”Leasing as a Risk-Sharing Mechanism Previously titled \The Leased Capital Premium”

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Leasing as a Risk-Sharing Mechanism

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Hong Kong University of Science and Technology

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- Operating lease:
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    - Asset is easily repossessed (returned to lessor in Chapter 11)
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    - Lessee (borrower) is not exposed to asset price fluctuations
- Alternative: secured lending (capital lease is equivalent)
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    - Asset is difficult to repossess (automatic stay in Chapter 11)
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Research Question

Anecdotal evidence

- TIF (Transportation & International Finance) of CIT group Inc. is a leading provider of leasing and financing solutions to operators and suppliers in the global aviation and railcar industries.
- "*The primary risks for TIF are* **asset risk (resulting from ownership of the equipment on operating lease)** *and credit risk.* **Asset risk arises from fluctuations in supply and demand for underlying equipment that is leased.** *... Credit risk in the leased equipment portfolio results from the potential default of lessees, and is economically* **less** *significant than asset risk for TIF, because in the operating lease business, there is no extension of credit to the obligor.* " – Quoted from CIT Group Inc. Annual Report 2014

Research Question

- Leasing as a risk-sharing arrangement:
- Key novel mechanism: Risk tolerant lessors provide insurance to financial constrained risk-averse lessees
  - Lessor (capital owner) effectively offers a future's contract to lessee
  - Lessee is insured against systematic asset price fluctuations

Research Question

- Leasing as a risk-sharing arrangement:
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  - Lessor (capital owner) effectively offers a future's contract to lessee
  - Lessee is insured against systematic asset price fluctuations
- Implications:
  - AP: The leased capital is less risky than owned capital
  - CF: Two forms of liability have different implications for cost of capital
  - Allocation: Constrained firms lease more as it is a "cheap" insurance

Summary of Paper

- Empirical evidence:
  - measure the leased capital ratio and construct sorted portfolios

$$\text{Leased capital ratio} = \frac{\text{leased capital}}{\text{leased} + \text{owned physical capital}}$$

  - find significant negative leased capital premium ($5 - 7\%$ p.a.)
- Theory:
  - a GE model with heterogenous firms, collateral constraints, dynamic lease versus buy decision
  - formalize the intuition for the leased capital premium
  - quantify the risk premium channel of lease v.s. buy decision.

Related Literature

- **Macroeconomic models of financial frictions**
  - Kiyotaki and Moore (1997), Kiyotaki and Gertler (2012), He and Krishnamurthy (2013), Brunnermeier and Sannikov (2014), Elenev, Landvoigt and Van Nieuwerburgh (2017)
- **Corporate finance literature on collateral constraints**
  - Albuquerque and Hopenhayn (2004), Schmid(2008), Rampini and Vishwanathan (2010, 2013), Li, Whited and Wu (2016)
- **Empirical literature on financial constraint and expected returns**
  - Lamont et. al. (2001), Whited & Wu (2006), Buehlmaier & Whited (2018)
- **Production/investment based models of the cross-section of returns**
  - Gomes, Kogan, and Zhang (2003), Zhang (2005), Liu, Whited and Zhang (2009), Ai and Kiku (2012), Garleanu, Kogan, and Panageas (2012), Kogan, Papanikolaou, and Stoffman (2017); Lin (2012), Eisfeldt and Papanikoulaou (2013) and Belo, Lin and Yang (2017), among others

Empirical Facts

The leased capital ratio

- The leased capital: capitalize rental expense
  - $XRENT \times 10$, follow Rampini and Vishwanathan (2013)
  - Robustness: discounted rental commitment
    - Rauh and Sufi (2011), Li, Whited and Wu (2016)

	Pooled Statistics		**Firm Characteristics**				
	Cons.	**Uncons.**	**Portfolios**				
Variables	**Mean**	**Mean**	**L**	**2**	**3**	**4**	**H**
Lease Ratio	0.56	0.31	0.30	0.54	0.68	0.77	0.83
Debt Leverage	0.08	0.15	0.12	0.08	0.06	0.05	0.05
Lease adj. Lev.	0.24	0.25	0.21	0.25	0.27	0.32	0.35

Empirical Facts

The leased capital premium

Table: **Univariate Portfolio Sorting on Leased Capital Ratio**

	Constrained Subsample					
Variables	**L**	**2**	**3**	**4**	**H**	**L-H**
			Panel A: WW			
E[R]-R_f (%)	10.15	9.50	7.82	5.81	3.01	**7.14**
[t]	2.05	1.86	1.61	1.10	0.56	3.60
SR	0.38	0.36	0.29	0.22	0.11	0.66
			Panel B: Rating			
E[R]-R_f (%)	10.57	8.77	7.35	6.29	4.42	**6.15**
[t]	2.64	1.76	1.81	1.61	0.96	2.72
SR	0.5	0.39	0.33	0.29	0.18	0.56
			Panel C: DIV			
E[R]-R_f (%)	9.54	10.25	9.82	5.29	4.38	**5.16**
[t]	2.40	2.10	2.09	1.26	1.05	2.26
SR	0.44	0.44	0.42	0.23	0.19	0.46

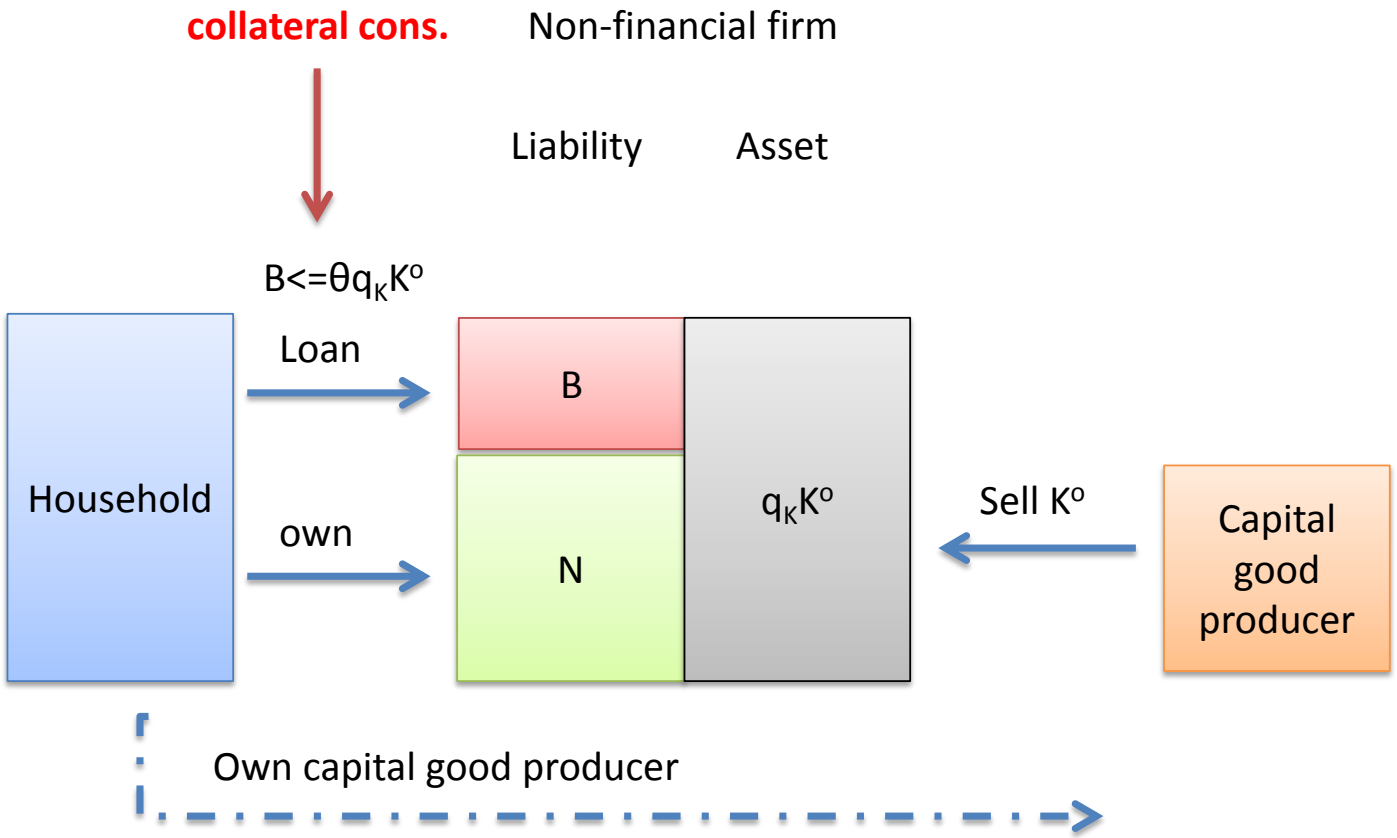
Model Setup

Overview

- A GE model with heterogenous firms and financial frictions
- Collateral constraints as in Kiyotaki and Moore (1997), and Gertler and Kiyotaki (2012)
- New ingredients:
  - dynamic lease versus buy decision (Eisfeldt and Rampini, 2009)
  - idiosyncratic productivity shocks/firm entry and exit
- Goals:
  - quantitatively plausible firm dynamics to study cross section
  - novel aggregation result (Ai, Li, Li, Schlag, 2018)

Model Setup

Model Overview



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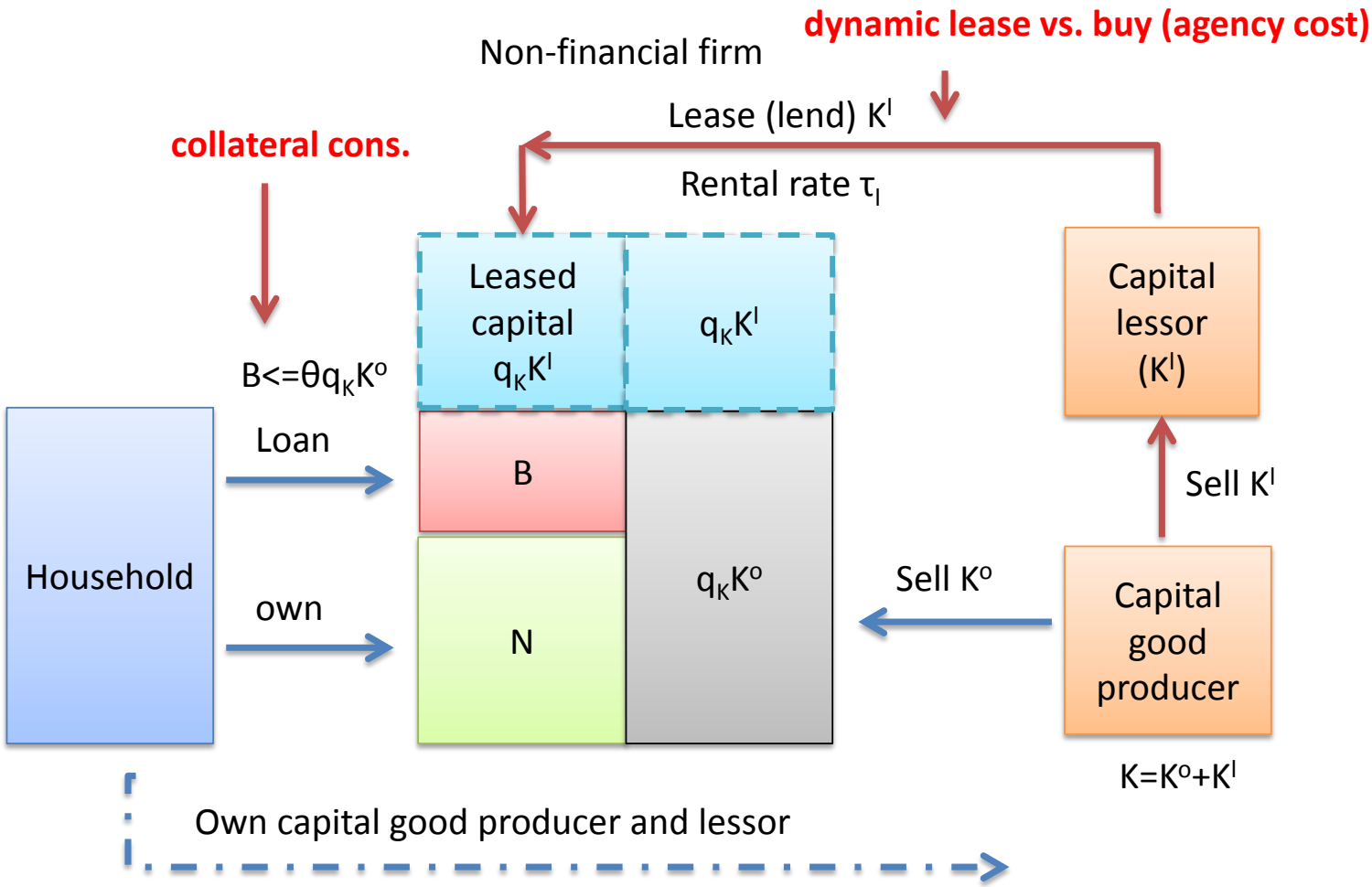


Key frictions: collateral constraint and incomplete market

- The household's SDF: M_{t+1}
  - M_{t+1} prices $R_{f,t+1}$
  - Unconstrained lessor also uses M_{t+1}
- Entrepreneur's augmented SDF:

$$\widetilde{M}_{t+1} = M_{t+1} \frac{\lambda + (1-\lambda)\mu_{t+1}}{\mu_t}$$

  - $\lambda\mu_{t+1} + (1-\lambda)$: weighted average of marginal value of net worth
  - The augmented SDF prices R^{Lev}_{t+1}, R^{I}_{t+1}, and $R_{I,t+1}$
- Shadow interest rate, $R_{I,t+1} = \frac{1}{E_t(\widetilde{M}_{t+1})}$
  - $R_{I,t+1} - R_{f,t+1}$ is positive when constraint is binding.

Key frictions: Competitive lessor and agency cost

- Lessor's problem:

$$\max_{\{K^l_{j+1}\}_{j=t}^{\infty}} E_t \sum_{j=t}^{\infty} M_{t,j} \left(\begin{array}{c} \tau_{l,j} K^l_{j+1} - q_{K,j} K^l_{j+1}(1+h) \\ +E_j \left\{ M_{j,j+1} q_{K,j+1} K^l_{j+1} \left[1-\delta\right] \right\} \end{array} \right).$$

- h reflects a proportional monitoring cost due to separation of control and ownership.
- The first order condition implies:

$$\tau_{l,t} = q_{K,t}(1+h) - \{1-\delta\} E_t \left[M_{t,t+1} q_{K,t+1} \right]$$

Model Implications

A Risk Premium Channel in Lease v.s Buy Tradeoff

- User cost of leased capital:

$$\begin{aligned} \tau_l &= q_K(1+h) - (1-\delta)E\left(M' q'_K\right) \\ &= \end{aligned}$$

- User cost of owned capital:

$$\begin{aligned} \tau_o &= q_K - (1-\delta)E[\widetilde{M}' q'_K] - \theta q_K \frac{\eta}{\mu} \\ &= \end{aligned}$$

  - η is the Lagrangian multiplier of collateral constraint.

Model Implications

A Risk Premium Channel in Lease v.s Buy Tradeoff

- User cost of leased capital:

$$\begin{aligned}\tau_l &= q_K(1+h) - (1-\delta)E\left(M' q'_K\right) \\ &= q_K(1+h) - (1-\delta)\left[\frac{1}{R_f}E\left(q'_K\right) + Cov\left(M', q'_K\right)\right]\end{aligned}$$

- User cost of owned capital:

$$\begin{aligned}\tau_o &= q_K - (1-\delta)E(\widetilde{M}' q'_K) - \theta q_K \frac{\eta}{\mu} \\ &= q_K - (1-\delta)\left[\frac{1}{R_l}E\left(q'_K\right) + Cov\left(\widetilde{M}', q'_K\right)\right] - \theta q_K \frac{\eta}{\mu}\end{aligned}$$

  - η is the Lagrangian multiplier of collateral constraint.

Model Implications

A Risk Premium Channel in Lease v.s Buy Tradeoff

- Define two wedges:
- Constraint-induced premium on internal funds:

$$\Delta_f = R_I - R_f$$

- Insurance premium wedge:

$$\Delta_{rp} = -Cov\left(\widetilde{M}', q'_K\right) + Cov\left(M', q'_K\right).$$

  - Due to financial constraint, entrepreneurs ($\widetilde{M}'$) are effectively more risk averse than lessor (M')
  - $\Delta_{rp} > 0$: Lease is a "cheap" insurance for constrained firms

Model Implications

A Risk Premium Channel in Lease v.s Buy Tradeoff

- Difference in user costs of capital:

$$\tau_l - \tau_o = \overbrace{q_K h + \theta q_K \frac{\Delta_f}{R_f + \Delta_f}}^{\text{Costs of leasing}} \underbrace{- \frac{1}{R_f}(1-\delta) E\left(q'_K\right) \frac{\Delta_f}{R_f + \Delta_f} - (1-\delta)\Delta_{rp}}_{\text{Benefits of leasing}},$$

  - $\Delta_{rp} > 0$: Lease is a "cheap" insurance for constrained firms
  - Additional incentive for constrained firms to rent capital
  - Cross-section return spread quantifies this risk premium channel

Model Implications

A Risk Premium Channel in Lease v.s Buy Tradeoff

- Special cases:
- Case 1: neither financial constraint nor agency cost, $\widetilde{M} = M$ and $h = 0$

$$\tau_I = \tau_o$$

  - frictionless neoclassical model: asset ownership indeterminate.
- Case 2: both frictions, infinite agency cost $h = \infty$
  - Gertler and Kiyotaki (2010): firms have no option to lease capital
- Case 3: both frictions, no adjustment cost, $q_K = 1$

$$\tau_I - \tau_o = q_K h - \frac{\Delta_f}{R_f + \Delta_f}\left[\frac{1}{R_f}(1-\delta) - \theta\right].$$

  - Eisfeldt and Rampini (2009): no risk-premium channel

Model Implications

Returns

- Return on purchased capital:

$$\begin{aligned} R_{K,t+1}^{Lev} &= \frac{\alpha A_{t+1} + (1-\delta)\, q_{K,t+1} - R_{f,t+1}\theta q_{K,t}}{q_{K,t}\,(1-\theta)}, \\ &= \frac{1}{1-\theta}\left(R_{t+1} - R_{f,t+1}\right) + R_{f,t+1}. \end{aligned}$$

  - $R_{t+1} = \frac{\alpha A_{t+1} + (1-\delta) q_{K,t+1}}{q_{K,t}}$ is un-levered return on owned capital.
- Return on leased capital:

$$R_{t+1}^{l} = \frac{\alpha A_{t+1}}{\tau_{l,t}}.$$

  - R^l is insured against capital price risks, by the lease-embedded insurance mechanism.

Quantitative Analysis

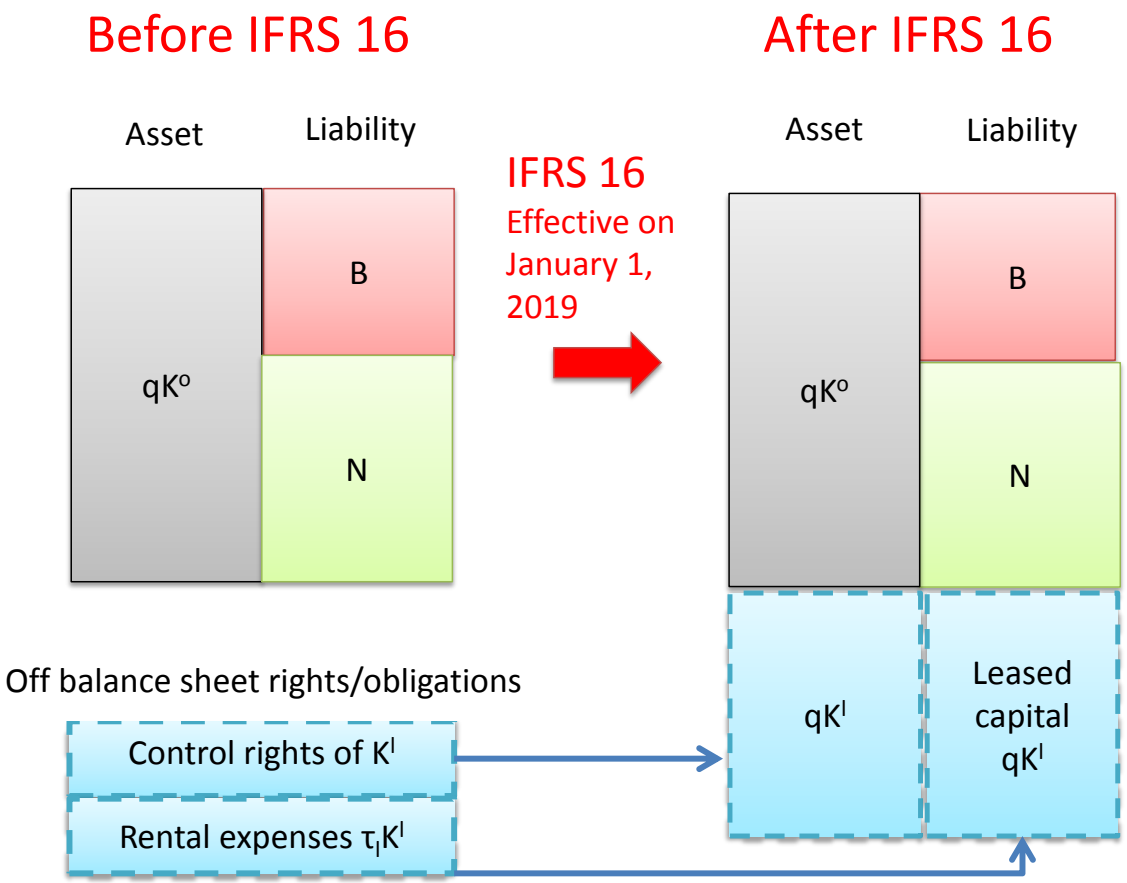
Cross Section

Table: **Firm Characteristics and Leased Capital Spread**

Variables	**L**	**2**	**3**	**4**	**H**	**L-H**
			Panel A: Data			
Leased Capital Ratio	0.3	0.54	0.68	0.77	0.83	
Lease adj. Leverage	0.21	0.25	0.27	0.32	0.35	
$E[R] - R_f$ (%)	10.15	9.50	7.82	5.81	3.01	**6.43**
			Panel B: Model			
Leased Capital Ratio	0.21	0.51	0.68	0.80	0.89	
Lease adj. Leverage	0.24	0.30	0.33	0.36	0.38	
$E[R] - R_f$ (%)	13.64	11.45	9.56	7.73	5.80	**7.84**

Policy Implication

- IFRS 16: an accounting rule change for operating leases
  - Consistent with CF academic views: Eisfeldt and Rampini (2009), Rauh and Sufi (2011), Li, Whited and Wu (2016)



Conclusion

- Theory guided empirical work on cross-section of expected returns
  - Novel theoretical mechanism: leasing is a risk-sharing mechanism
  - Paper finds supporting evidence through a negative leased capital premium
- General equilibrium model to quantitatively account for:
  - The cross-section of leased capital ratio among firms
  - The negative leased capital premium
- Policy implication:
  - a caveat for lease accounting change from asset pricing perspective.

Additional Testable Implications

Lease capital premium stronger for high capital price vol. industries

Table: **Double Sorts on Industry Capital Price Vol. and LC Ratio**

Panel B: Price Fluctuations						
	Portfolio Sorts					
	L	**2**	**3**	**4**	**H**	**L-H**
L	10.14	10.81	10.08	8.60	5.37	**4.77**
[t]	2.17	2.49	2.14	1.86	1.17	2.56
H	10.23	9.21	7.52	4.24	2.73	**7.49**
[t]	2.27	2.12	1.74	0.90	0.58	2.29

Additional Testable Implications

Insurance versus operating leverage

Table: **Double Sorts on Lease Commitment Duration and LC Ratio**

Panel A: Lease Commitment Duration								
	Portfolio Sorts						**Rental Commitment**	
	L	**2**	**3**	**4**	**H**	**L-H**	**Rental/CAPX**	**Rental/OIBDP**
L	10.18	8.46	7.15	7.03	2.89	**7.29**	0.015	0.052
[t]	2.27	2.10	1.54	1.48	0.62	3.83		
H	11.50	11.20	8.64	10.63	8.09	**3.41**	0.032	0.230
[t]	2.40	2.43	1.79	2.28	1.82	1.52		