In Search of Distress Risk

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What is financial distress?

- The idea of financial distress is often invoked to explain anomalous patterns in stock returns
  - Chan and Chen (1991) argue that “marginal firms” among small stocks explain the size effect
  - Fama and French (1996) use the term “relative distress” to capture this idea
- Unanswered questions:
  - →*How can we measure financial distress?*
  - →*What explains variation in financial distress across firms and over time?*
  - →*Do distressed stocks carry a risk premium?*

Our approach

- Measure financial distress as the probability of bankruptcy (Chapter 7 or Chapter 11) or of failure (bankruptcy, delisting, or default as defined by a credit rating agency) at some future date
- Use accounting and equity market data to estimate failure probabilities
- Sort stocks by these estimated probabilities
- Calculate average returns on distressed portfolios

Results

- Differences in accounting and market based firm characteristics explain much of variation in failure rate
- Distressed stocks have high standard deviation, market beta, and loadings on Fama-French HML (value) and SMB (size) factors
- However, they have low average returns

Related literature

- Bankruptcy prediction:
  - Altman (1968) Z-score, Ohlson (1980) O-score, Shumway (2001), Chava-Jarrow (2004), Hillegeist et al., Bharath-Shumway (2005), Duffie et al. (2006)

  →*We extend the horizon of failure prediction and directly predict failure for different horizons*
- Pricing of distressed firms:
  - Dichev (1998), Griffin-Lemmon (2002), Vassalou-Xing (2004), Garlappi-Shu-Yan (2005)
  - All except VX find low returns of distressed stocks

  →*We confirm results with superior measure of distress*

Data summary

- Chava-Jarrow (2004) bankruptcy indicator, Kamakura Risk Information Systems (KRIS) failure indicator
- Compustat accounting data and CRSP equity market data
- We have data on almost 1.7 million firm-months and 1600 failures from 1963-2003, but very little data before 1972

Explanatory variables

- We include refinements of existing variables and introduce new variables for failure prediction:
- Profitability: **NITA** (net income to total assets) and **NIMTA** (net income to market value of total assets)
- Leverage: **TLTA** (total leverage to total assets) and **TLMTA** (market value equivalent)

→*New:* we scale by market value of total assets - market value of equity plus book value of debt

Explanatory variables

- Excess return over the past month: **EXRET**
- Return volatility from daily data over the past three months: **SIGMA**
- Log market capitalization relative to the market value of the S&P 500 index: **RSIZE**
- Short-term assets to market value of total assets: **CASHMTA** *(new)*
- Market-book ratio: **MB** *(new)*
- Log share price up to $15: **PRICE** *(new)*

Probability of failure

- Model probability of failure (indicator equal to 1)

$$P_t\left(Y_{t+1}=1\right)=F\left(\alpha+X_t\beta\right)$$

- We find that firms with higher leverage, lower profitability, lower past stock returns, more volatile past stock returns, lower cash holdings, higher market-to-book ratios, and lower prices per share are more likely to fail
- We also use distance to default (DD) to predict the probability of failure - Merton (1974)

Failure prediction results

- Including refinements of existing variables and introducing new variables improves explanatory power by 16%.
  - The pseudo R^2 increases from 0.27 to 0.312
- Variables also explain failure at longer horizons
  - Volatility, the market-to-book ratio MB, and firm size become relatively more important at longer horizons
- Distance to default
  - Adding DD does not improve explanatory power
  - Our model doubles explanatory power relative to DD

Pricing of distressed stocks

- Should we expect high or low average returns on distressed equity?
- High: financial distress is a priced risk factor
- Low: Investors do not understand failure risk
  - Investors have been learning about the variables that predict failure
  - Investors overrate distressed stocks' prospects

How has distress risk been priced?

- We sort stocks by predicted failure risk each January from 1981 through 2003, using model estimated up to that date
- We form value weighted portfolios of stocks
- Distressed stocks have high standard deviation, market beta, and loadings on Fama-French HML (value) and SMB (size) factors
- So we expect them to have high average returns
- But they tend to have low average returns

Distressed stock returns

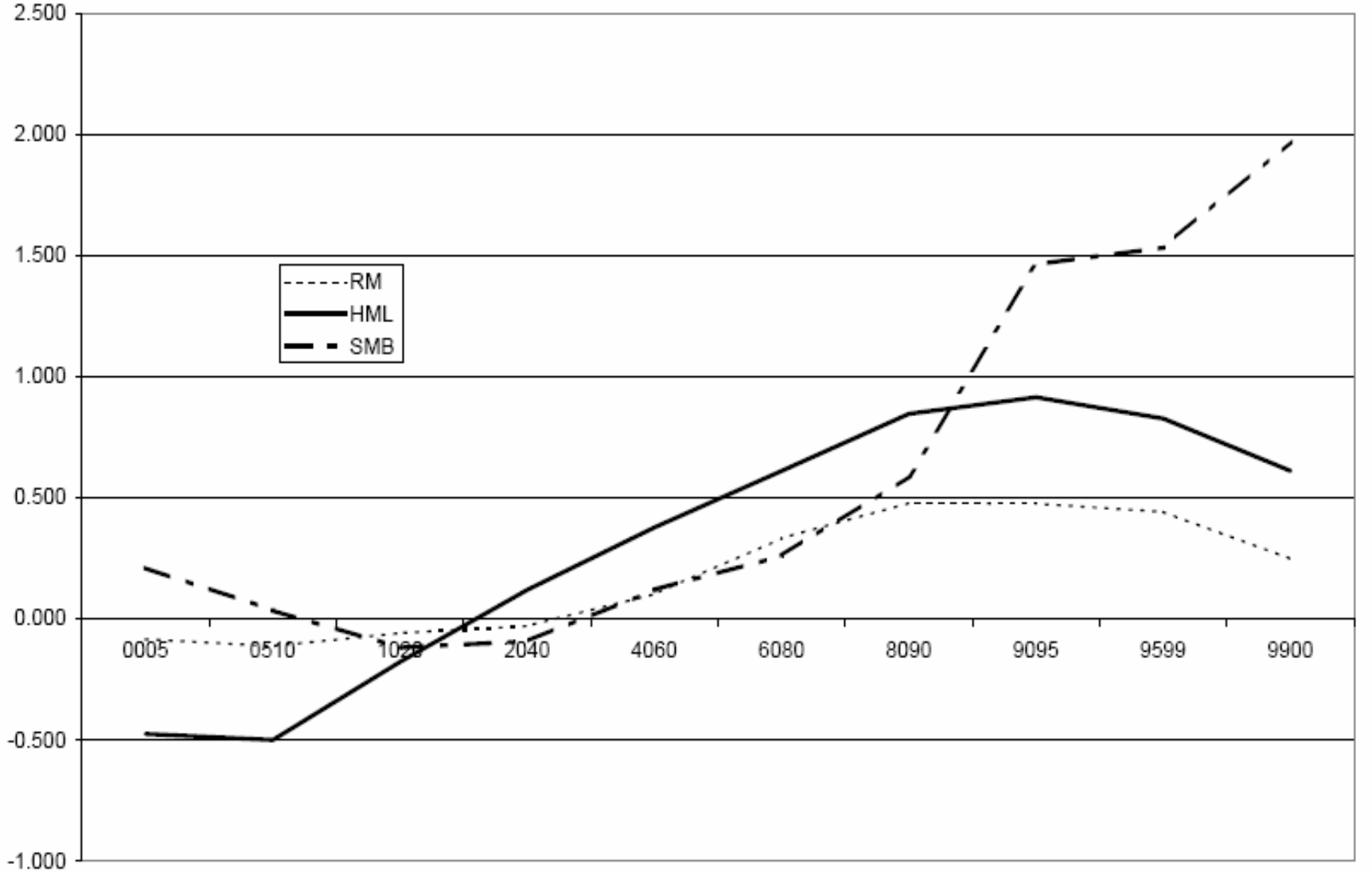
Panel A - Portfolio alphas

Portfolios	**0005**	**0510**	**…**	**9095**	**9599**	**9900**	**LS1090**
Excess return	3.39	2.36		-8.07	-6.63	-16.30	10.1988
	(1.45)	(1.08)		(1.72)	(1.24)	(1.98)*	(1.90)
CAPM alpha	2.74	2.04		-10.96	-9.45	-18.71	12.5976
	(1.17)	(0.92)		(2.40)*	(1.79)	(2.27)*	(2.36)*
3-factor alpha	5.70	5.30		-18.15	-16.13	-24.25	22.8852
	(2.95)**	(2.85)**		(5.75)**	(3.93)**	(3.35)**	(6.15)**
4-factor alpha	2.37	2.66		-10.01	-8.19	-20.39	12.1752
	(1.19)	(1.37)		(3.26)**	(1.96)	(2.64)**	(3.45)**

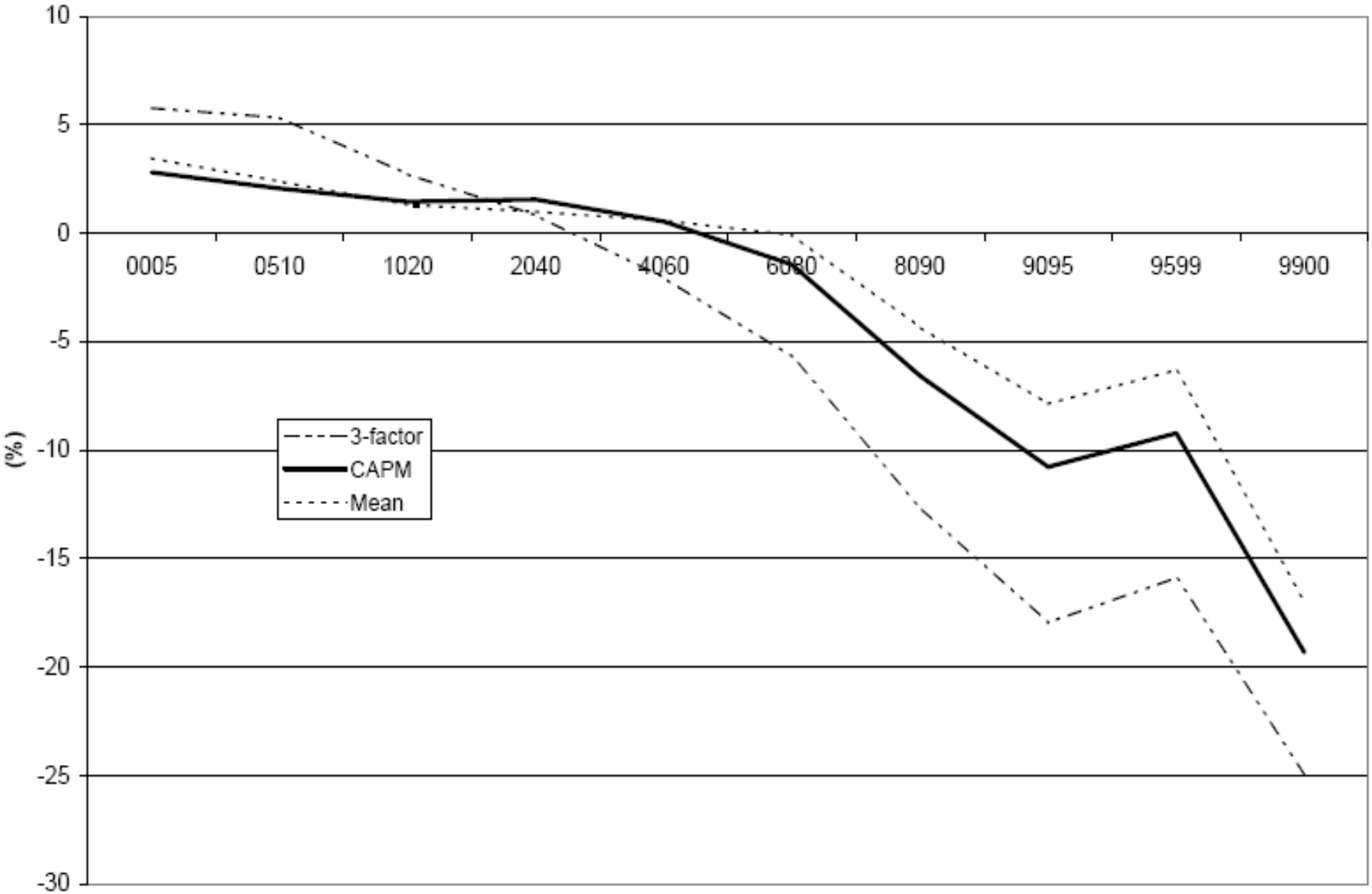
Panel B - 3-factor regression coefficients

Portfolios	**0005**	**0510**	**9095**	**9599**	**9900**	**LS1090**
RM	-0.083	-0.111	0.476	0.431	0.254	-0.563
	(2.22)*	(3.10)**	(7.81)**	(5.45)**	(1.82)	(7.82)**
HML	-0.474	-0.499	0.918	0.831	0.608	-1.396
	(9.68)**	(10.61)**	(11.50)**	(8.02)**	(3.32)**	(14.82)**
SMB	0.212	0.037	1.466	1.538	1.964	-1.394
	(3.89)**	(0.71)	(16.51)**	(13.34)**	(9.64)**	(13.31)**

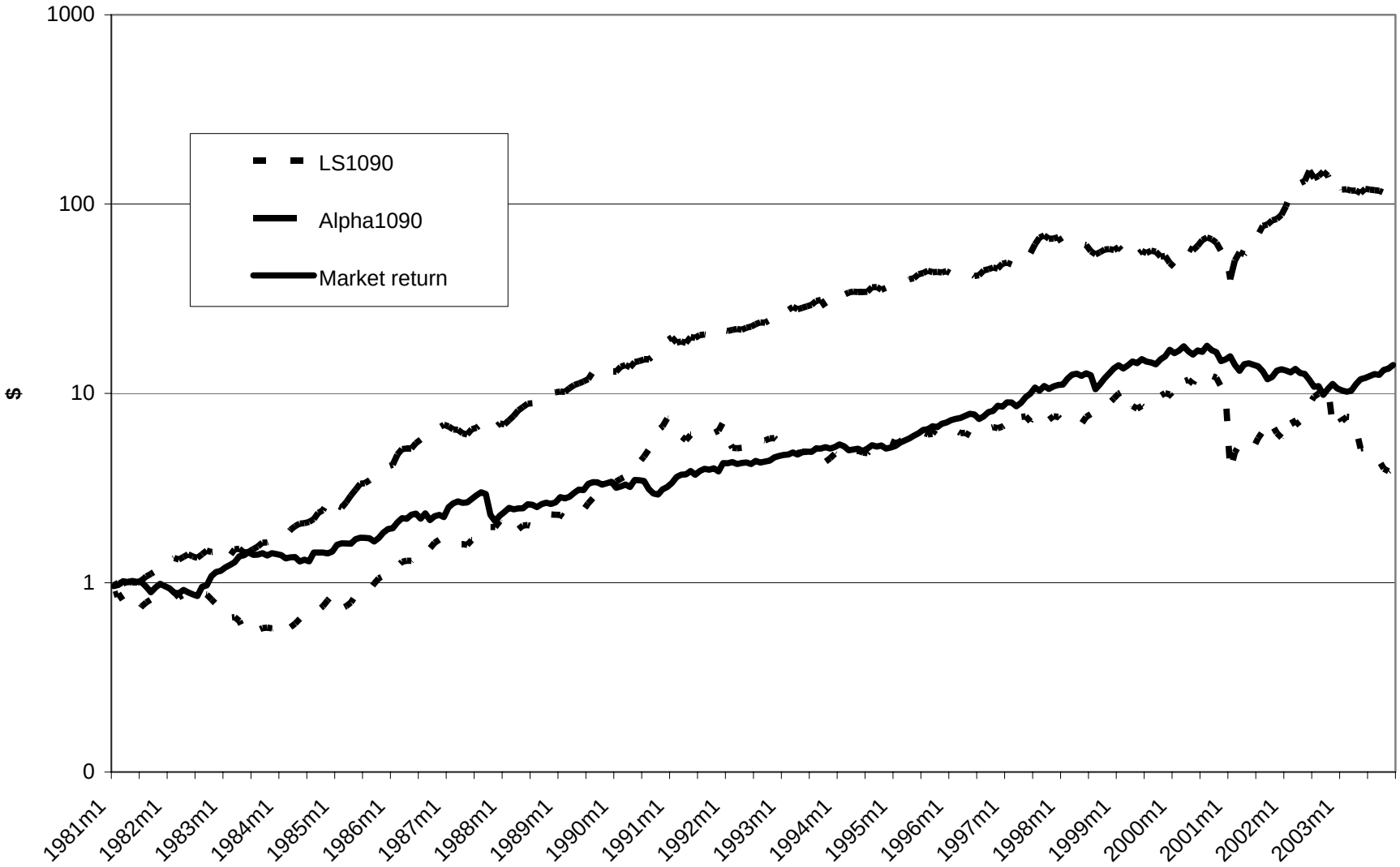
Factor loadings of distressed stocks



Alphas of distressed stocks



Returns on long-short portfolios



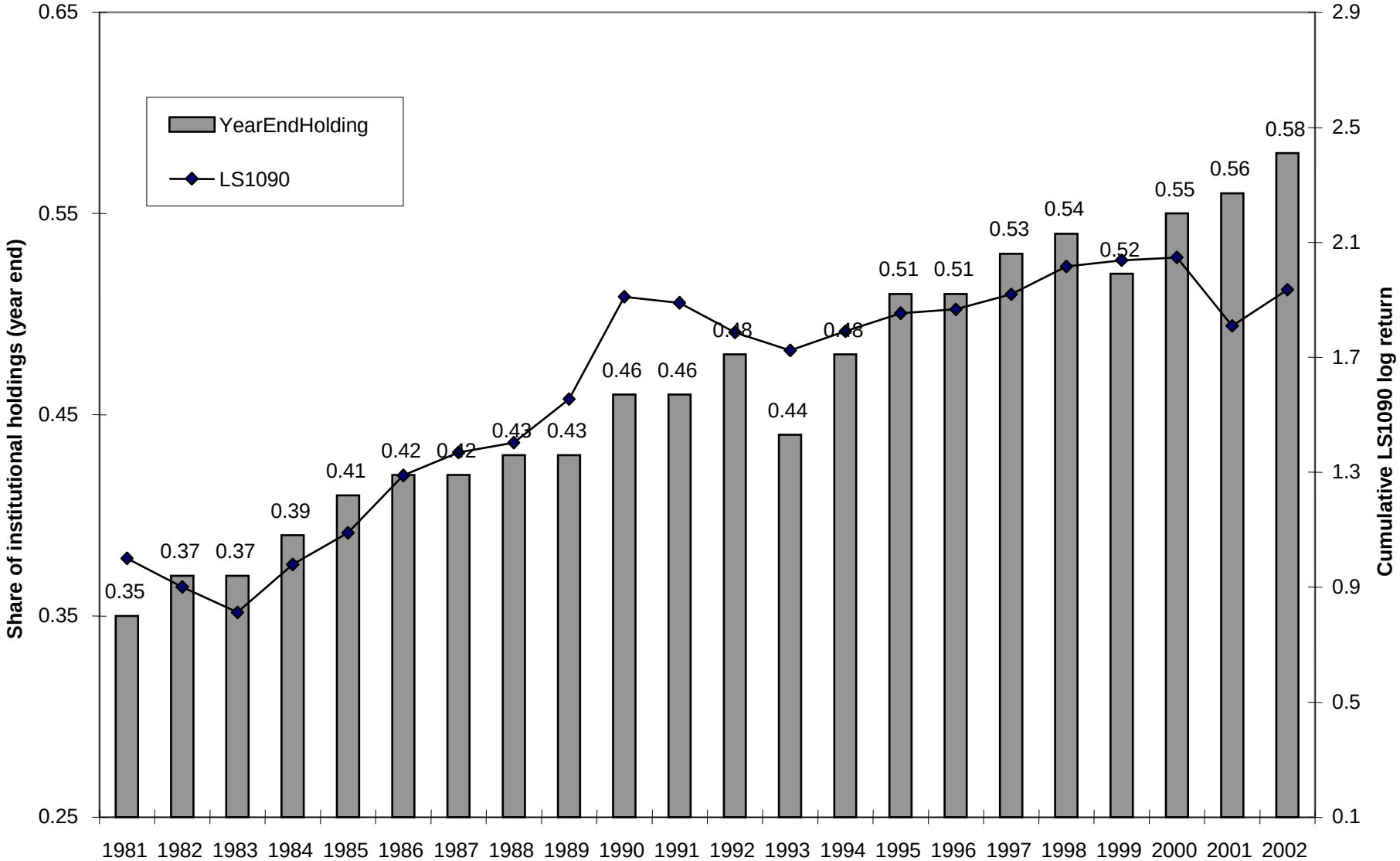
Sources of underperformance?

- Are return differences driven by differences in size and value?
  - →*No: Underperformance of distressed stocks is present in all size and value quintiles*
  - →*It is strongest in small stocks and growth stocks*
- Are negative returns to distressed stocks clustered around news events?
  - →*No: We do not find negative excess returns on distressed stocks around earnings announcements*

Institutional holdings and returns

- The distress anomaly may result from the preferences of institutional investors
- If institutions prefer to hold safe stocks and sell stocks that enter financial distress we may observe underperformance of distressed stocks
  - → *Returns to safe relative to distressed stocks are high when institutional holdings have large increases*
  - →*The correlation of the return to the long-short portfolio and the change in holdings is 31%*

Institutional holdings and returns



Conclusions

- Failures can best be predicted using a reduced-form econometric model
- Distance to default does well given its tight theoretical structure, but does not capture all relevant data
- Distressed stocks have risk characteristics that normally imply high returns
- Yet they have delivered low average returns in 1981-2003
- The effect is present in all size and value quintiles and is not concentrated around earnings announcements

Conclusions

- It is hard to imagine a risk-based story that will explain this finding
- It may be an anomaly that will be corrected once widely understood
- It may also be a transitional effect of the shift to institutional investing, combined with institutions' preferences for safe stocks