

# Macroeconomic Conditions, Corporate Financing Decisions, and Credit Risk

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# The Puzzles

## “credit spread puzzle”

	data	existing models
10-year Baa-Treasury	148 bp	39~65 bp
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Existing structural models (Merton models)

- constant risk premium, recovery rate, and default losses
- default probabilities only depend on firm value (not the business cycle)

⇒ low credit risk premium, small present value of default losses

# New Features

- Business cycle fluctuations affect fundamentals
  - ▶ aggregate output  $\Rightarrow$  risk premia are high in recessions
  - ▶ cash flows  $\Rightarrow$  default probabilities are high in recessions
- Model with endogenous financing and default decisions
- Identify cyclical variation in default losses using recovery rates

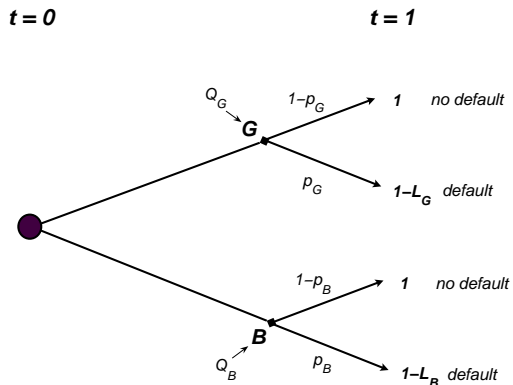
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## Results

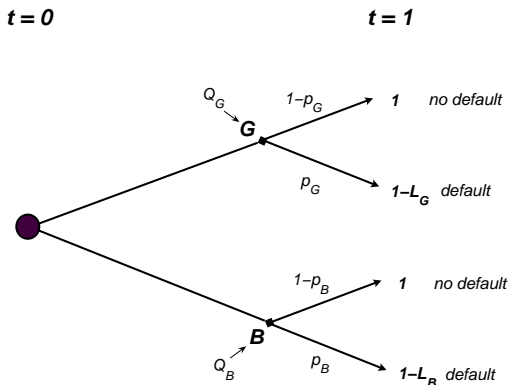
	data	existing models	this model
10-year Baa-Treasury	148 bp	39~65 bp	140 bp
10-year Baa-Aaa	101 bp	33~52 bp	97 bp
10-year Baa-Aaa Vol	40 bp	< 10 bp	35 bp
Baa firm leverage ratio	42%	> 60%	41.8%

# A Two-period Example



- Aggregate states:  
G - Good, B - Bad
- Idiosyncratic states:  
no default, default
- $Q_i, p_i, L_i$ :  
state price, default probability, default losses in aggregate state  $i$

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Price of defaultable bond at  $t = 0$ :  $(Q_G + Q_B) - (Q_G p_G L_G + Q_B p_B L_B)$

## A Two-period Example

$$\text{Bond Price} = (Q_G + Q_B) - (Q_G p_G L_G + Q_B p_B L_B)$$

- Standard models:  $Q, p, L$  constant across aggregate states ( $G, B$ )

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$$Q_G, p_G, L_G \downarrow \quad Q_B, p_B, L_B \uparrow$$

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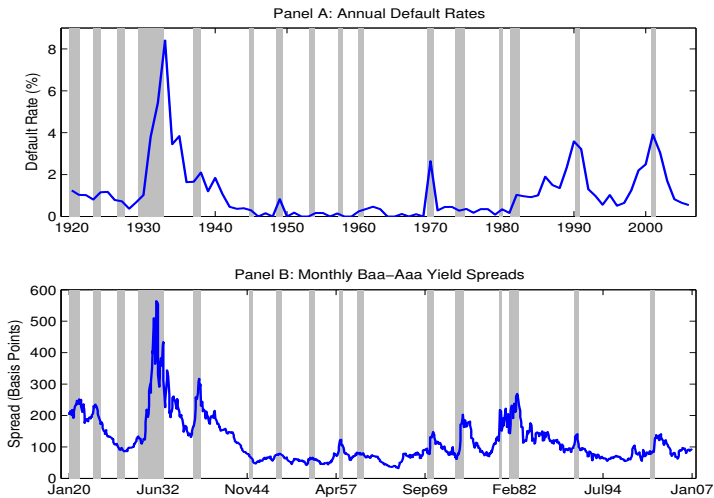
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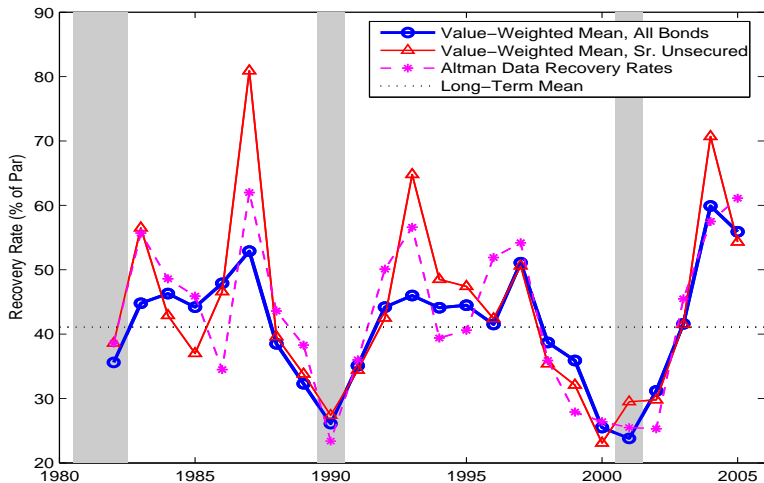
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- ▶ link  $Q$  to business cycle through consumption (long run risk model)
- ▶ link  $p, L$  to business cycle through endogenous financing decisions
- ▶ predictions on credit spreads and leverage ratios over business cycle

# Default Rates and Credit Spreads over the Business Cycle



# Bond Recovery Rates over the Business Cycle



## Related Literature

- Chen, Collin-Dufresne and Goldstein 2006, Hackbarth, Miao and Morellec 2006
- Structural credit models:
  - ▶ exogenous leverage: Black and Scholes 1973, Merton 1974, Black and Cox 1976, Geske 1977, Longstaff and Schwartz 1995, Huang and Huang 2003
  - ▶ endogenous leverage: Mello and Parsons 1992, Leland 1994, 98, Anderson and Sundaresan 1996, Duffie and Lando 2001, Goldstein, Ju and Leland 2001, Hennessy and Whited 2005, Strebulaev 2006, Bhamra, Kuhn and Strebulaev 2007
- Reduced-form models:
  - ▶ Jarrow and Turnbull 1995, Duffie and Singleton 1997, 99, Berndt et al. 2004, Longstaff et al. 2005, Longstaff and Rajan 2006, Pan and Singleton 2006, Duffie et al. 2006, Das et al. 2007, Almeida and Philippon 2006
- Long run risk models:
  - ▶ Bansal and Yaron 2004, Hansen, Heaton and Li 2005, Bansal, Dittmar and Lundblad 2005
- Counter-cyclical default losses:
  - ▶ Shleifer and Vishny 1990, Altman et al. 2005, Acharya et al. 2006

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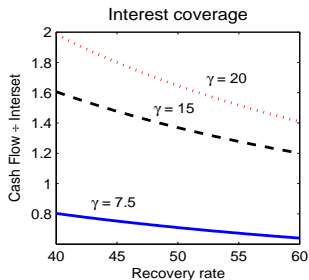
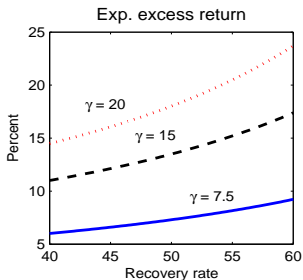
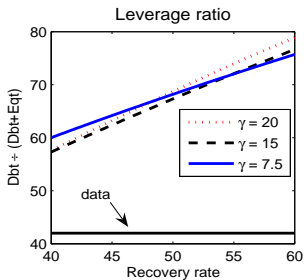
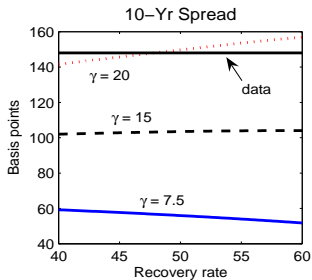
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- optimal capital structure: trade-off between tax benefits and costs of financial distress

# Benchmark Case - Baa Firm



# Results of the Model

## Benchmark Case

	Def10	Rec	Sprd10	Lev	IntCov	TaxBen	Sprd	ERx
Baa	4.9%	48.0%	56.5	66.7%	0.7	10.8%	79.1	7.0%
Aaa	0.6%	48.0%	7.1	91.2%	0.1	20.0%	4.2	8.3%

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## Model with Business Cycle Variation, Static

Baa	4.9%	47.3%	141.3	50.4%	1.7	5.3%	262.8	9.3%
	(1.2%)	(1.7%)	(9.7)	(3.5%)	(0.4)	(0.4%)	(50.5)	(1.6%)
Aaa	0.6%	47.7%	43.4	52.2%	1.3	6.9%	81.4	6.6%
	(0.1%)	(1.4%)	(1.1)	(1.8%)	(0.2)	(0.3%)	(17.1)	(1.2%)

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Baa	4.9% (1.2%)	47.3% (1.7%)	141.3 (9.7)	50.4% (3.5%)	1.7 (0.4)	5.3% (0.4%)	262.8 (50.5)	9.3% (1.6%)
Aaa	0.6% (0.1%)	47.7% (1.4%)	43.4 (1.1)	52.2% (1.8%)	1.3 (0.2)	6.9% (0.3%)	81.4 (17.1)	6.6% (1.2%)

## Model with Business Cycle Variation, Dynamic

Baa	4.9% (0.9%)	47.5% (1.5%)	139.8 (8.5)	41.8% (2.4%)	2.1 (0.3)	6.9% (0.4%)	261.5 (30.0)	7.7% (1.4%)
Aaa	0.6% (0.1%)	48.0% (1.2%)	42.4 (0.9)	45.5% (1.6%)	1.4 (0.1)	7.6% (0.3%)	78.8 (14.9)	5.9% (1.1%)

Def10 - 10-year default prob; Rec - average recovery rate; Sprd10 - credit spread for 10-year coupon bond; Lev - market leverage; IntCov - interest coverage; TaxBen - net tax benefits, measured by incr. in firm value; Sprd - credit spread of consol; ERx - exp. excess return on equity

# Comparative Statics for Baa Firms

## Model with Business Cycle Variation, Static

	Def10	Rec	Lev	IntCov	TaxBen	Sprd	ERx
Risky Tax	3.9%	48.8%	45.9%	1.96	4.7%	238.1	8.8%
Benefits	(0.8%)	(1.6%)	(2.9%)	(0.41)	(0.3%)	(42.0)	(1.6%)

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Costly Eq	4.7%	47.7%	49.1%	1.79	5.1%	255.9	9.2%
Issuance	(1.1%)	(1.6%)	(3.3%)	(0.38)	(0.4%)	(47.8)	(1.6%)

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Constant Deflt Losses	13.4% (0.7%)	50.6% (1.1%)	65.6% (0.5%)	1.19 (0.16)	7.9% (0.2%)	321.9 (42.6)	12.1% (2.4%)

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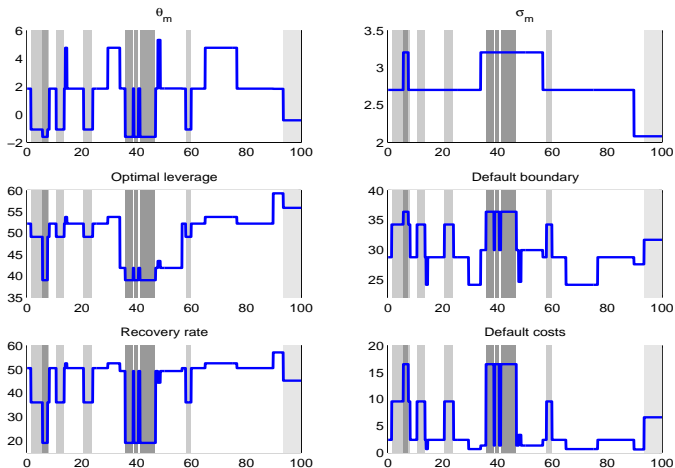
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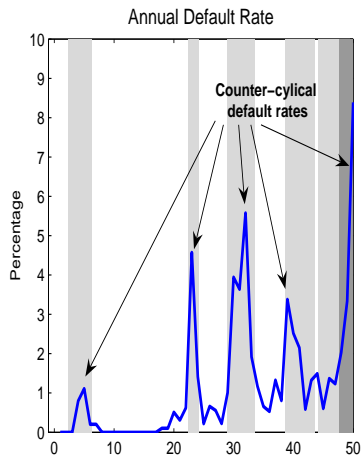
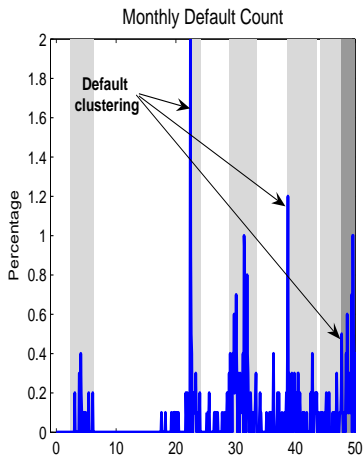
Constant Deflt Losses	11.39% (0.58%)	50.0% (0.9%)	57.4% (0.5%)	1.37 (0.14)	9.5% (0.2%)	318.1 (18.8)	10.6% (2.1%)
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# Cyclical Variation



All variables are in percentages. Default boundaries are relative to initial cash flow. Recovery rates are relative to par. Default losses are relative to pre-distress firm value.

# Simulating Defaults



# Conclusion

- Large effects of business cycle fluctuations on credit spreads and leverage ratios
- Comovements in risk prices, default probability and default losses  
⇒ high credit risk premium
- Endogenizing default:
  - ▶ better connecting credit risk with business cycle variables
  - ▶ identifying state contingent default losses
- Other predictions:
  - ▶ higher volatility in credit spreads
  - ▶ counter-cyclical market leverage, pro-cyclical debt issuance
  - ▶ cash flow beta and leverage
  - ▶ default clustering and “contagion” or “frailty”
  - ▶ investment distortions