Discussion of:

A Unified Model of Distress Risk Puzzles

Zhiyao Chen, Dirk Hackbarth and Ilya A. Strebulaev

Kent Daniel[†]

[†]Columbia Business School & NBER

2020 AFA Meetings
4 January 2020

Columbia Business School

Outline

- Paper's Goal: lay out theory that explains the "puzzles" raised in:
  - Campbell, Hilscher, and Szilagyi (2008, 2011)
  - Friewald, Wagner, and Zechner (2014)
- Discussion Outline:
  - Review CHS evidence.
    - I'll omit any discussion of FWZ.
  - This paper's model and model implications
  - Empirical tests.

Campbell, Hilscher, and Szilagyi (2008, 2011)

- Response to Fama and French (1996), who argued that value premium might be a distress premium.
- Found that firms with high distress risk deliver abnormally low returns.
  - Calculate an EDF based on Shumway (2001) bankruptcy model.
  - Builds on Dichev (1998), who found a negative relation between the Altman (1968) and Ohlson (1980) measures and future returns.
  - Also consistent with Garlappi, Shu, and Yan (2008), who use the Moodys-KMV measure of distance-to-default, with similar results (see also Garlappi and Yan, 2011).
- These results have continued to hold in a 1981–2010 sample (Anginer and Yıldızhan, 2017)

Campbell, Hilscher, and Szilagyi (2008, 2011)

- CHS (2011) abstract states:

  . . . We find that distressed stocks have high stock return volatility and high market betas and that they tend to underperform safe stocks by more at times of high market volatility and risk aversion. However, investors in distressed stocks have not been rewarded for bearing these risks. Instead, distressed stocks have had very low returns, both relative to the market and after adjusting for their high risk.

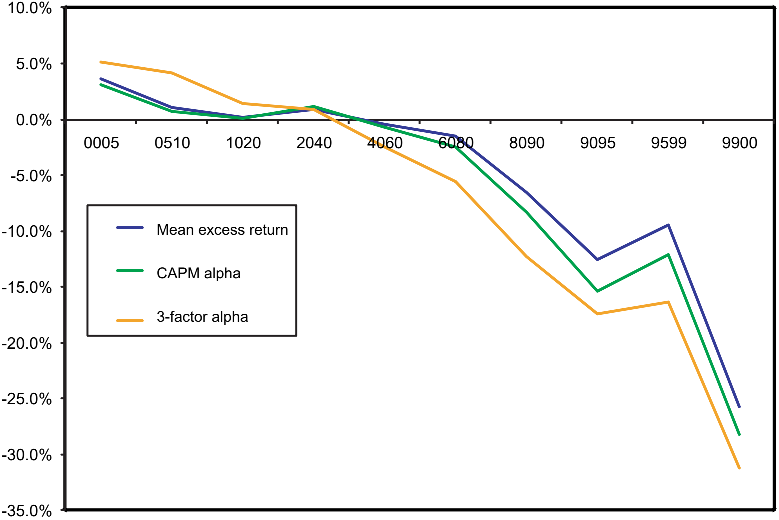
Campbell, Hilscher, and Szilagyi (2008, 2011)

- CHS (2011) abstract states:

  . . . We find that distressed stocks have high stock return volatility and high market betas and that they tend to underperform safe stocks by more at times of high market volatility and risk aversion. However, investors in distressed stocks have not been rewarded for bearing these risks. Instead, distressed stocks have had very low returns, both relative to the market and after adjusting for their high risk.

Campbell, Hilscher, and Szilagyi (2011)

Mean excess returns (%/year) (net of the market return):



Campbell, Hilscher, and Szilagyi (2008)

$PD_t^{\mathbb{P}}$–sorted portfolio results:

	Excess ret.	CAPM alpha	Three-factor alpha	Four-factor alpha	MKT	SMB	HML
Low	0.608**	0.166	0.433***	0.096	0.879***	0.109**	−0.462***
	(2.01)	(0.99)	(2.86)	(0.72)	(23.63)	(2.17)	(8.05)
2	0.569**	0.095	0.090	0.022	0.898***	0.110***	−0.141***
	(2.55)	(1.51)	(1.42)	(0.36)	(54.84)	(4.66)	(−2.72)
3	0.534**	0.092	0.034	0.043	1.033***	0.116***	−0.071***
	(2.51)	(1.48)	(0.55)	(0.69)	(60.30)	(4.66)	(−2.75)
4	0.553*	−0.059	−0.168**	−0.075	1.170***	0.249***	0.069**
	(1.92)	(−0.70)	(−2.06)	(−0.96)	(54.03)	(7.90)	(2.13)
5	0.496	−0.175	−0.279***	−0.167*	1.252***	0.367***	−0.021
	(1.54)	(−1.64)	(−2.73)	(−1.69)	(45.85)	(9.24)	(−0.84)
6	0.385*	−0.112	−0.157	0.056	1.254***	0.389***	0.013
	(1.70)	(−0.79)	(−1.19)	(0.47)	(36.52)	(9.37)	(0.32)
7	0.408*	−0.089	−0.224*	−0.043	1.245***	0.458***	0.031
	(1.68)	(−0.65)	(−1.77)	(−0.37)	(41.65)	(10.52)	(0.68)
8	0.308	−0.371***	−0.476***	−0.280***	1.171***	0.358***	0.027
	(0.92)	(−2.73)	(−3.99)	(−2.61)	(36.10)	(7.57)	(0.55)
9	0.200	−0.596**	−0.653***	−0.375***	1.425***	0.920***	0.053
	(0.44)	(−2.17)	(−2.67)	(−2.85)	(23.64)	(12.44)	(0.58)
High	−0.576	−1.216***	−1.509***	−0.736***	1.511***	0.923***	0.430***
	(1.19)	(3.87)	(5.29)	(3.24)	(21.63)	(9.82)	(3.99)
High–Low	−1.184**	−1.382***	−1.942***	−0.832***	0.632***	0.814***	0.892***
	(2.34)	(2.96)	(4.68)	(2.64)	(5.69)	(10.96)	(6.25)

Campbell, Hilscher, and Szilagyi (2008)

$PD_t^{\mathbb{P}}$–sorted portfolio results:

	Excess ret.	CAPM alpha	Three-factor alpha	Four-factor alpha	MKT	SMB	HML
Low	0.608**	0.166	0.433***	0.096	0.879***	0.109**	−0.462***
	(2.01)	(0.99)	(2.86)	(0.72)	(23.63)	(2.17)	(8.05)
2	0.569**	0.095	0.090	0.022	0.898***	0.110***	−0.141***
	(2.55)	(1.51)	(1.42)	(0.36)	(54.84)	(4.66)	(−2.72)
3	0.534**	0.092	0.034	0.043	1.033***	0.116***	−0.071***
	(2.51)	(1.48)	(0.55)	(0.69)	(60.30)	(4.66)	(−2.75)
4	0.553*	−0.059	−0.168**	−0.075	1.170***	0.249***	0.069**
	(1.92)	(−0.70)	(−2.06)	(−0.96)	(54.03)	(7.90)	(2.13)
5	0.496	−0.175	−0.279***	−0.167*	1.252***	0.367***	−0.021
	(1.54)	(−1.64)	(−2.73)	(−1.69)	(45.85)	(9.24)	(−0.84)
6	0.385*	−0.112	−0.157	0.056	1.254***	0.389***	0.013
	(1.70)	(−0.79)	(−1.19)	(0.47)	(36.52)	(9.37)	(0.32)
7	0.408*	−0.089	−0.224*	−0.043	1.245***	0.458***	0.031
	(1.68)	(−0.65)	(−1.77)	(−0.37)	(41.65)	(10.52)	(0.68)
8	0.308	−0.371***	−0.476***	−0.280***	1.171***	0.358***	0.027
	(0.92)	(−2.73)	(−3.99)	(−2.61)	(36.10)	(7.57)	(0.55)
9	0.200	−0.596**	−0.653***	−0.375***	1.425***	0.920***	0.053
	(0.44)	(−2.17)	(−2.67)	(−2.85)	(23.64)	(12.44)	(0.58)
High	−0.576	−1.216***	−1.509***	−0.736***	1.511***	0.923***	0.430***
	(1.19)	(3.87)	(5.29)	(3.24)	(21.63)	(9.82)	(3.99)
High–Low	−1.184**	−1.382***	−1.942***	−0.832***	0.632***	0.814***	0.892***
	(2.34)	(2.96)	(4.68)	(2.64)	(5.69)	(10.96)	(6.25)

Campbell, Hilscher, and Szilagyi (2008)

$PD_t^{\mathbb{P}}$–sorted portfolio results:

	Excess ret.	CAPM alpha	Three-factor alpha	Four-factor alpha	MKT	SMB	HML
Low	0.608**	0.166	0.433***	0.096	0.879***	0.109**	−0.462***
	(2.01)	(0.99)	(2.86)	(0.72)	(23.63)	(2.17)	(8.05)
2	0.569**	0.095	0.090	0.022	0.898***	0.110***	−0.141***
	(2.55)	(1.51)	(1.42)	(0.36)	(54.84)	(4.66)	(−2.72)
3	0.534**	0.092	0.034	0.043	1.033***	0.116***	−0.071***
	(2.51)	(1.48)	(0.55)	(0.69)	(60.30)	(4.66)	(−2.75)
4	0.553*	−0.059	−0.168**	−0.075	1.170***	0.249***	0.069**
	(1.92)	(−0.70)	(−2.06)	(−0.96)	(54.03)	(7.90)	(2.13)
5	0.496	−0.175	−0.279***	−0.167*	1.252***	0.367***	−0.021
	(1.54)	(−1.64)	(−2.73)	(−1.69)	(45.85)	(9.24)	(−0.84)
6	0.385*	−0.112	−0.157	0.056	1.254***	0.389***	0.013
	(1.70)	(−0.79)	(−1.19)	(0.47)	(36.52)	(9.37)	(0.32)
7	0.408*	−0.089	−0.224*	−0.043	1.245***	0.458***	0.031
	(1.68)	(−0.65)	(−1.77)	(−0.37)	(41.65)	(10.52)	(0.68)
8	0.308	−0.371***	−0.476***	−0.280***	1.171***	0.358***	0.027
	(0.92)	(−2.73)	(−3.99)	(−2.61)	(36.10)	(7.57)	(0.55)
9	0.200	−0.596**	−0.653***	−0.375***	1.425***	0.920***	0.053
	(0.44)	(−2.17)	(−2.67)	(−2.85)	(23.64)	(12.44)	(0.58)
High	−0.576	−1.216***	−1.509***	−0.736***	1.511***	0.923***	0.430***
	(1.19)	(3.87)	(5.29)	(3.24)	(21.63)	(9.82)	(3.99)
High–Low	−1.184**	−1.382***	−1.942***	−0.832***	0.632***	0.814***	0.892***
	(2.34)	(2.96)	(4.68)	(2.64)	(5.69)	(10.96)	(6.25)

Campbell, Hilscher, and Szilagyi (2008)

$PD_t^{\mathbb{P}}$–sorted portfolio results:

	Excess ret.	CAPM alpha	Three-factor alpha	Four-factor alpha	MKT	SMB	HML
Low	0.608**	0.166	0.433***	0.096	0.879***	0.109**	−0.462***
	(2.01)	(0.99)	(2.86)	(0.72)	(23.63)	(2.17)	(8.05)
2	0.569**	0.095	0.090	0.022	0.898***	0.110***	−0.141***
	(2.55)	(1.51)	(1.42)	(0.36)	(54.84)	(4.66)	(−2.72)
3	0.534**	0.092	0.034	0.043	1.033***	0.116***	−0.071***
	(2.51)	(1.48)	(0.55)	(0.69)	(60.30)	(4.66)	(−2.75)
4	0.553*	−0.059	−0.168**	−0.075	1.170***	0.249***	0.069**
	(1.92)	(−0.70)	(−2.06)	(−0.96)	(54.03)	(7.90)	(2.13)
5	0.496	−0.175	−0.279***	−0.167*	1.252***	0.367***	−0.021
	(1.54)	(−1.64)	(−2.73)	(−1.69)	(45.85)	(9.24)	(−0.84)
6	0.385*	−0.112	−0.157	0.056	1.254***	0.389***	0.013
	(1.70)	(−0.79)	(−1.19)	(0.47)	(36.52)	(9.37)	(0.32)
7	0.408*	−0.089	−0.224*	−0.043	1.245***	0.458***	0.031
	(1.68)	(−0.65)	(−1.77)	(−0.37)	(41.65)	(10.52)	(0.68)
8	0.308	−0.371***	−0.476***	−0.280***	1.171***	0.358***	0.027
	(0.92)	(−2.73)	(−3.99)	(−2.61)	(36.10)	(7.57)	(0.55)
9	0.200	−0.596**	−0.653***	−0.375***	1.425***	0.920***	0.053
	(0.44)	(−2.17)	(−2.67)	(−2.85)	(23.64)	(12.44)	(0.58)
High	−0.576	−1.216***	−1.509***	−0.736***	1.511***	0.923***	0.430***
	(1.19)	(3.87)	(5.29)	(3.24)	(21.63)	(9.82)	(3.99)
High–Low	−1.184**	−1.382***	−1.942***	−0.832***	0.632***	0.814***	0.892***
	(2.34)	(2.96)	(4.68)	(2.64)	(5.69)	(10.96)	(6.25)

Friewald, Wagner, and Zechner (2014)

- Stocks with a high credit risk premium, defined as $\mathbb{E}_t^{\mathbb{Q}}[S_{t+\tau}^T] - \mathbb{E}_t^{\mathbb{P}}[S_{t+\tau}^T]$,
  - Here, the expected spreads under the $\mathbb{P}$- and $\mathbb{Q}$-measures are based on the CDS term structure.
  - earn high average returns and CAPM αs.

What is going on?

There are (at least) two possibilities:

1. The market is completely wrong about which firms are going to default (inattention?)
   - The market is consistently (negatively) surprised when the "distressed" (high $\text{PD}_t^{\mathbb{P}}$) firms default, and positively surprised when the "healthy" (low $\text{PD}_t^{\mathbb{P}}$) firms don't!
     - This leads to lower realized (not expected) returns for the high $\text{PD}_t^{\mathbb{P}}$ firms.
2. The market's expectations are correct, but previous empirical tests haven't properly measured risk.
   - "Distressed" (high unconditional $\text{PD}^{\mathbb{P}}$) are actually "safe", in that they earn comparatively good returns in bad (high marginal utility) times.
   - The "healthy" (low $\text{PD}^{\mathbb{P}}$) firms earn low returns (default) in the worst (highest marginal utility) economic times.

What is going on?

There are (at least) two possibilities:

1. The market is completely wrong about which firms are going to default (inattention?)
    - The market is consistently (negatively) surprised when the "distressed" (high $PD_t^{\mathbb{P}}$) firms default, and positively surprised when the "healthy" (low $PD_t^{\mathbb{P}}$) firms don't!
        - This leads to lower realized (not expected) returns for the high $PD_t^{\mathbb{P}}$ firms.
2. The market's expectations are correct, but previous empirical tests haven't properly measured risk.
    - "Distressed" (high unconditional $PD^{\mathbb{P}}$) are actually "safe", in that they earn comparatively good returns in bad (high marginal utility) times.
    - The "healthy" (low $PD^{\mathbb{P}}$) firms earn low returns (default) in the worst (highest marginal utility) economic times.

This paper's model

This paper presents a very nice dynamic model consistent with (2):

- "Healthy" (unconditionally low $\mathrm{PD}^{\mathbb{P}}$ firms) issue debt in expansions.
  - When the economy weakens, and $\mathbb{E}_t[R_{m,t+1}]$ increases, the high debt levels of the "healthy" firms cause their market-betas to rise to a level higher than the "distressed" firms.
- Conversely, "distressed" (unconditionally high $\mathrm{PD}_t^{\mathbb{P}}$) take on less debt in expansions
  - Thus, their betas are lower in the worst (highest marginal utility) economic times.

Conditional CAPM logic:

From Jagannathan and Wang (2007) and Lewellen and Nagel (2006):

- The conditional CAPM states:

$$\mathbb{E}_t[r_{i,t+t}] = \beta_{i,t}\mathbb{E}_t[r^m_{t+1}]$$

- Take unconditional expectations of each side, and note that $\mathbb{E}[xy] = \mathbb{E}[x]\mathbb{E}[y] + cov(x,y)$:

$$\mathbb{E}[r_{i,t+t}] = \mathbb{E}[\beta_{i,t}]\mathbb{E}[r^m_{t+1}] + \underbrace{cov(\beta_{i,t}, \mathbb{E}_t[r^m_{t+1}])}_{\approx \alpha_i^{\text{CAPM,u}}}$$

- Over this sample, $\hat{\mathbb{E}}[r^m_t] \approx 7\%/yr$, and for the high-PD portfolio, $\hat{\mathbb{E}}[r_{i,t}] \approx 0$, $\hat{\beta}^u = 1.59$, $\hat{\alpha}_i^{\text{CAPM,u}} \approx -11\%/yr$
- $cov(\beta_{i,t}, \mathbb{E}_t[r^m_{t+1}]) = \sigma_{\beta_i}\sigma_{E[r^m]}\rho_{\beta,E[r^m]}$, so if $\sigma_{E[r^m]} = 7\%/yr$, then

$$\sigma_{\beta_i} \geq \frac{|cov(\beta_{i,t}, \mathbb{E}_t[r^m_{t+1}])|}{\sigma_{E[r^m]}} = \frac{11}{7} = 1.57$$

Conditional CAPM logic:

From Jagannathan and Wang (2007) and Lewellen and Nagel (2006):

- The conditional CAPM states:

$$\mathbb{E}_t[r_{i,t+t}] = \beta_{i,t}\mathbb{E}_t[r^m_{t+1}]$$

- Take unconditional expectations of each side, and note that $\mathbb{E}[xy] = \mathbb{E}[x]\mathbb{E}[y] + cov(x,y)$:

$$\mathbb{E}[r_{i,t+t}] = \mathbb{E}[\beta_{i,t}]\mathbb{E}[r^m_{t+1}] + \underbrace{cov(\beta_{i,t}, \mathbb{E}_t[r^m_{t+1}])}_{\approx \alpha_i^{\text{CAPM,u}}}$$

- Over this sample, $\hat{\mathbb{E}}[r^m_t] \approx 7\%/yr$, and for the high-PD portfolio, $\hat{\mathbb{E}}[r_{i,t}] \approx 0$, $\hat{\beta}^u = 1.59$, $\hat{\alpha}_i^{\text{CAPM,u}} \approx -11\%/yr$
- $cov(\beta_{i,t}, \mathbb{E}_t[r^m_{t+1}]) = \sigma_{\beta_i}\sigma_{E[r^m]}\rho_{\beta,E[r^m]}$, so if $\sigma_{E[r^m]} = 7\%/yr$, then

$$\sigma_{\beta_i} \geq \frac{|cov(\beta_{i,t}, \mathbb{E}_t[r^m_{t+1}])|}{\sigma_{E[r^m]}} = \frac{11}{7} = 1.57$$

Conditional CAPM logic:

From Jagannathan and Wang (2007) and Lewellen and Nagel (2006):

- The conditional CAPM states:

$$\mathbb{E}_t[r_{i,t+t}] = \beta_{i,t}\mathbb{E}_t[r^m_{t+1}]$$

- Take unconditional expectations of each side, and note that $\mathbb{E}[xy] = \mathbb{E}[x]\mathbb{E}[y] + cov(x,y)$:

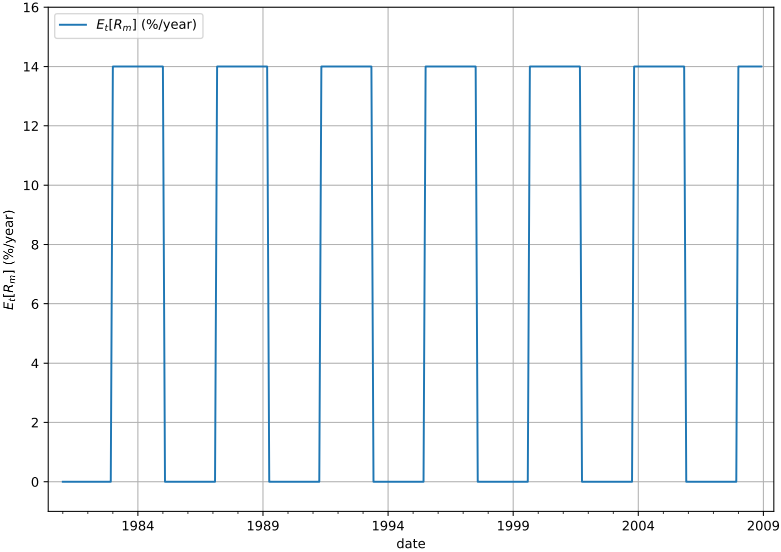
$$\mathbb{E}[r_{i,t+t}] = \mathbb{E}[\beta_{i,t}]\mathbb{E}[r^m_{t+1}] + \underbrace{cov(\beta_{i,t}, \mathbb{E}_t[r^m_{t+1}])}_{\approx \alpha_i^{\text{CAPM,u}}}$$

- Over this sample, $\hat{\mathbb{E}}[r^m_t] \approx 7\%/yr$, and for the high-PD portfolio, $\hat{\mathbb{E}}[r_{i,t}] \approx 0$, $\hat{\beta}^u = 1.59$, $\hat{\alpha}_i^{\text{CAPM,u}} \approx -11\%/yr$
- $cov(\beta_{i,t}, \mathbb{E}_t[r^m_{t+1}]) = \sigma_{\beta_i}\sigma_{E[r^m]}\rho_{\beta,E[r^m]}$, so if $\sigma_{E[r^m]} = 7\%/yr$, then

$$\sigma_{\beta_i} \geq \frac{|cov(\beta_{i,t}, \mathbb{E}_t[r^m_{t+1}])|}{\sigma_{E[r^m]}} = \frac{11}{7} = 1.57$$

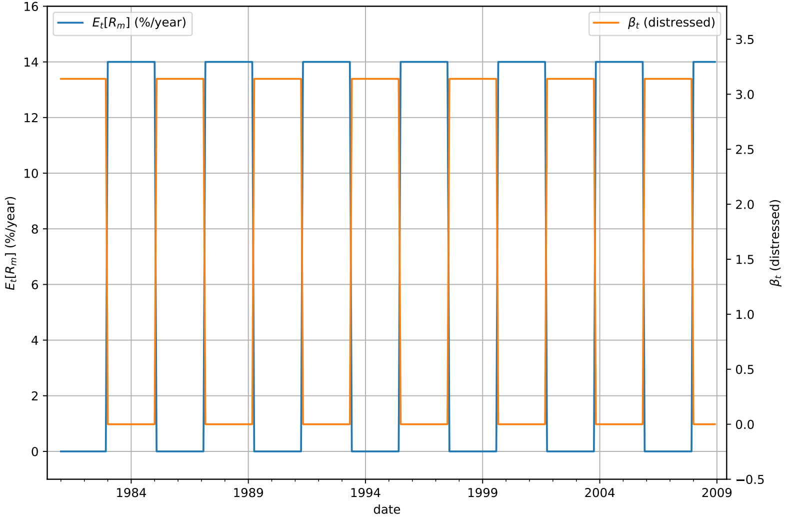
Simulated $\mathbb{E}_t[R_m]$s and β_ts

Expected Market Returns:



Simulated $\mathbb{E}_t[R_m]$s and β_ts

. . . and Distressed Firm Betas:



Estimation of $cov(\beta_{i,t}, \mathbb{E}_t[r^m_{t+1}])$

Table 7, Panel B:

Panel B. Model-Implied Excess Returns and Alphas											
	L(ow)	2	3	4	5	6	7	8	9	H(igh)	H-L
$\beta^E_{i,t}$	0.99	0.96	0.99	1.04	1.08	1.14	1.22	1.30	1.36	1.29	0.30
$E[\beta^E_{i,t}]E[r^m_t]$	6.89	6.66	6.88	7.24	7.50	7.90	8.47	9.07	9.49	9.00	2.11
$cov(\beta^E_{i,t}, r^m_t)$	0.62	0.02	0.04	−0.60	0.18	−1.90	−1.09	−3.20	−3.95	−5.96	−6.58
$r^{ex}_{i,t}$	7.50	6.67	6.92	6.64	7.68	6.00	7.37	5.87	5.54	3.04	−4.47
α^u	1.19	0.52	0.41	−0.49	0.12	−2.29	−1.72	−4.28	−5.30	−7.96	−9.15

- Since $\mathbb{E}_t[r^m_{t+1}]$ is unobservable, the authors instead estimate:

$$cov(\hat{\beta}_{i,t+1}, r^m_{t+1}) = cov(\beta_{i,t}, \mathbb{E}_t[r^m_{t+1}]) + cov(\hat{\beta}_{i,t+1}, \epsilon^m_{t+1})$$

  using monthly returns and β_ts, estimated using daily data.
- Lewellen and Nagel (2006, p. 307) note this will be biased if these "…firms covary more [with r_m] in down markets."
  - Note that this would lead to a negative estimated covariance.
- Thus, LN "…report this first estimate primarily as a benchmark rather than as a perfect estimate." (p. 307)

Estimation of $cov(\beta_{i,t}, \mathbb{E}_t[r^m_{t+1}])$

Table 7, Panel B:

Panel B. Model-Implied Excess Returns and Alphas											
	L(ow)	2	3	4	5	6	7	8	9	H(igh)	H-L
$\beta^E_{i,t}$	0.99	0.96	0.99	1.04	1.08	1.14	1.22	1.30	1.36	1.29	0.30
$E[\beta^E_{i,t}]E[r^m_t]$	6.89	6.66	6.88	7.24	7.50	7.90	8.47	9.07	9.49	9.00	2.11
$cov(\beta^E_{i,t}, r^m_t)$	0.62	0.02	0.04	−0.60	0.18	−1.90	−1.09	−3.20	−3.95	−5.96	−6.58
$r^{ex}_{i,t}$	7.50	6.67	6.92	6.64	7.68	6.00	7.37	5.87	5.54	3.04	−4.47
α^u	1.19	0.52	0.41	−0.49	0.12	−2.29	−1.72	−4.28	−5.30	−7.96	−9.15

- Since $\mathbb{E}_t[r^m_{t+1}]$ is unobservable, the authors instead estimate:

$$cov(\hat{\beta}_{i,t+1}, r^m_{t+1}) = cov(\beta_{i,t}, \mathbb{E}_t[r^m_{t+1}]) + cov(\hat{\beta}_{i,t+1}, \epsilon^m_{t+1})$$

  using monthly returns and β_ts, estimated using daily data.
- Lewellen and Nagel (2006, p. 307) note this will be biased if these "...firms covary more [with r_m] in down markets."
  - Note that this would lead to a negative estimated covariance.
- Thus, LN "...report this first estimate primarily as a benchmark rather than as a perfect estimate." (p. 307)

Estimating $\mathbb{E}_t[R_m]$ and $\hat{\beta}_t$

- Let's estimate this β variation using the other approach suggested by LN. Specifically, run time-series regressions:

$$\tilde{r}_{i,t} = \alpha_i(1 + \gamma_{0,i} Z_{t-1}) + (\beta_{0,i} + \beta_{1,i} \cdot Z_{t-1})\tilde{r}_{m,t} + \tilde{\epsilon}_{i,t}$$

  for a set of instruments Z that forecast market returns.

- Then:

$$\hat{\beta}_{i,t-1} = \hat{\beta}_{0,i} + \hat{\beta}_{1,i} \cdot Z_{t-1}$$

- We'll use as instruments:
  1. NBER Recession indicator
  2. $-1\times$ Past 2-year market return
  3. $-1\times$ Index of Leading Economic Indicators (LEI)
  4. VIX
  5. TERM Spread (10Y-3M)
- *These variables are all high in periods of distress, so expected market returns should be positively related to these variables.*

Estimating $\mathbb{E}_t[R_m]$ and $\hat{\beta}_t$

- Let's estimate this β variation using the other approach suggested by LN. Specifically, run time-series regressions:

$$\tilde{r}_{i,t} = \alpha_i(1 + \gamma_{0,i} Z_{t-1}) + (\beta_{0,i} + \beta_{1,i} \cdot Z_{t-1})\tilde{r}_{m,t} + \tilde{\epsilon}_{i,t}$$

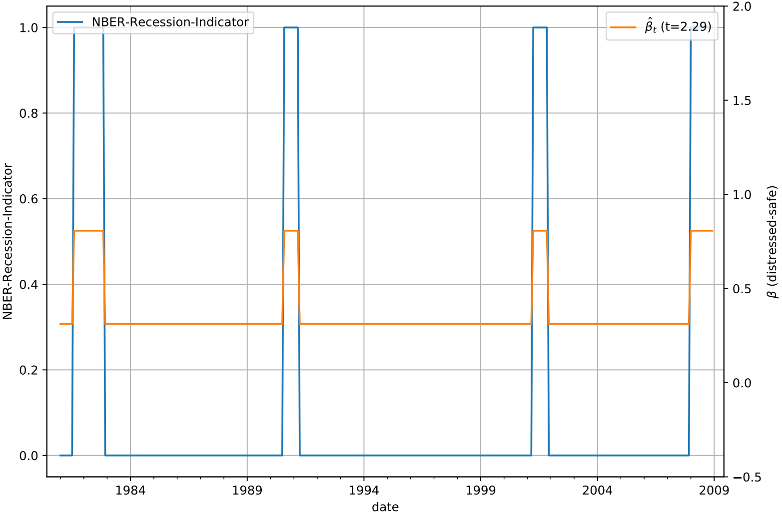
  for a set of instruments Z that forecast market returns.
- Then:

$$\hat{\beta}_{i,t-1} = \hat{\beta}_{0,i} + \hat{\beta}_{1,i} \cdot Z_{t-1}$$

- We'll use as instruments:
  1. NBER Recession indicator
  2. $-1\times$ Past 2-year market return
  3. $-1\times$ Index of Leading Economic Indicators (LEI)
  4. VIX
  5. TERM Spread (10Y-3M)
- *These variables are all high in periods of distress, so expected market returns should be positively related to these variables.*

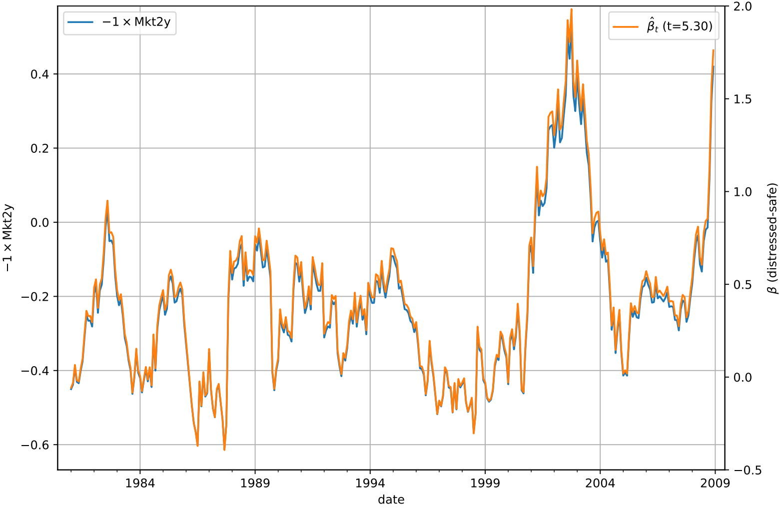
Time variation in $\hat{\beta}_{\text{LS}}$

Z_{t-1} = NBER Recession indicator



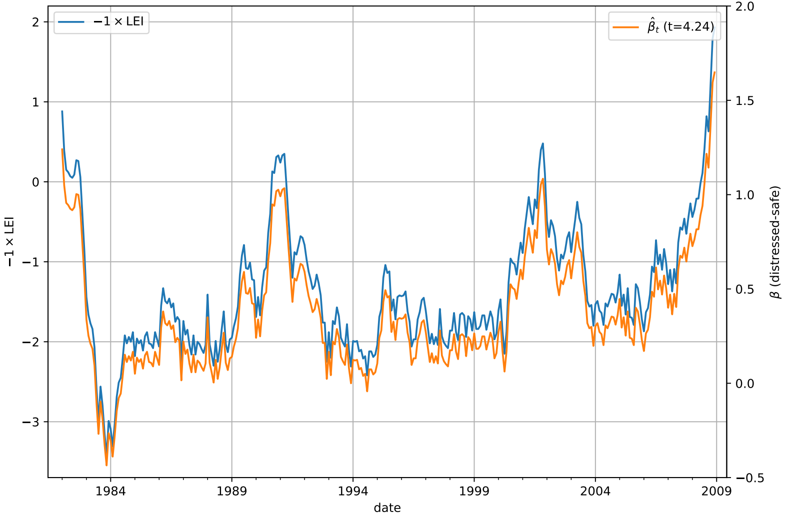
Time variation in $\hat{\beta}_{\text{LS}}$

$Z_{t-1} = -1\times$ 2-year log Market Return



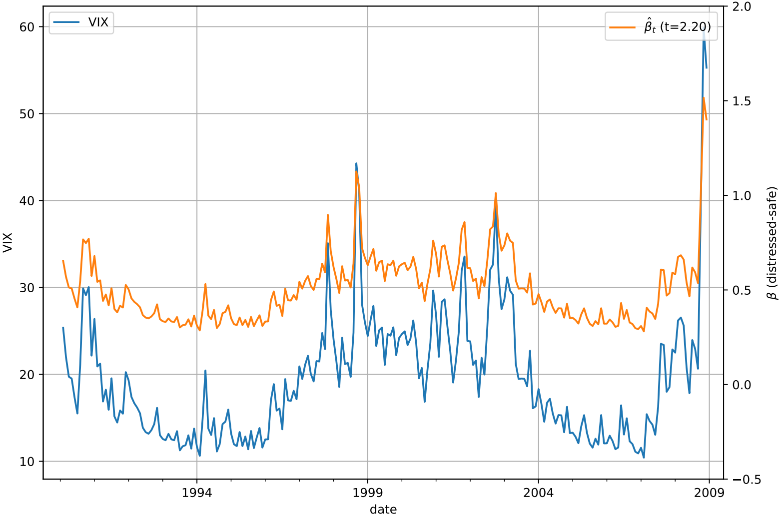
Time variation in $\hat{\beta}_{\text{LS}}$

$Z_{t-1} = -1\times$ Index of Leading Economic Indicators (LEI)



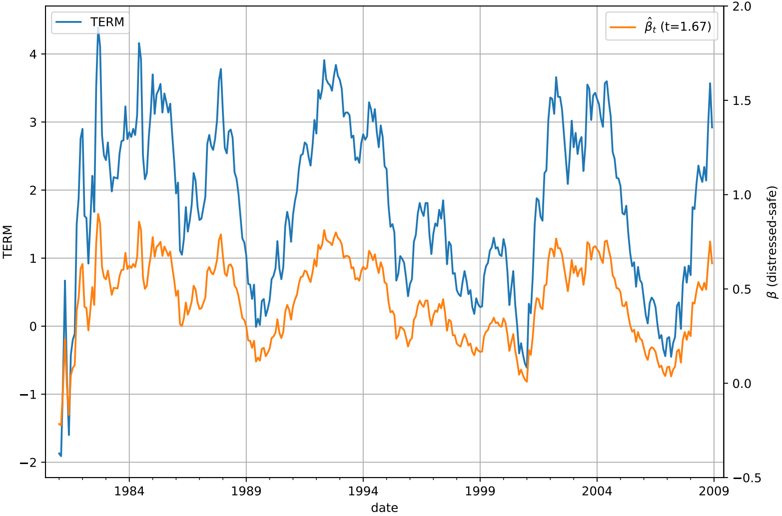
Time variation in $\hat{\beta}_{\text{LS}}$

$Z_{t-1} = \text{VIX}$



Time variation in $\hat{\beta}_{\mathrm{LS}}$

Z_{t-1} = TERM Spread (10Y-3M)



References I

Altman, Edward I, 1968, Financial ratios, discriminant analysis and the prediction of corporate bankruptcy, *The journal of finance* 23, 589–609.

Anginer, Deniz, and Çelim Yıldızhan, 2017, Is there a distress risk anomaly? pricing of systematic default risk in the cross-section of equity returns, *Review of Finance* 22, 633–660.

Campbell, John Y., Jens Hilscher, and Jan Szilagyi, 2008, In search of distress risk, *The Journal of Finance* 63, 2899–2939.

Campbell, John Y, Jens Dietrich Hilscher, and Jan Szilagyi, 2011, Predicting financial distress and the performance of distressed stocks, *Journal of Investment Management* 9, 1–21.

Dichev, Ilia, 1998, Is the risk of bankruptcy a systematic risk?, *Journal of Finance* 53, 1131–1147.

Fama, Eugene F., and Kenneth R. French, 1996, Multifactor explanations of asset pricing anomalies, *Journal of Finance* 51, 55–84.

Friewald, Nils, Christian Wagner, and Josef Zechner, 2014, The cross-section of credit risk premia and equity returns, *The Journal of Finance* 69, 2419–2469.

Garlappi, Lorenzo, Tao Shu, and Hong Yan, 2008, Default risk, shareholder advantage, and stock returns, *The Review of Financial Studies* 21, 2743–2778.

Garlappi, Lorenzo, and Hong Yan, 2011, Financial distress and the cross-section of equity returns, *The journal of finance* 66, 789–822.

Jagannathan, Ravi, and Yong Wang, 2007, Lazy investors, discretionary consumption, and the cross-section of stock returns, *The Journal of Finance* 62, 1623–1661.

References II

Lewellen, Jonathan, and Stefan Nagel, 2006, The conditional CAPM does not explain asset-pricing anomalies, *Journal of Financial Economics* 58, 289–314.

Ohlson, James A, 1980, Financial ratios and the probabilistic prediction of bankruptcy, *Journal of accounting research* pp. 109–131.

Shumway, Tyler, 2001, Forecasting bankruptcy more accurately: A simple hazard model, *The journal of business* 74, 101–124.