Lecture 4: Value

Illustrate the Value effect and its market efficiency debate through 3 great papers:

1. Lakonishok, Shleifer, and Vishny (1994) – value and growth effect with a behavioral interpretation.
2. Fama and French (1996) – comprehensive analysis of all anomalies, with a rational risk-based interpretation.
3. Daniel and Titman (1997) – try to break the log-jam of the behavioral vs. risk-based debate.
    - Two more recent papers that followed: Davis, Fama, and French (2000), and Berk (2001).

Contrarian Investment, Extrapolation, and Risk
– Lakonishok, Shleifer, and Vishny (1994,JF)

Value and Growth

- form portfolios of value stocks
  - a value stock is one with low price relative to some measure of fundamentals, i.e. *high*
    book to market (B/M) ratios
    cash flow to price (C/P) ratios
    earnings to price (E/P) ratios
- also form portfolios of growth stocks, i.e. with low values of these ratios
- find that value stocks dramatically outperform growth stocks

Why?

- LSV argue that value vs. growth strategies (contrarian strategies) exploit naive investor behavior and are not riskier.
- Investors may extrapolate earnings too far in the future, may overreact to news, assume a trend in stock prices, or equate a good company with a good investment.

- **irrational story**: Stocks that have done well in the past are Growth stocks that are 'glamorous' to investors. People tend to want to buy these and stampede towards them, pushing up the price, and depressing their future returns.

  Value stocks have been neglected, people tend to overreact to these poorly performing firms, causing their prices to fall too much, and expected returns to rise.

  Psychological evidence suggests people form these naive strategies.

  This is an *overreaction* story, and a contrarian strategy exploits it.

- LSV also argue that value stocks are not riskier than growth stocks.
  - they don't have higher variance
  - they don't have high downside risk (i.e., do not underperform often or by that much)
  - they don't have higher betas
  - they don't underperform in bad states of the world

- They examine two aspects of these strategies:
  1. *Glamour* stocks should be those where past performance was good and expected future performance

is good. *Value* stocks are those where past performance was bad and expected future performance is bad.

They argue that past and expected performance are distinct and measurable.

- Past performance: past growth in sales, earnings, and cash flow.
- Expected future performance: P/E and P/C multiples.

2. Assessing risk: value stocks must underperform glamour stocks with some frequency, and in states of the world important to investors (i.e., low consumption states).

Data and Methodology

- NYSE-AMEX firms from 1963-1990.
- Start strategies in 1968, because require 5 years of past performance history.
- Examine CRSP (price and returns data) and COMPUSTAT (accounting data) universe.

  What selection bias issues might we be worried about here?

  How would this affect contrarian or value vs. growth strategies?

How do they mitigate these biases?

- Form strategy at time t and compute returns annually over years $t+1$ to $t+5$. (employ equal-weighted portfolios)
- What happens if a firm disappears during the year?
  - replace its return until end of year with return on a similar size decile portfolio.

    Does this induce any biases? What returns should we assign to delisted firms? Is this likely to affect value or growth firms more?
- Adjust returns for size, using characteristic-matched benchmarks (not regressions). (Why this method?)
- Use accounting ratios to compute growth rates and expectations of future growth.

  ex: computing growth rate from $t-4$ to $t-3$
  - form portfolio by investing \$1 in each firm at $t-4$.
  - multiply total firm earnings by fraction of firm held, sum over all stocks in the portfolio, and divide by number of stocks in the portfolio.

$$E_{p,t-4} = \frac{1}{n} \sum_{i=1}^{n} E_{i,t-4} \frac{\$1}{Mkt.Cap._{i,t-4}}$$

– Do this for $t-3$ as well.

– Now compute growth rate from $t-4$ to $t-3$,

$$g_{t-4:t-3} = \frac{E_{p,t-3} - E_{p,t-4}}{E_{p,t-4}}$$

for each year t, and then want to average across the 22 years.

– Problems: what if $E_{p,t-4} < 0$? Also, won't $g_{t-4:t-3}$ be very volatile?

– Solution: First average earnings over time, then compute growth rates.

$$\begin{aligned} AE_{p,t-4} &= \frac{1}{T}\sum_{t=1}^{T}\left(\frac{1}{n}\sum_{i=1}^{n} E_{i,t-4}\frac{\$1}{Mkt.Cap._{i,t-4}}\right) \\ g_{t-4:t-3} &= \frac{AE_{p,t-3} - AE_{p,t-4}}{AE_{p,t-4}} \end{aligned}$$

- Focus on long-term buy and hold returns of these portfolios.
- Have measures of past growth now. What about measures of expected future growth?
- Use measure of profitability to price. Firms with lower ratios have higher expected growth.
- Intuition comes from Gordon's growth model: $P = \frac{D}{r-g}$.

- This breakdown into past and expected future growth will help determine whether low BE/ME firms are those with a lot of intangible assets, or attractive growth opportunities, or a stock with low risk and therefore low discount rate, or an overvalued glamour stock. This is the idea in the paper.
- Also use past sales growth as a measure (not as volatile as cash flow or earnings, and not affected by price).
- Could also use analysts' forecast of future growth (Laporta (1993)).

Results

- Glamour stock should be one with high past growth and high expected future growth.
- Value stock should be one with low past growth and low expected future growth.
- Buy low past, low future stocks, sell high past, high future stocks. These should outperform simple strategies of buy high BE/ME and sell low BE/ME stocks. Refining this strategy consistent with investor sentiment.
  (TABLE II)
- Robustness:

Panel A: C/P and GS

	Glamour						Value		
C/P	1	1	1	2	2	2	3	3	3
GS	1	2	3	1	2	3	1	2	3
R_1	0.157	0.131	0.113	0.181	0.156	0.139	0.215	0.202	0.137
R_2	0.147	0.120	0.100	0.191	0.165	0.167	0.213	0.188	0.165
R_3	0.165	0.140	0.121	0.197	0.190	0.165	0.227	0.195	0.172
R_4	0.164	0.124	0.114	0.198	0.169	0.166	0.231	0.204	0.177
R_5	0.179	0.135	0.121	0.200	0.173	0.151	0.218	0.216	0.184
$\bar{AR}$	0.162	0.130	0.114	0.193	0.171	0.157	0.221	0.201	0.167
CR_5	1.122	0.843	0.712	1.419	1.200	1.076	1.711	1.497	1.163
$SAAR$	−0.006	−0.020	−0.033	0.030	0.014	0.003	0.054	0.036	0.008

Panel B: E/P and GS

	Glamour						Value		
E/P	1	1	1	2	2	2	3	3	3
GS	1	2	3	1	2	3	1	2	3
R_1	0.184	0.148	0.118	0.188	0.153	0.139	0.224	0.205	0.174
R_2	0.167	0.134	0.100	0.204	0.174	0.154	0.214	0.187	0.190
R_3	0.185	0.153	0.119	0.222	0.189	0.169	0.221	0.198	0.189
R_4	0.190	0.138	0.103	0.205	0.175	0.160	0.232	0.217	0.188
R_5	0.189	0.163	0.104	0.201	0.180	0.157	0.215	0.210	0.199
$\bar{AR}$	0.183	0.147	0.109	0.204	0.174	0.156	0.221	0.203	0.188
CR_5	1.315	0.986	0.674	1.533	1.230	1.063	1.716	1.523	1.365
$SAAR$	0.005	−0.011	−0.037	0.033	0.013	0.002	0.040	0.034	0.017

Table II—*Continued*

Panel C: *B/M* and *GS*

	Glamour						Value		
B/M	1	1	1	2	2	2	3	3	3
GS	1	2	3	1	2	3	1	2	3
R_1	0.147	0.141	0.132	0.160	0.159	0.121	0.204	0.185	0.135
R_2	0.127	0.138	0.127	0.175	0.166	0.150	0.200	0.172	0.163
R_3	0.149	0.149	0.137	0.190	0.186	0.152	0.221	0.192	0.182
R_4	0.147	0.130	0.130	0.191	0.176	0.154	0.222	0.190	0.195
R_5	0.158	0.140	0.124	0.203	0.180	0.165	0.216	0.211	0.164
AR	0.146	0.140	0.130	0.184	0.173	0.148	0.212	0.190	0.168
CR_5	0.974	0.925	0.842	1.325	1.224	0.996	1.618	1.387	1.171
SAAR	−0.009	−0.012	−0.021	0.022	0.015	−0.009	0.039	0.030	0.017

Panel D: *E/P* and *B/M*

	Glamour								Value
E/P	1	1	1	2	2	2	3	3	3
B/M	1	2	3	1	2	3	1	2	3
R_1	0.116	0.118	0.186	0.142	0.143	0.174	0.135	0.174	0.189
R_2	0.086	0.120	0.194	0.146	0.163	0.192	0.173	0.178	0.185
R_3	0.114	0.154	0.201	0.157	0.184	0.220	0.177	0.178	0.204
R_4	0.093	0.151	0.218	0.150	0.166	0.193	0.188	0.200	0.214
R_5	0.093	0.188	0.218	0.168	0.169	0.209	0.241	0.205	0.204
AR	0.100	0.146	0.203	0.152	0.165	0.198	0.183	0.187	0.199
CR_5	0.613	0.976	1.521	1.032	1.146	1.464	1.311	1.354	1.479
SAAR	−0.039	−0.009	0.022	0.002	0.009	0.033	0.003	0.023	0.030

Panel E: *B/M* and *C/P*

	Glamour								Value
B/M	1	1	1	2	2	2	3	3	3
C/P	1	2	3	1	2	3	1	2	3
R_1	0.111	0.153	0.141	0.101	0.144	0.171	0.170	0.161	0.194
R_2	0.085	0.164	0.172	0.111	0.160	0.181	0.174	0.173	0.189
R_3	0.111	0.172	0.179	0.147	0.177	0.191	0.192	0.206	0.207
R_4	0.101	0.153	0.187	0.155	0.168	0.200	0.177	0.195	0.219
R_5	0.108	0.162	0.250	0.184	0.178	0.208	0.233	0.201	0.209
AR	0.103	0.161	0.186	0.139	0.165	0.190	0.189	0.187	0.203
CR_5	0.633	1.108	1.339	0.917	1.148	1.387	1.378	1.355	1.524
SAAR	−0.037	0.007	0.018	−0.021	0.011	0.026	0.006	0.020	0.037

	Int.	GS	B/M	SIZE	E/P+	DE/P	C/P+	DC/P
Mean	0.180	−0.061						
t-statistic	3.251	−2.200						
Mean	0.108		0.039					
t-statistic	2.167		2.132					
Mean	0.185			−0.009				
t-statistic	2.140			−1.095				
Mean	0.110				0.526			
t-statistic	2.029				2.541			
Mean	0.099						0.356	
t-statistic	1.873						4.240	
Mean	0.129	−0.058	0.006				0.301	−0.029
t-statistic	2.584	−2.832	0.330				3.697	−1.222
Mean	0.143		0.009	−0.009			0.280	−0.032
t-statistic	1.562		0.565	−1.148			4.223	−1.625
Mean	0.169	−0.044	0.000	−0.009			0.296	−0.036
t-statistic	1.947	−2.125	0.005	−1.062			4.553	−1.625
Mean	0.172	−0.051	0.016	−0.009	0.394	−0.032		
t-statistic	1.961	−2.527	1.036	−1.065	2.008	−1.940		

  - Driven by just small stocks?
  - What about selection bias issues?
  - Perform Fama-MacBeth regressions in addition to their portfolio analysis. What advantages and disadvantages does this have over portfolio sorts? (TABLE IV)

- Further test of investor sentiment: How do actual growth rates compare to expectations (as proxied by the book-to-price ratios)?
  (TABLE V)

- persistence of growth rates seems to have been overestimated (consistent with the story) over the following 5 years (although is somewhat consistent in first two years after portfolio formation).

- They argue these are long-term trends that take time to be corrected as people slowly abandon their beliefs (opposite of momentum)

What about risk?

- Analyze how often value underperforms growth, and whether these are "bad" states of the world where marginal utility of wealth/consumption is high.

- Motivated by the ICAPM, but what about APT as a possibility?

	Panel 1		Panel 2	
	Glamour B/M_1	Value B/M_{10}	Glamour $C/P_1, GS_3$	Value $C/P_3, GS_1$
Panel A: Fundamental Variables				
E/P ✓	0.029	0.004	0.054	0.114
C/P ✓	0.059	0.172	0.080	0.279
S/P ✓	0.993	6.849	1.115	5.279
D/P ✓	0.012	0.032	0.014	0.039
B/M ✓	0.225	1.998	0.385	1.414
$SIZE$ ✓	663	120	681	390
Panel B: Past Performance—Growth Rates and Past Returns				
$AEG_{(-5,0)}$	0.309	−0.274	0.142	0.082
$ACG_{(-5,0)}$	0.217	−0.013	0.210	0.078
$ASG_{(-5,0)}$	0.091	0.030	0.112	0.013
$RETURN_{(-3,0)}$	1.455	−0.119	1.390	0.225
Panel C: Future Performance				
$AEG_{(0,5)}$	0.050	0.436	0.089	0.086
$ACG_{(0,5)}$	0.127	0.070	0.112	0.052
$ASG_{(0,5)}$	0.062	0.020	0.100	0.037
$AEG_{(2,5)}$	0.070	0.215	0.084	0.147
$ACG_{(2,5)}$	0.086	0.111	0.095	0.088
$ASG_{(2,5)}$	0.059	0.023	0.082	0.038

- Value outperforms growth in at least 17/22 years, and in every 5-year period.

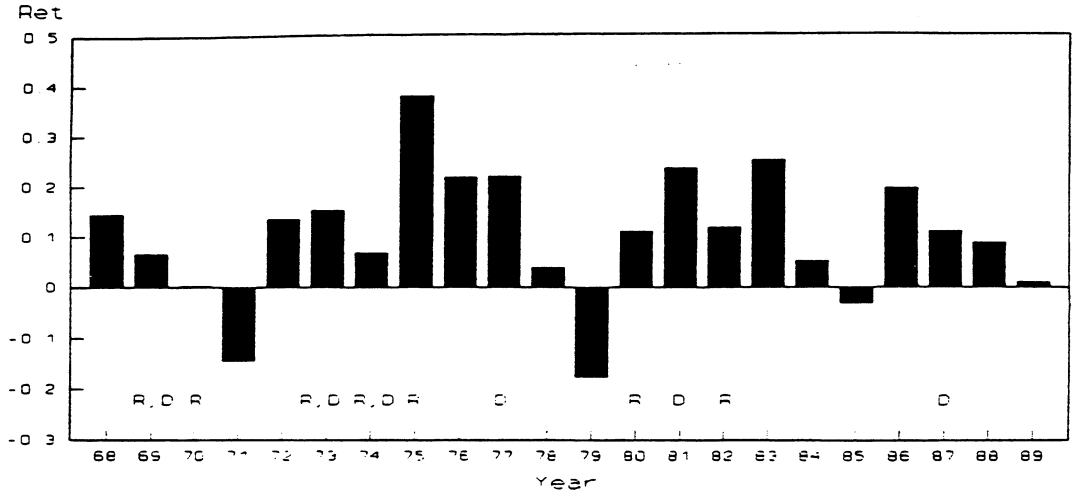

Figure 2. Year-by-year returns: Value minus glamour. At the end of each April between 1968 and 1989, 9 groups of stocks are formed. The stocks are independently sorted in ascending order into 3 groups ((1) bottom 30 percent, (2) middle 40 percent, and (3) top 30 percent) based on each of two variables: cash-flow-to-price (C/P) and growth-in-sales (GS). The value portfolio consists of those stocks in the highest C/P groups and the lowest GS group. The glamour portfolio consists of those stocks in the lowest C/P group and the highest GS group. The numbers presented are annual buy-and-hold returns for the value portfolio minus returns for the glamour portfolio. Annual buy-and-hold returns are calculated beginning at the end of April for the given year. R indicates NBER recession years, and D indicates years in which the CRSP equally weighted index declined in nominal terms.

- Also, betas and standard deviations are not higher for value stocks.

So then why does this persist if not due to risk?

Perhaps will be exploited, but until now did not know how.

Individuals may not be able to overcome behavioral biases. Good company often confused with good investment.

Institutions may also focus on glamour stocks because they are easy to justify to clients.

Both may have short horizons, whereas contrarian strategies may take a while to close.

What about data mining? (international evidence, pre-sample evidence)

Multifactor Explanations of Asset Pricing Anomalies – Fama and French (1996,JF)

- Three-factor model largely captures a host of anomalies, except for momentum.

$$E[\tilde{r}_i] = r_f + b_i[E(\tilde{R}_M) - r_f] + s_i E(SMB) + h_i(HML)$$
$$r_i - r_f = \alpha_i + b_i(R_M - r_f) + s_i SMB + h_i HML + \epsilon_i$$

- Many of the CAPM anomalies are related and face common variation.
- Consistent with ICAPM or APT.
- HML proxies for firm distress. Weak firms with low earnings have high h_i, HML captures common variation among these firms. Also, SMB captures variation among small stocks not picked up by the market.
- **rational**: Represents a distress factor in the economy. Value stocks are more prone to this source of risk than growth stocks.

  $\Rightarrow$ higher average returns.

  Value stocks are typically 'fallen angels'
- FF(93) show this model captures variation among size and BE/ME portfolios.

- Here, show it captures returns related to E/P, C/P, and sales growth (the LSV(94) portfolios), and DeBondt and Thaler contrarian portfolios on long-term returns. Losers have high s_i and h_i, whereas winners are strong stocks with low or negative s_i and h_i.
- Cannot explain momentum, however. Losers again have high s_i and h_i, and winners have low, but here, winner have high returns and losers have low returns!
- HML drives most of these results. Hence, interpretation focuses on HML.
- FF(96) claim it is a risk factor related to distress. Also address other interpretations of HML, such as selection bias, data snooping, and irrational investor behavior.

Results

- Pretty much captures 25 size and BE/ME portfolios. Alphas are close to zero, except for small, low BE/ME.
- GRS(89) test rejected, but R^2 over 93%, which means small alphas can lead to rejection. Economically, the alphas are quite small (about 9 basis points per month).
- Examine LSV(94) portfolios, but use only NYSE stocks.
- Three factor model explains these portfolios. Alphas are all zero and GRS(89) test fails to reject the null.

	Deciles											
	1	2	3	4	5	6	7	8	9	10	GRS	$p(GRS)$
BE/ME	**Low**									**High**		
a	0.08	−0.02	−0.09	−0.11	−0.08	−0.03	0.01	−0.04	0.03	−0.00		
$t(a)$	1.19	−0.26	−1.25	−1.39	−1.16	−0.40	0.15	−0.61	0.43	−0.02	0.57	0.841
R^2	0.95	0.95	0.94	0.93	0.94	0.94	0.94	0.94	0.95	0.89		
E/P	**Low**									**High**		
a	−0.00	−0.07	−0.07	−0.04	−0.03	0.02	0.06	0.09	0.12	0.00		
$t(a)$	−0.07	−1.07	−0.94	−0.52	−0.43	0.24	1.01	1.46	1.49	0.05	0.84	0.592
R^2	0.91	0.95	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92		
C/P	**Low**									**High**		
a	0.02	−0.08	−0.07	−0.00	−0.04	0.00	0.00	0.05	0.06	0.01		
b	1.04	1.06	1.08	1.06	1.05	1.04	0.99	1.00	0.98	1.14		
s	0.45	0.50	0.54	0.51	0.55	0.50	0.53	0.48	0.57	0.92		
h	−0.39	−0.18	0.07	0.11	0.23	0.31	0.36	0.50	0.67	0.79		
$t(a)$	0.22	−1.14	−1.00	−0.04	−0.51	0.00	0.06	0.72	0.92	0.14	0.49	0.898
$t(b)$	51.45	61.16	62.49	64.15	59.04	61.28	60.02	63.36	58.92	46.49		
$t(s)$	15.56	20.32	22.11	21.57	21.49	20.72	22.19	21.17	24.13	26.18		
$t(h)$	−12.03	−6.52	2.56	4.28	7.85	11.40	13.52	19.46	24.88	19.74		
R^2	0.93	0.95	0.95	0.95	0.94	0.94	0.94	0.94	0.94	0.92		
5-Yr SR	**High**									**Low**		
a	−0.21	−0.06	−0.03	−0.01	−0.04	−0.02	−0.04	0.00	0.04	0.07		
b	1.16	1.10	1.09	1.03	1.03	1.03	1.00	0.99	0.99	1.02		
s	0.72	0.56	0.52	0.49	0.52	0.51	0.50	0.57	0.67	0.95		
h	−0.09	0.09	0.21	0.20	0.24	0.33	0.33	0.36	0.47	0.50		
$t(a)$	−2.60	−0.97	−0.49	−0.20	−0.61	−0.25	−0.66	0.07	0.47	0.60	0.87	0.563
$t(b)$	59.01	70.59	67.65	65.34	56.68	68.89	62.49	54.12	50.08	34.54		
$t(s)$	25.69	25.11	22.59	21.65	20.15	23.64	21.89	21.65	23.65	22.34		
$t(h)$	−2.88	3.55	8.05	7.98	8.07	13.63	12.80	12.13	14.78	10.32		
R^2	0.95	0.96	0.95	0.95	0.93	0.95	0.94	0.93	0.92	0.87		

LSV Ports.

	1-1	1-2	1-3	2-1	2-2	2-3	3-1	3-2	3-3	GRS	p (GRS)
BE/ME & Sales Rank											
a	−0.00	0.00	−0.06	−0.19	−0.00	0.00	−0.19	−0.07	0.07		
b	1.10	1.03	1.00	1.12	1.00	0.99	1.17	1.06	1.01		
s	0.49	0.31	0.55	0.63	0.48	0.50	0.87	0.74	0.97		
h	−0.33	−0.14	−0.04	0.31	0.25	0.32	0.75	0.70	0.68		
$t(a)$	−0.10	0.12	−0.57	−2.59	−0.07	0.12	−1.64	−0.94	0.69	1.22	0.284
$t(b)$	71.67	67.85	35.65	61.81	67.36	51.00	41.29	54.45	38.46		
$t(s)$	22.30	14.32	13.77	24.42	22.44	18.18	21.36	26.62	25.76		
$t(h)$	−13.19	−5.74	−0.94	10.57	10.33	10.17	16.30	22.31	15.91		
R^2	0.96	0.95	0.86	0.94	0.95	0.92	0.89	0.93	0.89		
E/P & Sales Rank											
a	−0.06	−0.06	0.02	−0.09	0.03	0.06	−0.19	−0.06	0.06		
b	1.11	1.04	1.02	1.11	1.01	0.99	1.13	1.04	1.00		
s	0.48	0.45	0.74	0.58	0.43	0.48	0.82	0.65	0.92		
h	−0.34	−0.12	0.18	0.14	0.25	0.39	0.53	0.58	0.61		
$t(a)$	−0.89	−0.87	0.24	−1.23	0.53	0.81	−2.10	−0.82	0.59	1.06	0.394
$t(b)$	62.12	56.09	41.52	58.97	67.48	53.80	51.32	59.05	37.61		
$t(s)$	18.61	17.04	21.07	21.30	20.18	18.13	26.08	25.66	23.98		
$t(h)$	−11.56	−3.86	4.41	4.50	10.46	12.88	14.92	20.49	14.19		
R^2	0.95	0.94	0.90	0.94	0.95	0.92	0.93	0.94	0.89		
C/P & Sales Rank											
a	−0.02	−0.06	−0.02	−0.14	0.00	0.07	−0.17	−0.02	0.04		
b	1.11	1.01	1.02	1.12	1.02	1.00	1.13	1.04	1.00		
s	0.46	0.42	0.72	0.63	0.46	0.53	0.80	0.64	0.92		
h	−0.36	−0.12	0.14	0.17	0.26	0.34	0.62	0.62	0.68		
$t(a)$	−0.27	−1.03	−0.24	−1.93	0.08	0.95	−1.73	−0.34	0.34	1.04	0.405
$t(b)$	64.04	65.82	40.20	63.31	67.96	52.28	45.55	58.48	36.63		
$t(s)$	18.37	19.12	19.86	24.77	21.34	19.47	22.57	25.32	23.47		
$t(h)$	−12.71	−4.90	3.42	5.82	10.61	10.84	15.21	21.64	15.40		
R^2	0.95	0.95	0.89	0.95	0.95	0.92	0.91	0.94	0.88		

	1	2	3	4	5	6	7	8	9	10	GRS	p(GRS)
Portfolio formation months are t-12 to t-2												
a	−1.15	−0.39	−0.21	−0.22	−0.04	−0.05	0.12	0.21	0.33	0.59		
b	1.14	1.06	1.04	1.02	1.02	1.02	1.04	1.03	1.10	1.13		
s	1.35	0.77	0.66	0.59	0.53	0.48	0.47	0.45	0.51	0.68		
h	0.54	0.35	0.35	0.33	0.32	0.30	0.29	0.23	0.23	0.04		
$t(a)$	−5.34	−3.05	−2.05	−2.81	−0.54	−0.93	1.94	3.08	3.88	4.56	4.45	0.000
$t(b)$	21.31	33.36	42.03	51.48	61.03	73.62	68.96	62.67	51.75	35.25		
$t(s)$	17.64	16.96	18.59	20.87	22.06	23.96	21.53	19.03	16.89	14.84		
$t(h)$	6.21	6.72	8.74	10.18	11.86	13.16	11.88	8.50	6.68	0.70		
R^2	0.75	0.85	0.89	0.92	0.94	0.96	0.95	0.94	0.92	0.86		
Portfolio formation months are t-48 to t-2												
a	−0.73	−0.32	−0.09	−0.08	−0.05	−0.00	0.07	0.10	0.15	0.37		
b	1.16	1.12	1.06	1.05	1.02	1.01	1.00	0.99	1.04	1.11		
s	1.59	0.87	0.64	0.52	0.48	0.42	0.41	0.40	0.42	0.49		
h	0.90	0.60	0.44	0.44	0.36	0.31	0.18	0.11	−0.05	−0.26		
$t(a)$	−2.91	−2.79	−0.96	−0.99	−0.67	−0.01	1.08	1.46	2.09	3.60	2.02	0.031
$t(b)$	18.61	39.22	46.55	53.19	57.82	63.78	64.72	58.62	57.02	43.37		
$t(s)$	17.91	21.36	19.68	18.61	19.17	18.51	18.52	16.61	16.22	13.40		
$t(h)$	8.91	12.94	11.93	13.78	12.61	11.87	7.34	4.19	−1.55	−6.35		
R^2	0.73	0.88	0.91	0.92	0.93	0.94	0.95	0.93	0.94	0.90		
Portfolio formation months are t-60 to t-13												
a	−0.18	−0.16	−0.13	−0.07	0.00	0.02	0.06	0.10	−0.07	−0.12		
b	1.13	1.09	1.07	1.04	0.99	1.00	1.00	1.01	1.06	1.15		
s	1.50	0.83	0.67	0.59	0.47	0.38	0.35	0.40	0.45	0.50		
h	0.87	0.54	0.50	0.42	0.34	0.29	0.23	0.13	−0.00	−0.26		
$t(a)$	−0.80	−1.64	−1.69	−0.99	0.02	0.40	0.96	1.43	−0.92	−1.36	1.29	0.235
$t(b)$	20.24	44.40	55.03	61.09	63.79	65.68	62.58	58.26	60.49	53.04		
$t(s)$	18.77	23.63	24.09	24.06	21.21	17.44	15.43	16.18	18.06	16.33		
$t(h)$	9.59	13.67	15.94	15.31	13.46	11.82	8.98	4.46	−0.14	−7.50		
R^2	0.75	0.91	0.93	0.94	0.94	0.94	0.94	0.93	0.94	0.93		

- In fact, has hardest time with sales growth portfolios (which are not based on price), but still captures their returns.
  (TABLE III)
- Also explains double-sorted portfolios of LSV.
  (TABLE V)
- So, at the very least, there are not multiple anomalies, even if believe not related to risk, HML still captures these other effects.
- Also captures DeBondt and Thaler (1985) long-term reversal effect. But, cannot capture short-term momentum effect.
  (TABLE VII)

Interpretation

- Other combinations of the three factors describe returns equally well.
- This is consistent with multifactor mean variance efficiency.

  MMV = minimum variance for given expected return and given factor loadings.
- Under ICAPM, first factor is market, and other factors (in this case two) represent changing investment opportunities.

							R^2	$s(e)$
S	=	0.28 (1.99)	+1.17 M (36.95)	+ e			0.79	2.68
L	=	−0.10 (−1.15)	+1.20 M (62.84)	+ e			0.92	1.62
H	=	0.46 (4.08)	+0.99 M (38.73)	+ e			0.80	2.16
SMB	=	0.19 (1.32)	+0.21 M (6.54)	+ e			0.10	2.74
HML	=	0.56 (4.42)	−0.21 M (−7.53)	+ e			0.13	2.41
S	=	0.00 (0.17)	−0.83 M (−29.12)	+1.00 L (46.81)	+0.81 H (50.12)	+ e	0.99	0.65
L	=	−0.03 (−0.90)	+0.86 M (51.83)	+0.86 S (46.81)	−0.67 H (−29.30)	+ e	0.99	0.60
H	=	0.06 (1.36)	+0.98 M (31.38)	+1.09 S (50.12)	−1.05 L (−29.30)	+ e	0.98	0.75
M	=	0.00 (0.08)	−0.85 S (−29.12)	+1.03 L (51.83)	+0.75 H (31.38)	+ e	0.98	0.66

Dependent Ports.	Explanatory Ports.			GRS	p(GRS)	Ave $\lvert a \rvert$	Ave a^2	Ave R^2
25 Size-BE/ME	M			2.76	0.000	0.286	0.1140	0.77
25 Size-BE/ME	M	SMB	HML	1.97	0.004	0.093	0.0164	0.93
25 Size-BE/ME	M	S	H	2.06	0.002	0.097	0.0170	0.93
25 Size-BE/ME	M	S	L	2.16	0.001	0.102	0.0183	0.92
25 Size-BE/ME	M	L	H	1.87	0.008	0.094	0.0159	0.92
25 Size-BE/ME	S	L	H	2.06	0.002	0.094	0.0162	0.92
E/P	M			2.85	0.002	0.260	0.1059	0.83
E/P	M	SMB	HML	0.84	0.592	0.051	0.0039	0.93
E/P	M	S	H	0.95	0.488	0.059	0.0051	0.94
E/P	M	S	L	1.02	0.427	0.064	0.0057	0.94
E/P	M	L	H	0.86	0.575	0.052	0.0041	0.93
E/P	S	L	H	0.86	0.571	0.051	0.0040	0.93
Sales Rank	M			2.51	0.006	0.256	0.0821	0.82
Sales Rank	M	SMB	HML	0.87	0.563	0.053	0.0058	0.93
Sales Rank	M	S	H	1.01	0.437	0.055	0.0068	0.94
Sales Rank	M	S	L	0.96	0.474	0.052	0.0059	0.94
Sales Rank	M	L	H	0.92	0.514	0.052	0.0057	0.93
Sales Rank	S	L	H	0.93	0.509	0.052	0.0057	0.93
C/P & Sales Rank	M			2.93	0.002	0.268	0.1007	0.80
C/P & Sales Rank	M	SMB	HML	1.04	0.405	0.062	0.0068	0.93
C/P & Sales Rank	M	S	H	1.13	0.338	0.067	0.0068	0.93
C/P & Sales Rank	M	S	L	1.14	0.333	0.063	0.0064	0.93
C/P & Sales Rank	M	L	H	1.03	0.416	0.061	0.0064	0.92
C/P & Sales Rank	S	L	H	1.05	0.396	0.061	0.0065	0.93
60-13	M			2.51	0.006	0.268	0.0899	0.80
60-13	M	SMB	HML	1.29	0.235	0.092	0.0114	0.92
60-13	M	S	H	1.38	0.186	0.094	0.0112	0.92
60-13	M	S	L	1.19	0.299	0.077	0.0074	0.92
60-13	M	L	H	1.29	0.234	0.089	0.0102	0.91
60-13	S	L	H	1.30	0.230	0.090	0.0107	0.91
12-2	M			5.13	0.000	0.337	0.1647	0.79
12-2	M	SMB	HML	4.46	0.000	0.331	0.2097	0.90
12-2	M	S	H	4.45	0.000	0.322	0.2027	0.90
12-2	M	S	L	4.58	0.000	0.329	0.2040	0.90
12-2	M	L	H	4.51	0.000	0.326	0.2047	0.90
12-2	S	L	H	4.46	0.000	0.328	0.2069	0.90

- Under APT, these capture common variation among returns.
- Just like mean-variance mathematics, any three MMV portfolios can be used to generate any other MMV portfolio.
- While it is unlikely S, B, H, L are truly MMV, given the job SMB and HML do on average returns and variation in returns, it is likely that they are pretty close to MMV.
- First, they show that one needs other factors to explain returns (i.e., need at least three).
  (TABLE VIII)
- Then, show that any combination of the three will work.
  (TABLE IX)
- So, why SMB and HML? (these are the least correlated with each other, making coefficients easier to interpret).
- Is it risk?
  - Captures sizeable common covariation in returns.
  - Common factors in fundamentals like earnings and sales.

- Captures a host of anomalies, including more refined sorts of LSV(94).
- **But, still need to identify the state variables associated with these factors**. This is the missing piece of the puzzle to call these things risk.
- FF call HML a proxy for distress. Distressed firms are highly correlated with it, and it predicts when certain industries become distressed or not. This may be linked to investors' human capital.
- However, even if found a relevant state variable, must still argue why it carries a special premium. It could be captured by a better proxy for the market, or may not provide a hedge to investors.

• What about LSV's(94) irrational story?

- FF argue the Sharpe ratio on HML is not that high. HML still has significant volatility. Also, H has underperformed L as many times as S has underperformed B and R_M has underperformed r_f.
- High premium for distress persists for at least 5 years, but mean reversion of earnings growth is much sooner. This seems inconsistent with the LSV(94) story.

  - Also, they claim distress is not a macro-variable and hence its correlation with GNP or the market is expected to be low.

- What about data mining or spurious anomalies?
  - Survivor bias? – No, they value-weight and focus only on NYSE stocks.
  - Data snooping? – Probably not, because of evidence in Davis (1994) for pre-1962 period, and host of international evidence (out of sample tests).

    Also, all the other anomalies (save momentum) were captured by the model, hence there are not that many anomalies.

- Poor market proxy?
- What about momentum?
  - Not data mining – Jegadeesh and Titman (2000), Rouwenhorst (1999).
  - Also a challenge to behavioral finance (they are trying to meet this Barberis, Shleifer, and Vishny (1999), Daniel, Hirshleifer, and Subrahmanyam (1998), Hong and Stein (1999)).
  - Could it be another factor?

Finally, since 1990, growth has beaten value. Does this support FF(96) or LSV(94)? Or, something else?

Evidence on the Characteristics of Cross-Sectional Variation in Returns – Daniel and Titman (1997,JF)

- Can we distinguish between rational and behavioral explanations for size and BE/ME?
- Addresses the more fundamental question of whether return patterns of characteristic-sorted portfolios can really be explained by a factor model at all.
- Are there pervasive factors associated with size and BE/ME? And, are there risk premia associated with them?
- They answer no on both counts.
- Even though high BE/ME stocks covary with one another, it is because they have similar characteristics, not because they covary with a distress factor. They may be from same industry, same region, etc.
- As proof of this, they find that high BE/ME firms were equally highly correlated *before* they became distressed.
- They then assess whether covariances or characteristics describe returns. They show that firms with different risk loadings but same characteristics do not have different average returns.

Return Generating Processes: The Hypotheses

Risk-Based Models:

1. Constant risk premia and a distress factor:

$$\begin{aligned} r_{i,t} &= E[r_{i,t}] + \sum_{k=1}^{K} \beta_{i,k} F_{k,t} + \theta_{i,t-1} F_{D,t} + \epsilon_{i,t} \\ E[r_{i,t}] &= r_{f,t} + \sum_{k=1}^{K} \beta_{i,k} \lambda_k + \theta_{i,t-1} \lambda_D \end{aligned}$$

   BE/ME proxies for $\theta_{i,t-1}$.

2. Time-varying risk premia and no distress factor:

$$\begin{aligned} r_{i,t} &= E[r_{i,t}] + \sum_{k=1}^{K} \beta_{i,k} F_{k,t} + \epsilon_{i,t} \\ E[r_{i,t}] &= r_{f,t} + \sum_{k=1}^{K} \beta_{i,k} \lambda_{k,t-1} \end{aligned}$$

   Although no distress factor exists, it appears as if one does because distressed firms are more likely to have had high loadings on the factors that have had negative realizations.

   In this way, BE/ME successfully times the factors.

3. Non-risk model: Characteristic-based.

$$E[r_{i,t}] \;=\; a + b_1\theta_{i,t-1}$$

No relation at all to the covariance structure of asset returns. Presents an asymptotic arbitrage opportunity.

Results

- Examine how risk characteristics (covariances) of stocks change before and after they become high or low BE/ME.
- Look at pre- and post-formation standard deviations of portfolios. Not much of a difference.
  (TABLE II)

  This seems inconsistent with a distress factor, since variance should change pre- vs. post-distress. This indicates these firms *always* have common variation (likely due to another source). Does BE/ME change enough to justify this test?
- This seems inconsistent with model 1.
- How about model 2 vs. 3?
  - Look for variation in factor loading without variation in BE/ME characteristic.
  - First sort portfolios on characteristics, then sort within them on HML loading.

- They use preformation loadings (estimated from -42 to -7) and portfolios to mitigate the errors-in-variables problem. What about the regression phenomenon?
  (Pre-formation successfully ranks post-formation factor loadings)
- All NYSE, AMEX, and NASDAQ firms from 1973-1993.
- No discernable relation between HML loading and returns, once control for factors. What little relation there is comes from some correlation with BE/ME characteristic.
  (TABLE III)
- Do same for market loadings and SMB loadings.

- Does this necessarily imply size and BE/ME are irrational anomalies?
  - No, could proxy for some true unknown factor, better captured by the characteristic.
  - Measurement of betas are prone to estimation error, which increases *noise* in the relation between the betas and average returns. Whereas characteristics are measured without error.
  - What if factor loadings are time-varying? Will past factor loadings predict future ones?

Char Port		Factor Loading Portfolio				
BM	SZ	1	2	3	4	5
1	1	0.202	0.833	0.902	0.731	0.504
1	2	0.711	0.607	0.776	0.872	0.710
1	3	0.148	0.287	0.396	0.400	0.830
2	1	1.036	0.964	1.014	1.162	0.862
2	2	0.847	0.957	0.997	0.873	0.724
2	3	0.645	0.497	0.615	0.572	0.718
3	1	1.211	1.112	1.174	1.265	0.994
3	2	1.122	1.166	1.168	1.080	0.955
3	3	0.736	0.933	0.571	0.843	0.961
Average		0.740	0.817	0.846	0.866	0.806

- Davis, Fama, and French (2000): find that DT(97) results disappear when look over the longer period 1927-1997.
- Berk (2001): "Sorting Out Sorts." Claims that sorting first on characteristics then factor loadings is misleading and biases the test to fail to reject the null. Should do independent sorts.

What if DT(97) are correct? What are the implications for performance evaluation, cost of capital, event studies?