing more attractive during recessions than booms.

There is extensive literature on leasing in finance, but the main focus is tax considerations. However, the economics of leasing are recognized beyond tax minimization. A small but growing literature has focused on the non-tax aspects of leasing. Eisfeldt and Rampini (2009) incorporate financial constraints into a model of the choice between leasing

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[1] The Sample consists of 203,265 firm-year observations for firms on COMPUSTAT from 1955 to 2014. Foreign incorporated companies and a few industries are excluded. Details of the data are in Section 2.

and secured lending. Zhang (2012) investigates the role of uncertainty and financial constraints in understanding the leasing decisions of corporate firms. All of these papers focus on firms' incentive to lease, while this study focuses on how firms' leasing behavior changes over business cycles. This work is also related to a series of papers that study the cyclical behavior of other sources of external finance. Jermann and Quadrini (2012) use aggregate data and find that debt is procyclical and equity issuance is countercyclical. In contrast, Covas and Den Haan (2011) demonstrate that both debt and equity issuance are procyclical for most size-sorted firm categories of listed U.S. firms. This paper is the first, to the best of my knowledge, to document the countercyclical pattern of leasing.

2. Data and measurement

Data, which are from Compustat, comprise an unbalanced panel of 18,131 publicly listed U.S. firms with 203,265 firm-year observations from 1955 to 2014. This sample period includes nine business cycles, according to the National Bureau of Economic Research's definition of business cycle dates. Seven industries are included in the sample: construction, manufacturing, transportation, wholesale, retail, service, and public administration[2]. Firms are also categorized to four quartile-size groups based on the book value of assets deflated by GDP deflator in each year[3].

The main data item used in this work is reported rental expenses from the income statements. The fraction of capital from leasing (the lease share) is measured by the ratio of rental expenses to total cash expenditures on rent and investment (Eisfeldt and Rampini (2009)).

$$lease\ share = \frac{rental\ expenses}{rental\ expenses + capital\ expenditures} \tag{1}$$

Lease shares below 0 are set equal to 0, and lease shares above 1 are set equal to 1. My measure for real activity is real GDP[4].

3. Empirical results

3.1 Sample statistics

Table I reports the mean value of firm lease share. An average firm leases 39.63% of its capital. Panel A shows that firms in the smallest quartile lease more than 50% of their capital, whereas firms in the top quartile lease 28.34% of capital. Small firms lease more capital than large firms. This is consistent with the findings of Sharpe and Nguyen (1995). Panel B presents the lease share of different industries; it ranges from a low of 29.26% for firms in transportation to a high of 51.8% for firms in public administration. Leased capital is clearly important for all firms.

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2 Industries are classified by the Standard Industrial Classification (SIC) code. All firms in public administration in my sample are in one group called nonclassifiable establishments. This group includes establishments that cannot be classified in any other industry.
3 I also categorize firms by number of employees, and all findings are robust.
4 Results are robust by using real GDP per capita.

Table I: Lease share of total capital costs

Notes: The sample consists of publicly listed U.S. firms over the period 1955-2014. The lease share is the fraction of capital from leasing, and is measured by the ratio of rental expenses to total cash expenditures on rent and investment. Firms are categorized to four quartile-size groups based on the book value of assets deflated by GDP deflator. Firms in construction, manufacturing, transportation, wholesale, retail, service and public administration are included in the sample.

Panel A: Size			
Size group	Mean	Std. Dev	Obs
0%-25%	0.5381	0.3013	50,841
25%-50%	0.4099	0.2571	50,811
50%-75%	0.3538	0.2314	50,822
75%-100%	0.2834	0.2008	50,791
Total	0.3963	0.2672	203,265
Panel B: Industry			
Industry	Mean	Std. Dev	Obs
Construction	0.4387	0.2919	2,797
Manufacturing	0.3505	0.2532	112,138
Transportation	0.2926	0.2646	13,427
Wholesale	0.4656	0.2575	10,579
Retail	0.4955	0.2453	19,917
Service	0.4768	0.2685	41,342
Public administration	0.5180	0.3241	3,065

3.2 Correlation results

It is well known that debt and equity issuance are procyclical (Covas and Den Haan (2011)). However, less is known about leasing. I adopt two approaches from Covas and Den Haan for the analysis. The first approach measures cyclicality by using the correlation between the cyclical components of lease-share series and the cyclical component of real GDP. This approach is commonly used in the macroeconomics literature. I first generate time series of average lease share by size group and industry, then look at the correlation between the HP-filtered group average lease shares and HP-filtered GDP[5].

The cyclical properties of leasing are documented in Table II. The correlation of output and the lease share of all firms is significantly negative, with a point estimate of -0.3893. Figure 1 plots the cyclical components of average lease-share series of all firms against real GDP. The lease share countermoves with GDP[6]. Economic booms are usually associated with

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[5] I use the weight of 100 in the filter to extract the cyclical component from annual data.

[6] I also examine the cyclical patterns of rental expenses and capital expenditures separately. The rental expenses are countercyclical over business cycles, whereas the capital expenditures are procyclical.

considerable drops in lease-share levels, and recessions are associated with rises in the lease share.

I find significant countercyclical patterns in most size groups (Panel A) and industries (Panel B). All correlation coefficients are negative, and most are statistically significant. Large firms are more responsive to GDP fluctuations. Firms in manufacturing, transportation, wholesale, and retail industries have more severe countercyclical leasing behavior than firms in construction and public administration.

Table II: Cyclical behavior of lease share

Notes: This table presents correlation between HP-filtered group average lease shares and HP-filtered GDP. Panel A shows the results of all firms and of each size group, and Panel B shows the results of each industry. Standard errors are computed using a GMM approach adapted from the Hansen, Heaton, and Ogaki GAUSS programs. *, **, *** denote statistically significantly different from zero at the 10%, 5%, and 1% level of significance, respectively.

| Panel A: Size		
Size group	Correlation	Standard error
0%-25%	-0.2339	0.2100
25%-50%	-0.3247	0.2051
50%-75%	-0.4645***	0.1617
75%-100%	-0.5313***	0.1598
All firms	-0.3893**	0.1894
Panel B: Industry		
Industry	Correlation	Standard error
Construction	-0.2528	0.2507
Manufacturing	-0.3862**	0.1890
Transportation	-0.4468***	0.1586
Wholesale	-0.3645*	0.2004
Retail	-0.4346**	0.1879
Service	-0.3155*	0.1912
Public administration	-0.2718	0.2092
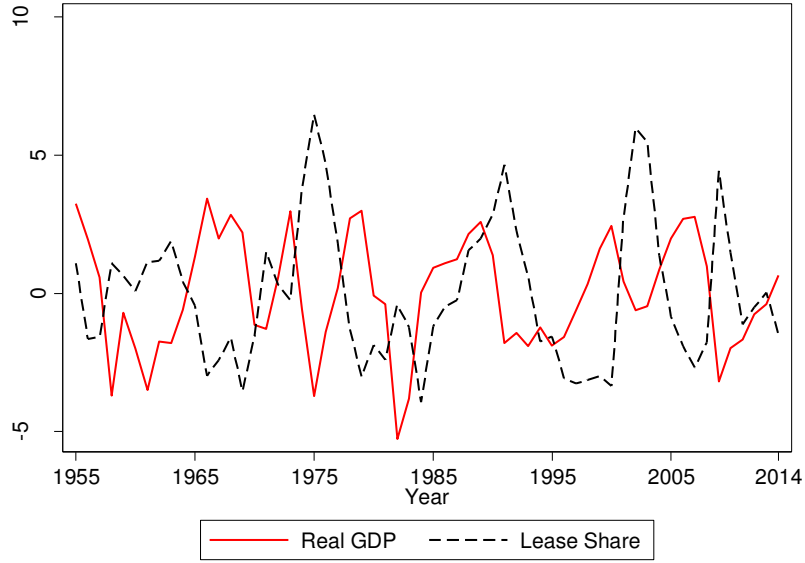
Figure 1: Cyclical behavior of lease share

Notes: This figure presents the cyclical component of real GDP and the cyclical component of average lease share of all firms in the sample.

3.3 Panel regressions

I also use panel regressions to quantitatively assess the magnitudes of the changes in the lease share over the business cycle, using the specification below.

$$Lease\ Share_{i,t} = \alpha_0 + \sum_{j=1}^{J} I_{i,t}(j)(\alpha_{j,t}t + \alpha_{j,t}t^2 + \alpha_{j,Yc}Y_t^c + \alpha_{j,CF}(\frac{CF_{i,t}}{A_{i,t}} - \frac{\overline{CF_{J,t}}}{A_{J,t}}) +$$

$$\alpha_{j,q}(q_{i,t} - \overline{q_{J,t}})) + v_i + u_{i,t} \tag{2}$$

$Lease\ Share_{i,t}$ is the lease share of firm i at year t. $I_{i,t}(j)$ is an indicator function that equals to 1 if firm i is in group j and equals to 0 if not in group j. Y_t^c is the scaled HP-filtered real GDP obtained by setting the minimum value to 0 and the maximum value to 1. Thus, the coefficient $\alpha_{j,Yc}$ measures the change in the lease share when the economy moves from the worst to the best. I control for cash flow and Tobin's Q by subtracting cash flow over assets and Tobin's Q from each group mean in the corresponding period. Linear and quadratic trends and firm fixed effects are also included in the regressions[7]. Because of missing information on cash flow and Tobin's Q before 1962, the panel regression sample period is from 1962 to 2014.

Regression results are reported in Table III. Panel A reports the results by using size groups. All size quartiles have significantly negative coefficients on the cyclical component of GDP. The lease share increases approximately 4% when the economy moves from the best condition to the worst condition. Coefficients on cash flow and Tobin's Q are significantly negative in all size quartiles. Panel B presents the results by industry. The lease share is countercyclical in all industries, and most of the estimated coefficients on the cyclical

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[7] I run the Hausman test to choose between fixed effects and random effects. The *p*- value of the Hausman test is 0.0000, which suggests that fixed effects are preferable.

component of GDP are significantly negative.

Table III: Panel regression results of lease share

Notes: The dependent variable is the value of lease shares. Y^c is the scaled HP-filtered real GDP. Cash flow/Asset is measured as the deviation to the group average of cash flow over assets in the corresponding period. q is the deviation to the group average of Tobin's Q in the corresponding period. Panel A reports the results by using size group in the regression specification, and Panel B reports the results by using industry group in the regression specification. I control for firm fixed effects in the regressions. *, **, *** denote statistically significantly different from zero at the 10%, 5%, and 1% level of significance, respectively.

	Panel A: Regression based on size		
Size group	Y^c	Cash flow/Asset	q
0%-25%	-0.0303***	-0.0402***	-0.0008**
	(0.0062)	(0.0021)	(0.0003)
25%-50%	-0.0414***	-0.0833***	-0.0010***
	(0.0044)	(0.0072)	(0.0008)
50%-75%	-0.0462***	-0.1093***	-0.0101***
	(0.0035)	(0.0116)	(0.0008)
75%-100%	-0.0406***	-0.1512***	-0.0080***
	(0.0031)	(0.0163)	(0.0010)
R2	0.1875		
No. of Obs.	163,917		
	Panel B: Regression based on industry		
Industry	Y^c	Cash flow/Asset	q
Construction	-0.0241	-0.0773***	-0.0031
	(0.0228)	(0.0251)	(0.0034)
Manufacturing	-0.0398***	-0.0714***	-0.0028***
	(0.0029)	(0.0030)	(0.0004)
Transportation	-0.0600***	-0.0407***	-0.0017
	(0.0099)	(0.0107)	(0.0014)
Wholesale	-0.0201*	-0.0633***	0.0011
	(0.0107)	(0.0130)	(0.0019)
Retail	-0.0564***	-0.1320***	-0.0105***
	(0.0067)	(0.0151)	(0.0022)
Service	-0.0418***	-0.0463***	-0.0022
	(0.0059)	(0.0034)	(0.0005)
Public administration	-0.0172	-0.0433***	0.0011
	(0.0258)	(0.0077)	(0.0013)
R2	0.0644		
No. of Obs.	163,282		

Next, I perform four robustness exercises. First, I adopt a more general specification to estimate the relationship between leasing and business cycles. The regression specification is:

$$Lease\ Share_{i,t} = \alpha_0 + \alpha_{Yc}Y_t^c + \alpha_{CF}\left(\frac{CF_{i,t}}{A_{i,t}}\right) + \alpha_q\left(q_{i,t}\right) + industry\ dummies\ +$$

$$size\ group\ dummies\ + u_{i,t} \tag{3}$$

In this specification, we estimate the average effect of business cycles on leasing of all firms when controlling for cash flow, Tobin's Q, industry fixed effects, and size group fixed effects. Results are presented in Table IV, column 1. Second, I add the lagged value of lease share as one independent variable to control for the persistent usage of leasing. Column 2 of Table IV shows the regression results. Coefficients on the cyclical component of GDP are significantly negative in both column 1 and column 2 of Table IV. Third, I use real GDP growth as an alternative business cycle measure instead of the cyclical component of real GDP, and report the results in Column 3 of Table IV. Last, I use total assets and firm age as control variables. Results are presented in the last column of Table IV. Both regression results suggest a significantly negative coefficient on real GDP growth: Firms tend to lease less when the economy has high GDP growth. All of these robustness exercises support the conclusion that leasing is countercyclical over business cycles.

Table IV: Panel regression results of lease share: Robustness

Notes: The dependent variable is the value of lease shares. Y^c is the scaled HP-filtered real GDP. *, **, *** denote statistically significantly different from zero at the 10%, 5%, and 1% level of significance, respectively.

	(1)	(2)	(3)	(4)
Y^c	-0.0379***	-0.0226***		
	(0.0025)	(0.0018)		
Cash flow/Asset	-0.0834***	-0.0053***	-0.0807***	
	(0.0012)	(0.0009)	(0.0012)	
q	-0.0031***	-0.0042***	-0.0030***	
	(0.0002)	(0.0001)	(0.0002)	
Lagged lease share		0.7272***		
		(0.00017)		
Real GDP Growth			-1.1270***	-1.4774***
			(0.0293)	(0.0562)
Total Assets				-0.0949***
				(0.0009)
Firm Age				0.0042***
				(0.0001)
Industry Fixed Effects	YES	YES	YES	NO
Size Group Fixed Effects	YES	YES	YES	NO
R2	0.2201	0.6445	0.2260	0.1565
No. of Obs.	163,917	15,4347	16,3917	72,666

4. Why leasing is countercyclical

In the U.S. bankruptcy code (Chapter 11, Title 11, United States Code), it is much easier for a lessor to repossess an asset than it is for a secured lender. The lessor is less concerned with the lessee's default, and thus unlikely to require the lessee to provide collateral for a leasing agreement. The lessee only needs to pay a leasing fee for one period in advance. If a firm purchases capital, however, it would need to pay the full price up front. Even if a firm uses debt to finance the purchase, the lender might require collateral for the loan. Leases, therefore, are easier to finance than purchases. This is one advantage of leasing. A lease also provides protection against the risk of equipment obsolescence and provides operational flexibility, since leased capital can be more easily redeployed than owned capital. This is another advantage of leasing. The disadvantage of leasing is that it usually costs more in the long run. This is because leasing involves the separation of ownership and control, which induces an agency cost; Gavazza (2010) estimates that lease rates are 20% higher than implicit rental rates on owned assets in the aircraft industry. The benefits of leasing, in terms of ease of finance and operational flexibility, are particularly important to financially constrained firms and firms with high uncertainty (Eisfeldt and Rampini (2009), Zhang (2012)). In this work, I also demonstrate that small firms lease more of their capital than large firms. Small firms are more financially constrained and face higher uncertainty than large firms. Therefore, leases are more widely used by small firms.

In terms of business cycles, firms are more financially constrained during recessions than during booms. During recessions, demand and sales are low; thus firms have less sales revenue and less internal funding. The amount of funds that firms can raise externally through debt and equity issuance declines during an economic downturn (Covas and Den Hann (2011)). Firms don't have enough internal funding and can't raise enough external finance through debt and equity to support their capital purchases. Therefore, they decrease their investment in recessions. Since they buy less capital than they should have in recessions, the marginal return of capital is higher, and thus leasing is more attractive in recessions. Moreover, Bloom *et al.* (2016) and Gilchrist *et al.* (2014) demonstrate that macroeconomic uncertainty and idiosyncratic uncertainty rise sharply during recessions. High uncertainty makes firms pause purchasing capital because of irreversibility and the adjustment costs of capital. Leasing's benefit of providing operational flexibility is more attractive in recessions. Financial constraint, together with uncertainty, helps explain the countercyclical behavior of leasing.

5. Conclusion

This paper demonstrates that leasing, as one of the most important external sources of financing, is countercyclical over the business cycle. I provide plausible explanations for this countercyclical pattern. Leasing is easier to finance and provides operational flexibility, although it costs more in the long run. Tighter financing conditions and higher uncertainty during recessions make the benefits of leasing more attractive, and thus firms lease more during recessions than booms.

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