An overview of my research on asset pricing and asset pricing anomalies

Maria Vassalou
Columbia University

Focus of my research:

- Understanding what economic risk factors affect equity returns
- Provide risk-based explanations for some longstanding asset pricing anomalies.

Why should we be interested in these issues?

- Collapse of the CAPM in 1992-93.
- Emergence of behavioral finance as an alternative way for explaining asset returns.

Underlying questions in my research:

- Are asset returns determined in a rational way?

- Do excess returns earned by various trading strategies represent "free lunches", or compensations for some economic risk factor we haven't accounted for so far?

Important:

- This is an ongoing research project.
- This document reports results obtained so far.
- Many more asset pricing questions remain unanswered and can be the subject of future research.

The collapse of CAPM

- Fama and French (1992, 1993) show that the CAPM cannot explain the cross-section of asset returns.
- They propose an alternative model that includes the market factor, a factor related to size, and a factor related to book-to-market.

The Fama-French model

$$R(t) - RF(t) = a + b[RM(t) - RF(t)] + sSMB(t) + hHML(t) + e(t)$$

R(t): Return on a stock at time t

RF(t): Return on the risk-free asset at time t

SMB(t): Return on the size factor at time t

HML(t): Return on the book-to-market factor at time t

e(t): error term of the regression

Note:

- Unlike CAPM, the Fama-French model is not an equilibrium model.
- There is no theory telling us what gives rise to the SMB and HML factors.
- The Fama-French model is purely empirically motivated.

Furthermore:

- Both size and book-to-market are well-known anomalies within the CAPM literature.

What are the SMB and HML factors?

- The SMB is a zero-investment portfolio which is long on small ME stocks and short on big ME stocks.
- HML is a zero-investment portfolio that is long on high B/M stocks and short on low B/M stocks.
- Although SMB and HML are zero-investment portfolios, they earn positive returns.

How to construct HML and SMB:

- Sort stocks into three B/M portfolios (30% - H, 40% - M, 30% - L)
- Sort stocks into two size portfolios (S, B)
- Create 6 portfolios from the intersections:
  - SH, SM, SL, BH, BM, BL
- HML =(1/2*SH+1/2*BH)-(1/2*SL+1/2*BL)
- SMB =(1/3*SH+1/3*SM+1/3*SL)-(1/3*BH+1/3*BM+1/3*BL)

International performance of SMB

Country	Quarterly rebalancing			Semi-annual rebalancing			Annual rebalancing		
	Mean (%)	Std (%)	T-value	Mean (%)	Std (%)	T-value	Mean (%)	Std (%)	T-value
Australia	6.21	15.88	1.38	2.79	16.06	0.61	5.88	19.15	1.06
Canada	4.85	10.71	2.01	6.02	10.79	2.46	5.16	10.15	2.21
France	5.22	11.70	1.66	5.46	11.42	1.79	5.40	10.49	1.92
Germany	2.07	9.69	0.68	0.82	9.63	0.27	0.46	9.94	0.14
Italy	2.19	10.50	0.67	2.92	10.32	0.89	0.59	10.29	0.18
Japan	6.78	15.27	1.81	6.92	15.37	1.82	6.57	14.05	1.87
Netherland	2.00	12.98	0.67	1.82	12.73	0.62	2.40	11.92	0.88
Switzerland	-4.13	10.81	-1.26	-3.39	11.01	-1.02	-1.20	10.88	-0.37
U.K.	3.37	11.15	1.33	3.02	11.09	1.20	3.17	11.00	1.25
USA	10.73	13.65	3.48	11.46	13.93	3.62	6.45	10.57	2.65

Source: Liew & Vassalou (2000)-Journal of Financial Economics

International evidence on HML

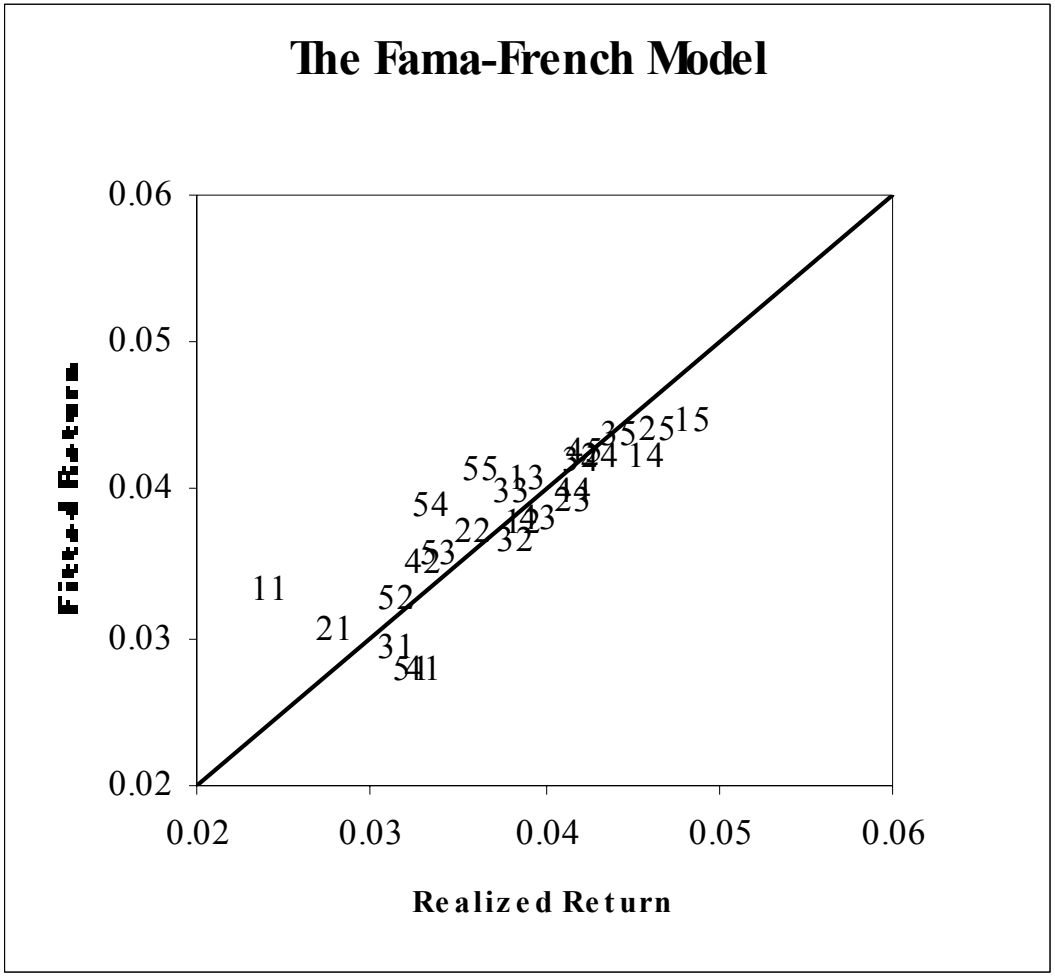
Country	Quarterly rebalancing			Semi-annual rebalancing			Annual rebalancing		
	Mean (%)	Std (%)	T-value	Mean (%)	Std (%)	T-value	Mean (%)	Std (%)	T-value
Australia	9.30	14.53	2.26	9.14	14.06	2.29	5.93	13.74	1.48
Canada	7.44	11.06	2.98	8.56	10.69	3.53	8.16	10.46	3.41
France	12.51	9.09	5.13	12.05	9.26	4.85	10.32	9.90	3.90
Germany	5.55	6.42	2.75	3.14	5.96	1.66	4.56	5.98	2.40
Italy	7.29	9.77	2.38	7.47	9.24	2.55	7.43	9.18	2.54
Japan	8.75	10.12	3.53	6.85	9.77	2.84	7.71	9.32	3.29
Netherland	0.75	11.50	0.28	0.96	11.60	0.36	0.68	11.17	0.26
Switzerland	8.66	10.34	2.77	7.62	10.57	2.38	8.48	9.87	2.83
U.K.	8.33	6.09	6.06	7.45	5.90	5.56	6.91	5.84	5.14
USA	7.99	12.24	2.89	7.98	12.12	2.90	6.74	8.64	3.39

Source: Liew & Vassalou (2000)-Journal of Financial Economics

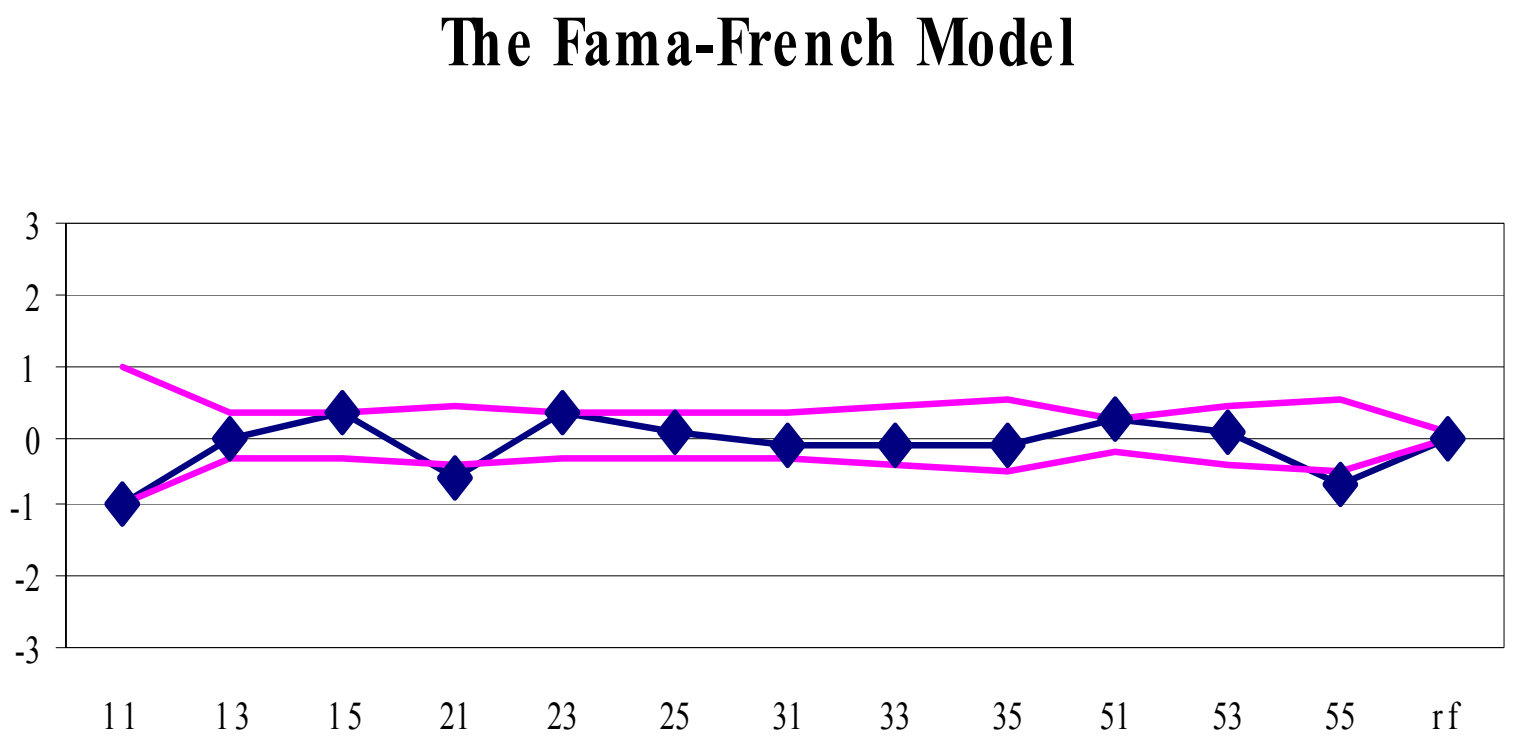
Fama-French model: Cross-sectional regression

	Constant	RM-RF	SMB	HML	Adj R^2
Premium	0.031	-0.012	0.003	0.012	0.65
(t-value)	(2.265)	(-0.753)	(0.566)	(2.034)	

Predicted vs realized returns



Pricing errors



Why can HML and SMB explain the cross-section?

- Large empirical literature on the topic explores
  - Data-snooping explanations
  - Performance in other periods or markets
  - Behavioral explanations
  - Risk-based explanations

HML and SMB as risk factors

- Fama and French (1992, 1993, 1995, 1996, 1998) argue that HML and SMB are state variables that describe changes in the investment opportunity set.

HML and SMB as risk factors contd

- If HML and SMB are state variables, they should be related to fundamental risk in the economy. In other words, they should be related to economic growth.

- Liew and Vassalou (2000) show that HML and SMB are related to future GDP growth.

Predicting annual GDP growth conditional on info about the market and HML

	Market		HML		Adj R^2
Country	Slope	T-value	Slope	T-value	
Australia	0.029	1.63	0.010	0.55	2.4
Canada	0.050	2.41	0.003	0.08	10.2
France	-0.007	-0.48	0.068	2.69	19.6
Germany	0.036	0.81	0.166	2.13	6.2
Italy	0.023	2.32	0.046	2.49	39.2
Japan	0.030	2.25	0.041	1.30	14.0
Netherlands	0.046	2.73	0.048	2.01	14.5
Switzerland	-0.030	-1.46	0.142	6.00	59.1
UK	0.071	3.34	0.073	2.32	22.6
USA	0.080	3.73	0.083	3.05	25.5

Predicting annual GDP growth conditional on info about the market and SMB

	MKT		SMB		Adj R^2
Country	Slope	T-value	Slope	T-value	
Australia	0.002	0.18	0.049	3.89	35.5
Canada	0.055	3.09	0.086	3.42	24.7
France	0.004	0.24	0.089	3.99	29.4
Germany	0.122	2.53	0.205	2.96	42.9
Italy	0.029	2.54	0.048	3.16	40.3
Japan	0.028	1.83	0.031	1.38	14.9
Netherlands	0.044	2.78	0.054	2.69	12.7
Switzerland	0.023	0.96	0.090	5.89	38.7
UK	0.054	2.69	0.076	4.37	32.9
USA	0.047	2.50	0.041	1.49	16.8

Predicting future GDP growth using info on the market and HML or SMB

- Even in the presence of the market factor, the coefficients of HML and SMB are positive.
- The market can still predict future GDP growth.
- HML and SMB contain info about the future state of the economy, over and above the info contained in the market factor.

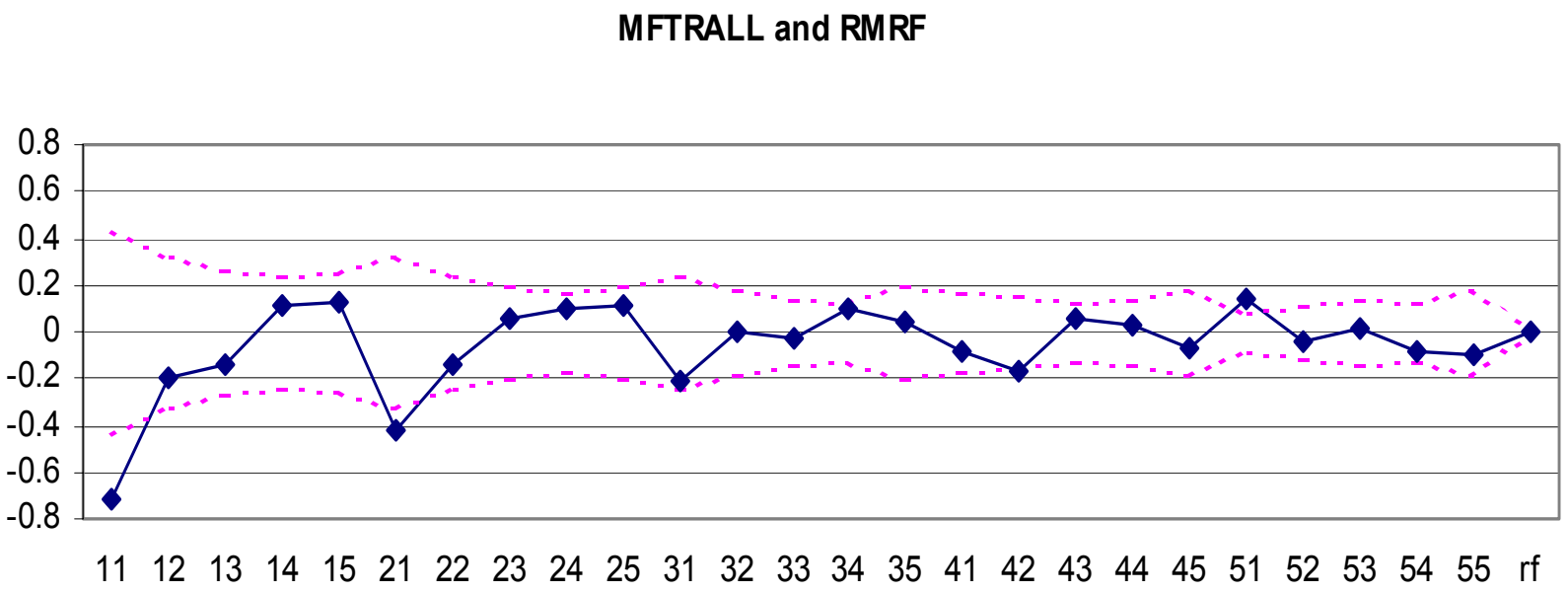
Implication

- The hypothesis that HML and SMB act as state variables that describe the future state of the economy cannot be rejected.
- A risk-based explanation for the returns of HML and SMB is plausible and likely.
- Can we replicate the performance of the FF model by using info about future GDP growth?

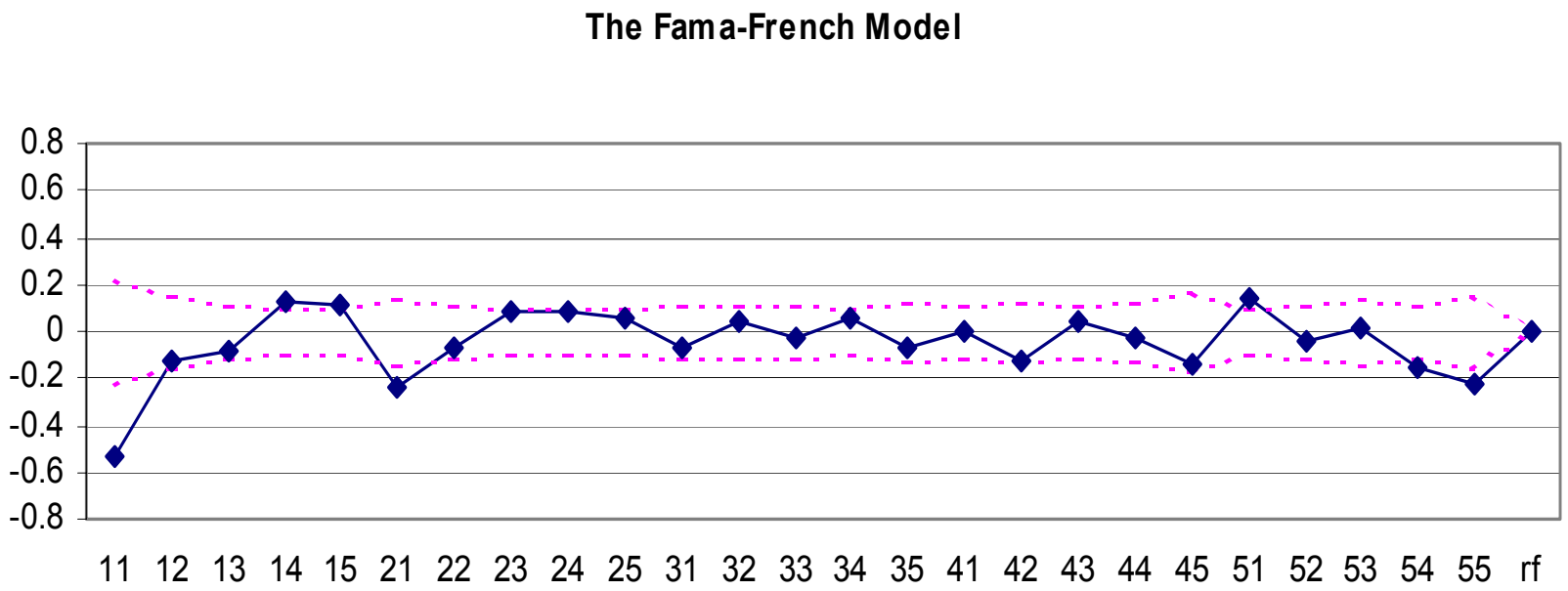
Yes, we can!

- Vassalou (2003, JFE) shows that a model that includes news related to future GDP growth along with the market factor, can price equities about as well as the FF model.
- When news related to future GDP growth is present in the model, HML and SMB lose their ability to explain the cross-section of equity returns.

Pricing errors from Vassalou's model



Pricing errors from the FF model



Estimation of mimicking portfolio and asset pricing models in one-step: quarterly data, unscaled returns

Panel A: Coefficients on the base assets

	Coefficient	t-value
S MV, L B/M	-0.005	-0.11
S MV, M B/M	0.008	0.07
S MV, H B/M	0.014	0.15
B MV, L B/M	-0.048	-1.16
B MV, M B/M	0.054	0.79
B MV, H B/M	0.034	0.51
DEF	0.142	1.74
TERM	0.013	0.52

p-value of joint significance test on the coefficients of base assets: 0.0126

Panel C: The RMRF and QFTRALL factor model

	Constant	QFTRALL	RMRF
Coefficient	1.075	-76.096	1.308
(t-value)	(12.45)	(-1.50)	(0.53)
[t-value]	[21.51]	[-3.29]	[0.88]
Premium		0.002	0.016
(t-value)		(1.97)	(1.63)
[t-value]		[4.04]	[2.48]
	Over-identification test	P-Wald(b)	Wald(SMB&HML)
	19.460		4.828
(p-value)	(0.0348)	(0.0000)	(0.0895)

Implication

- The higher returns earned by small-cap and high B/M stocks are compensations for bearing risk related to the state of the economy.

Going a step further:

- GDP is an aggregate variable.
- Which component of GDP growth is most important for asset returns?
- We can decompose GDP into consumption and investment.
- Focus on investment side, since consumption is smoothed over time, which reduces its ability to explain returns.

Investment-based CAPM

- Cochrane's (1996) specification: The expected excess return of a risky asset is a linear function of its covariance with the residential and nonresidential investment growth rates.

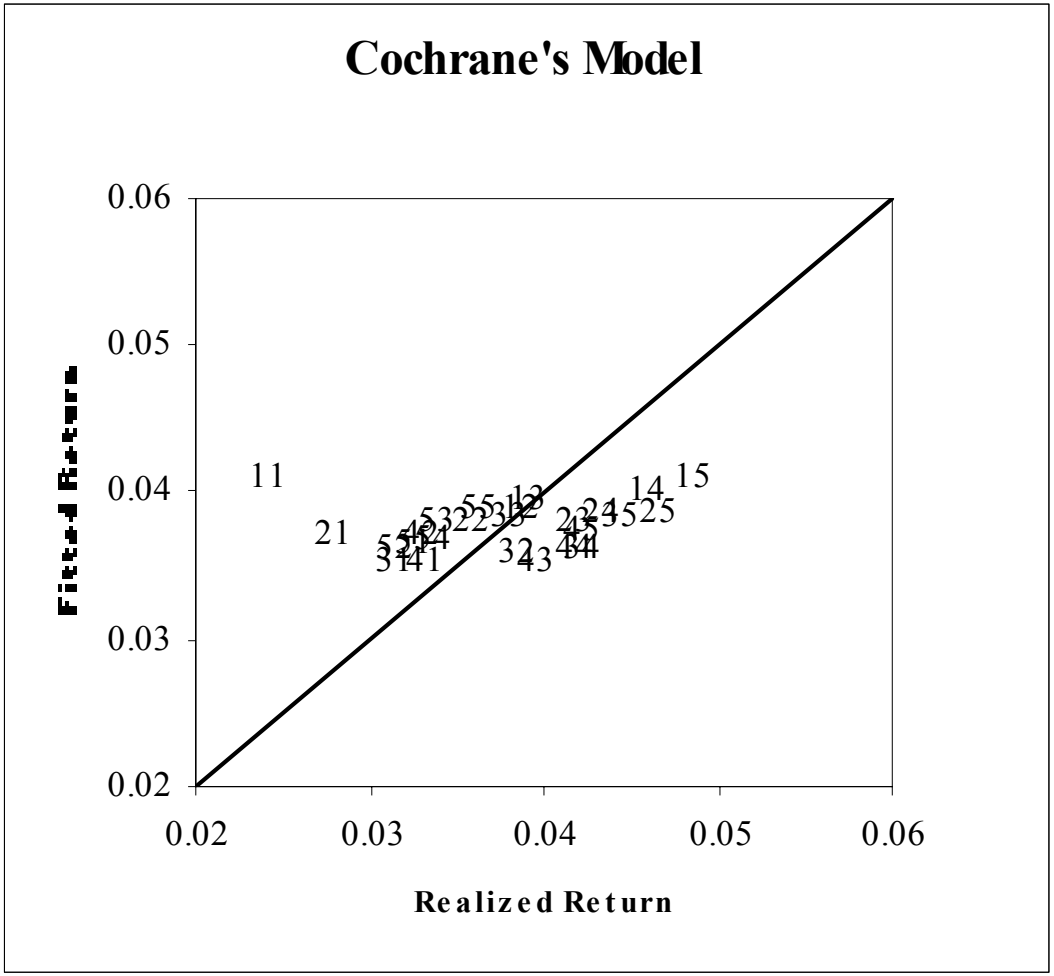
Investment-based CAPM

- Li, Vassalou, and Xing's (2001) specification: The expected excess return of a risky asset is a linear function of its covariances with five sector investment growth rates.

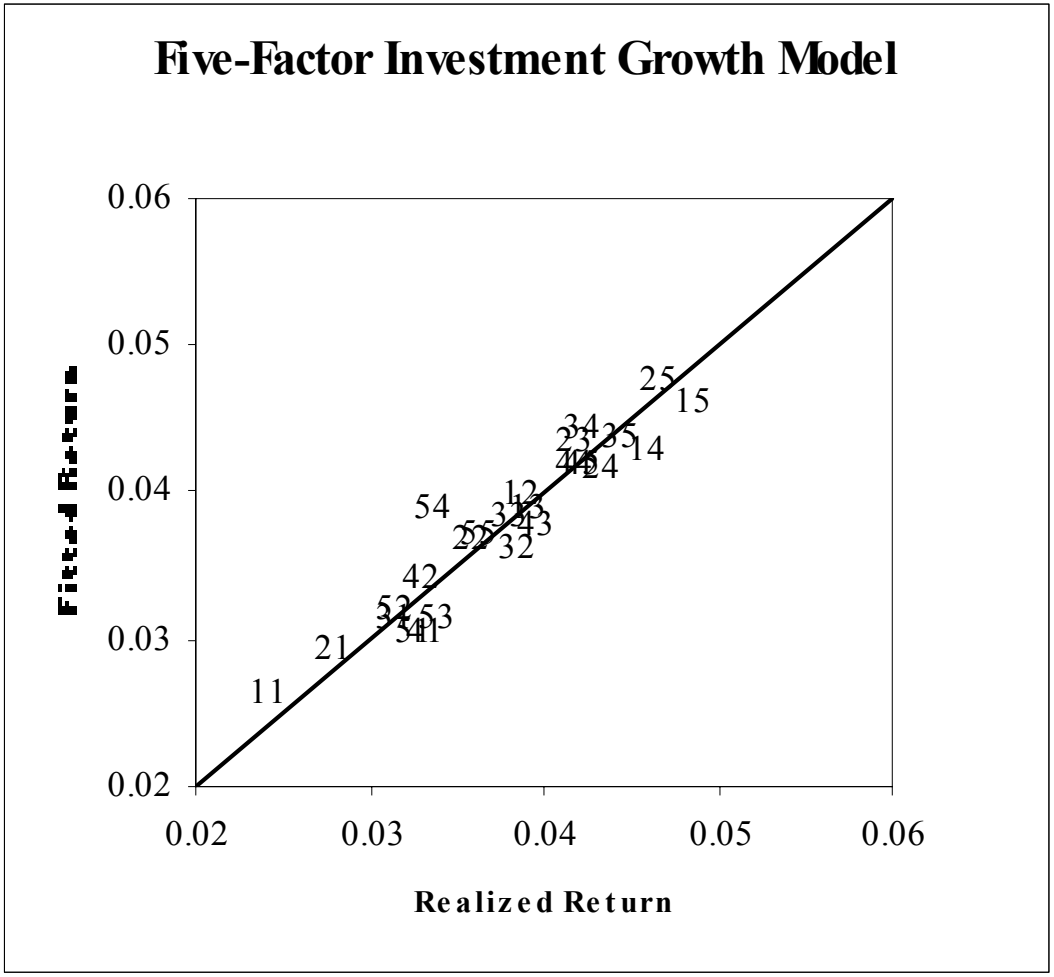
Empirical results on investment CAPM

Constant	NONRES	RESID				Adj R^2
0.026	0.012	0.018				-0.00
(2.706)	(0.889)	(1.178)				
Constant	HHOLDS	NFINCO	NONCOR	FARM	FINAN	Adj R^2
0.023	-0.009	-0.100	-0.117	-3.979	0.021	0.87
(1.715)	(-0.388)	(-1.999)	(-2.396)	(-0.906)	(0.390)	

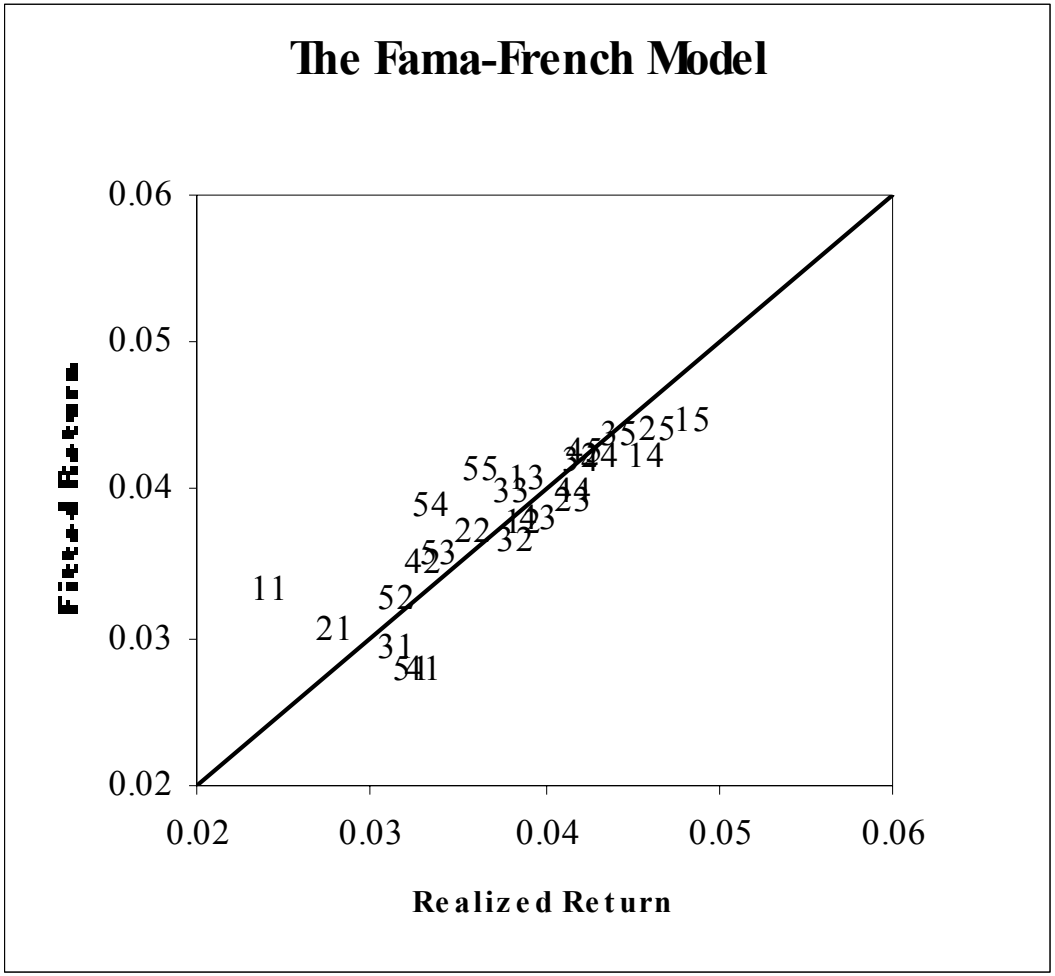
Predicted vs realized returns



Predicted vs realized returns



Predicted vs realized returns



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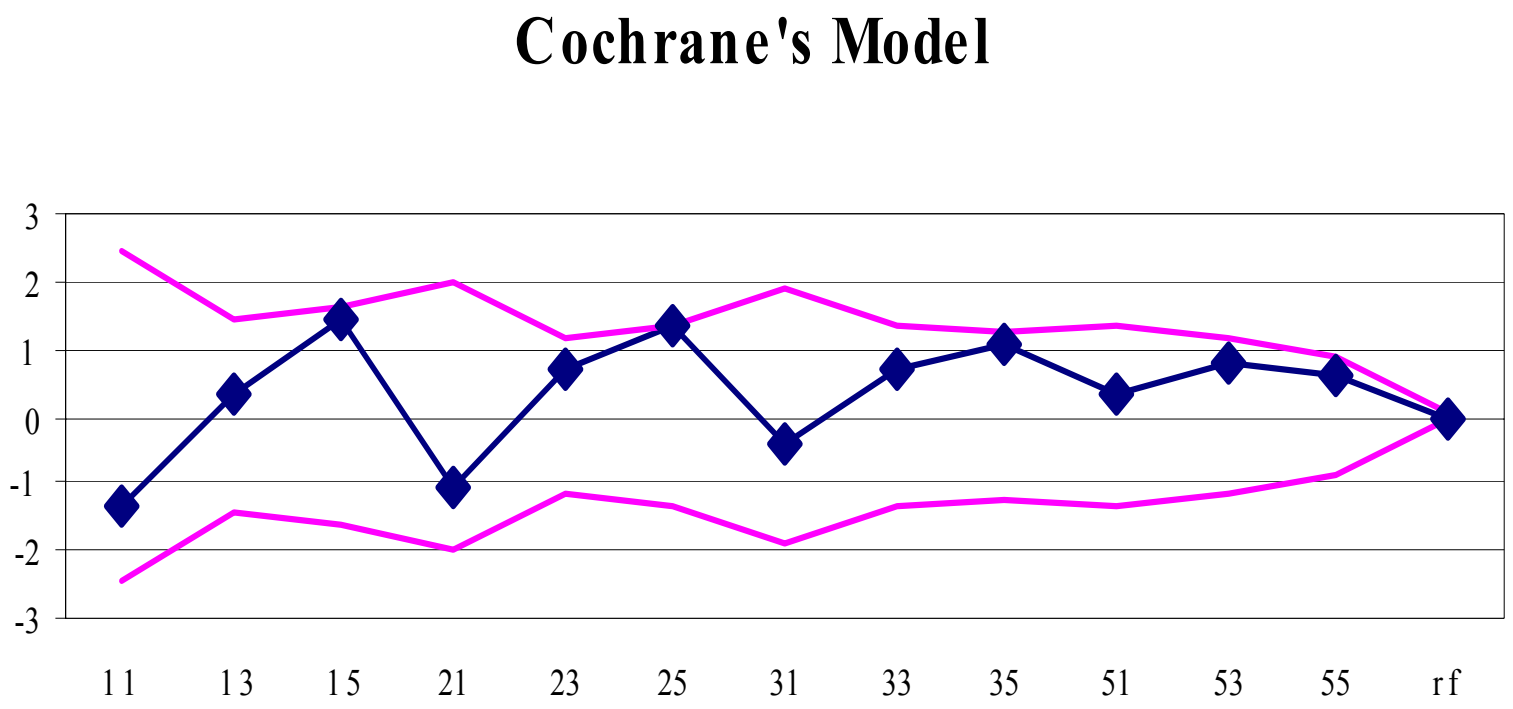

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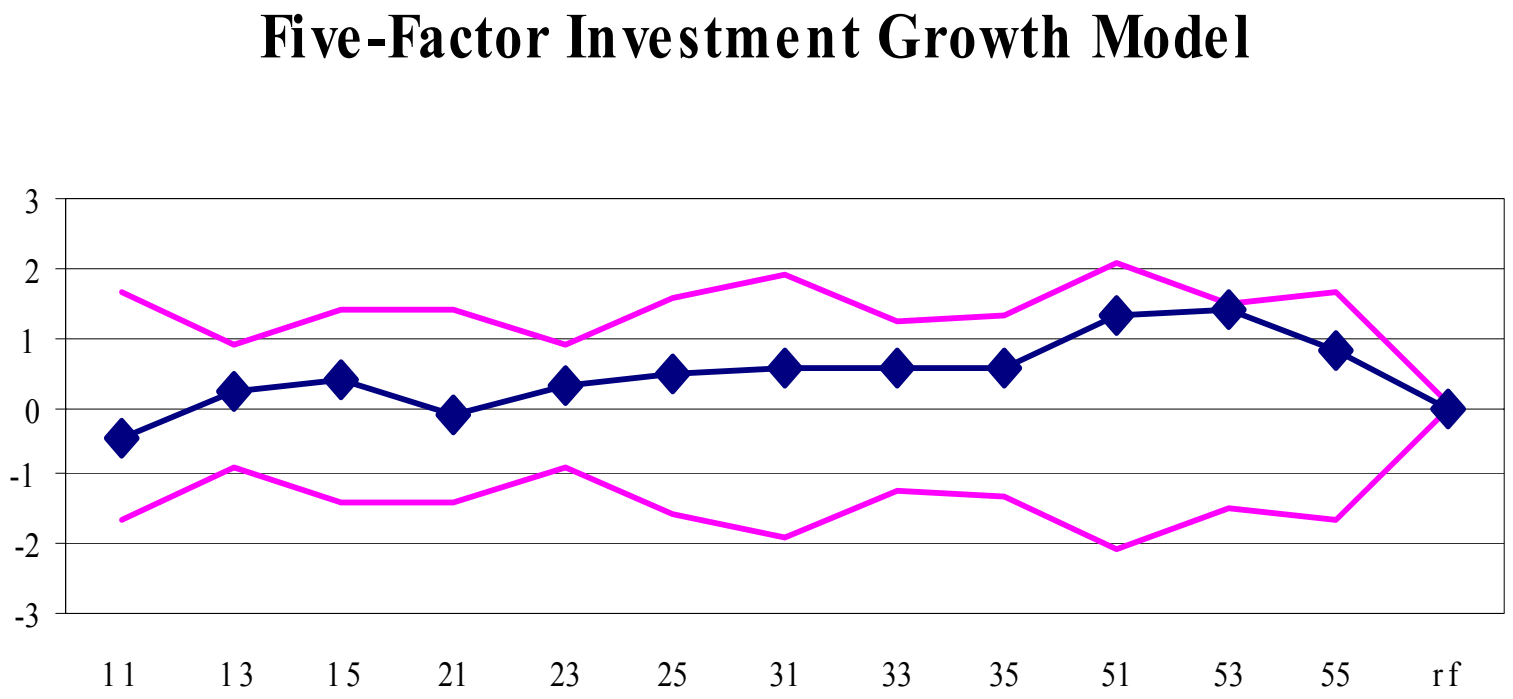

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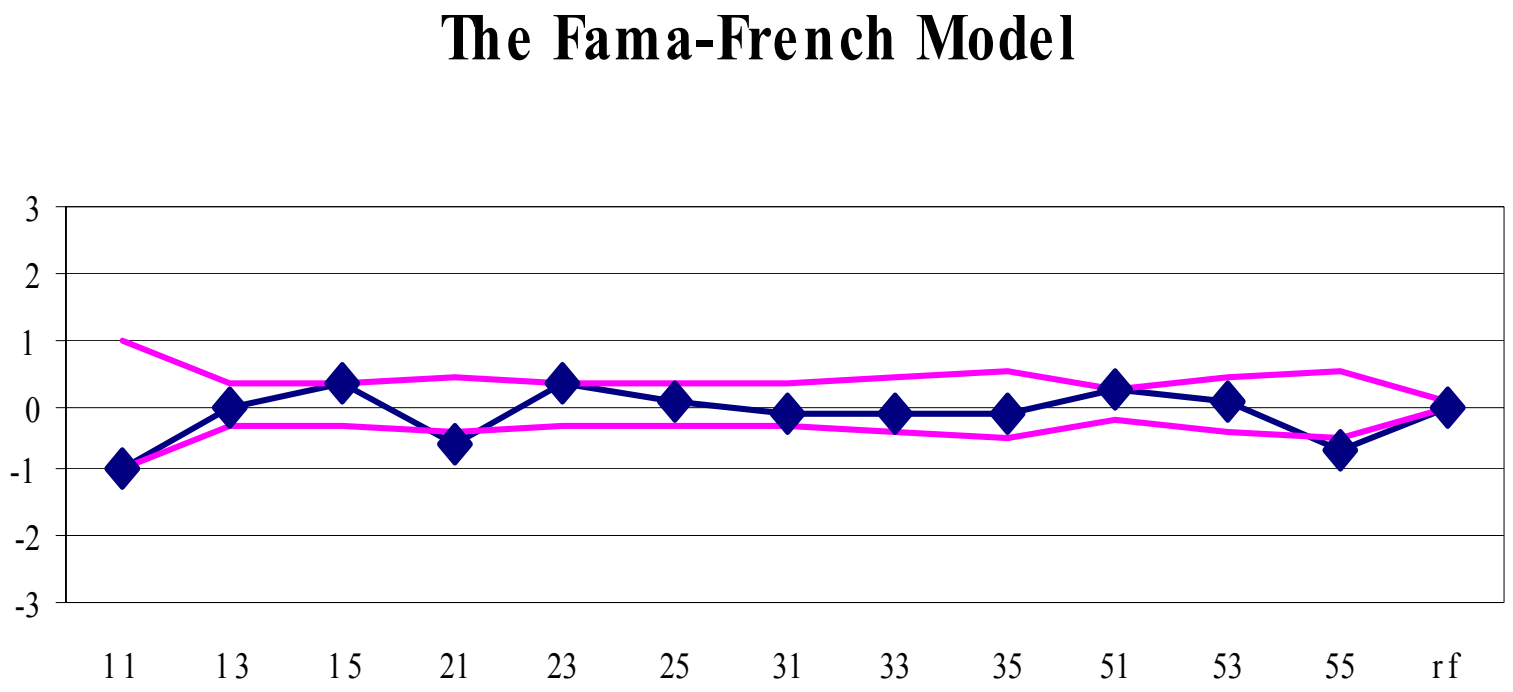


Specification tests

Constant	HHOLDS	NFINCO	NONCOR	FARM	FINAN	SIZE	Adj R^2
0.045	-0.021	-0.068	-0.111	-4.436	0.006	-0.002	0.88
(1.394)	(-0.771)	(-1.092)	(-2.449)	(-1.182)	(0.122)	(0.705)	
Constant	NONRES	RESID				SIZE	Adj R^2
0.071	0.024	-0.017				-0.004	0.13
(3.605)	(1.827)	(-0.959)				(-2.202)	
Constant	HHOLDS	NFINCO	NONCOR	FARM	FINAN	B/M	Adj R^2
0.022	-0.010	-0.100	-0.113	-3.494	0.024	0.001	0.87
(1.710)	(-0.452)	(-2.049)	(-2.230)	(-0.827)	(0.481)	(0.189)	
Constant	NONRES	RESID				B/M	Adj R^2
0.009	-0.011	-0.005				0.008	0.547
(1.165)	(-1.159)	(-0.297)				(2.877)	

Therefore:

- Models that include forward-looking information about GDP growth or components of it, such as investments, can explain the cross-section of equity returns well.

Implications for trading strategies

- Predict the returns of size and BM deciles one month ahead, using business cycle variables, such as TERM, DEF, TBill, and Dividend yield.
- Go long on the highest expected return deciles, and short on the lowest expected return deciles.

Out-of-Sample Performance of Simple Size-Decile Zero-Investment Strategies

Panel A: Out-of-Sample Performance of Size Decile Strategies: Top 1 – Bottom 1

Active	Mean Return	t-statistic (mean vs 0)	t-statistic (active mean vs benchmark mean)	Standard Deviation	Terminal Wealth
$Long_{size}$	1.90	7.12	1.82	5.52	1654.33
$Short_{size}$	0.34	1.44	-2.16	4.94	0.14
$Combined_{size}$	1.56	8.27	4.79	3.89	540.60
Benchmark					
S = S1	1.17	3.92		6.17	64.45
B = S10	1.02	1.53		4.16	0.009
S - B	0.15	0.69		4.64	1.23

Panel B: Out-of-Sample Performance of Size Decile Strategies: Top 3 – Bottom 3

Active	Mean Return	t-statistic (mean vs 0)	t-statistic (active mean vs benchmark mean)	Standard Deviation	Terminal Wealth
$Long_{size}$	1.62	6.23	1.16	5.37	518.46
$Short_{size}$	0.64	2.63	-1.31	5.02	0.04
$Combined_{size}$	0.98	7.94	4.43	2.55	56.10
Benchmark					
S = (S1+S2+S3)/3	1.17	4.07		5.96	67.14
B = (S8+S9+S10)/3	1.06	4.95		4.45	0.007
S – B	0.10	0.67		3.18	1.26

Out-of-Sample Performance of Simple Book-to-Market (B/M) Decile Zero-Investment Strategies

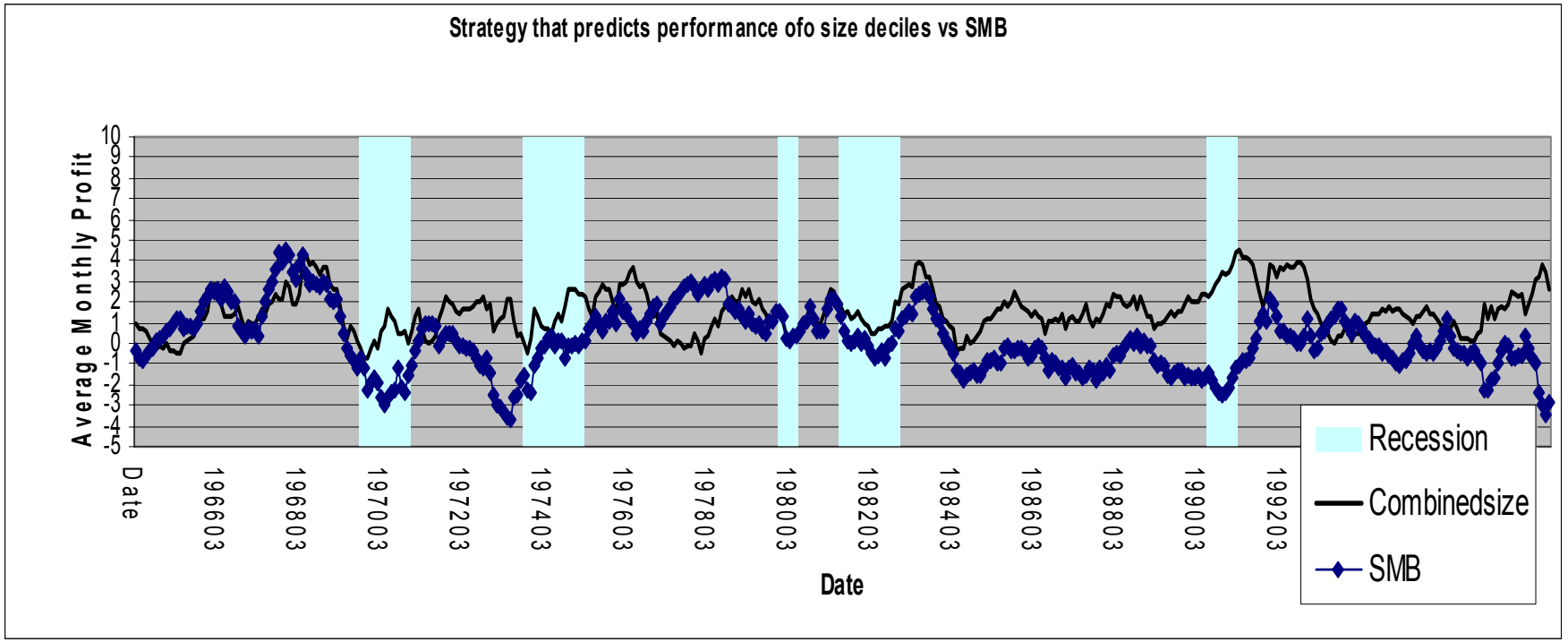
Panel A: Out-of-Sample Performance of B/M Decile Strategies: Top 1 – Bottom 1

Active	Mean Return	t-statistic (mean vs 0)	t-statistic (active mean vs benchmark mean)	Standard Deviation	Terminal Wealth
$Long_{BM}$	1.42	5.87	-0.24	4.98	242.42
$Short_{BM}$	1.10	4.73	0.43	4.82	0.005
$Combined_{BM}$	0.31	1.82	-0.84	3.54	2.92
Benchmark					
H=BM10 (Long)	1.50	5.72		5.42	313.26
L=BM1 (Short)	0.96	3.87		5.11	0.009
H - L	0.54	6.75		4.44	0.063

Panel B: Out-of-Sample Performance of B/M Decile Strategies: Top 3 – Bottom 3

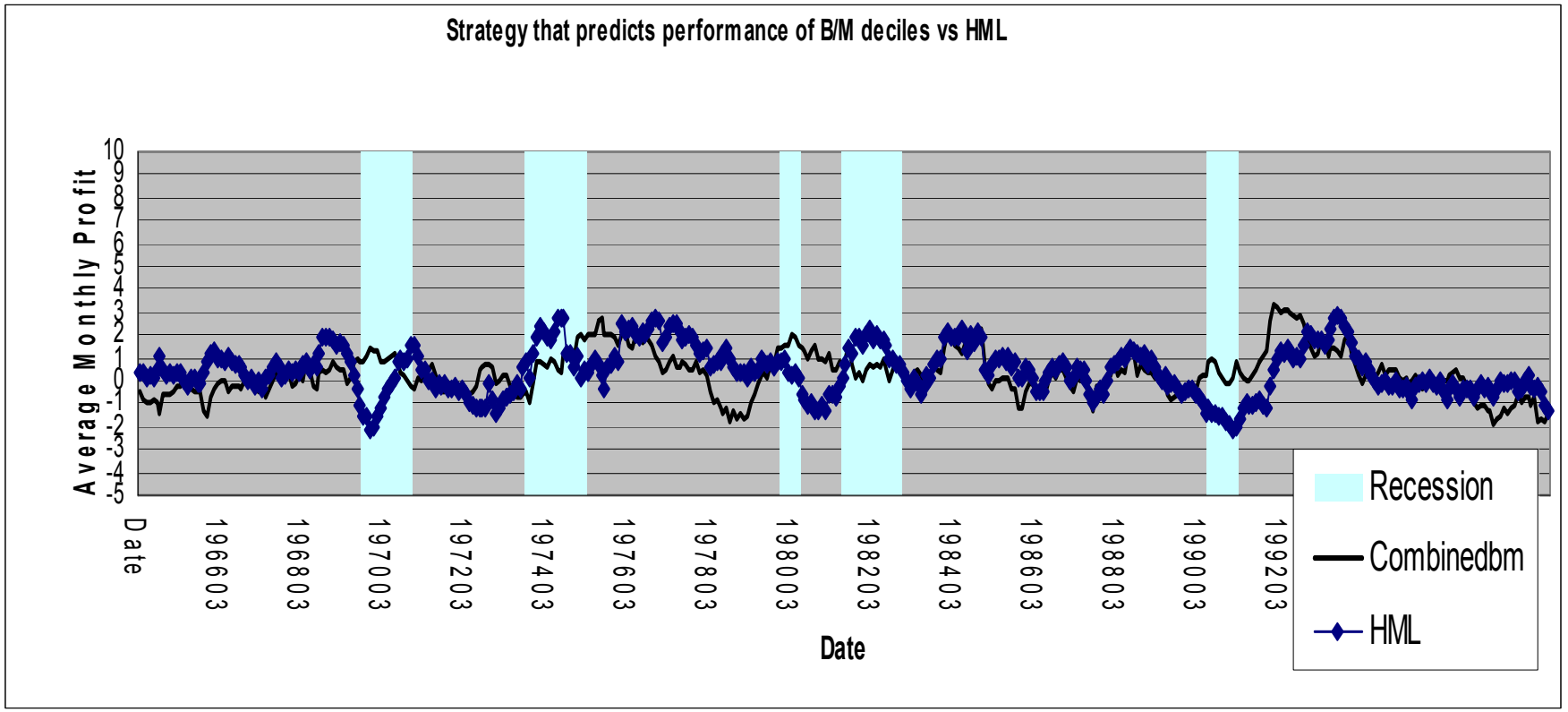
Active	Mean Return	t-statistic (mean vs 0)	t-statistic (active mean vs benchmark mean)	Standard Deviation	Terminal Wealth
$Long_{BM}$	1.33	6.11	-0.18	4.51	187.62
$Short_{BM}$	1.07	4.81	0.15	4.58	0.007
$Combined_{BM}$	0.27	2.52	-0.61	2.19	2.82
Benchmark					
H=(BM8+BM9+BM10)/3	1.39	6.24		4.60	233.11
L=(BM1+BM2+BM3)/3	1.02	4.45		4.73	0.008
H - L	0.37	4.15		2.77	0.17

Trading strategies implications



Source: Cooper, Gulen, and Vassalou (2001)

Implications for trading strategies



Source: Cooper, Gulen, and Vassalou (2001)

Size effect

- There is a reason why it is easier to beat the SMB strategy than the HML.
- The size effect is a default effect, as shown in Vassalou and Xing (2004, JF).
- HML captures mainly news about future GDP growth, and specifically, investment growth.

Equity returns and default risk

- How does default risk affect equity returns? Fama and French argue that SMB and HML may proxy for financial distress.
- Do we earn a risk premium for bearing default risk in our portfolios?
- Are there any profitable trading strategies that use information about default risk?
- Vassalou and Xing (2004, JF) examine the above hypotheses.

How should we measure default risk?

- Estimate default probabilities for individual firms. (KMV does that!)
- This approach does not rely on information about default obtained from the bonds market as is the case for the default spread.
- Neither does it rely on accounting ratios, as it uses the market value of equity and debt.
- To estimate default probabilities, use Merton's (1974) model.

What is the effect of default risk on equities?

- Stocks with high default probability earn significantly higher returns than portfolios of stocks with low default probability.
- The book-to-market and size effects are present only within the portfolio of stocks with the highest default probabilities.
- Once stocks with the highest default probabilities are excluded from the sample, both the size and B/M effects disappear.

The size effect after we control for the default probabilities of stocks

Panel A: Average Return

	Small 1	2	3	4	Big 5	Small-Big	*t*-stat
High *DLI* 1	4.6256	1.7233	1.1105	0.7801	0.8048	3.8208	(9.5953)
2	1.5333	1.2293	1.0915	1.2269	1.2865	0.2468	(1.0464)
3	1.4725	1.4583	1.2988	1.3268	1.3978	0.0747	(0.3481)
4	1.2973	1.3970	1.4683	1.3446	1.2946	0.0027	(0.0129)
Low *DLI* 5	1.2755	1.2216	1.1997	1.0520	1.1286	0.1469	(0.5730)
Whole Sample	2.1207	1.1591	1.2032	1.2837	1.2238	0.8969	(3.2146)

The size characteristics of the portfolios

Panel B: Average Size

	Small 1	2	3	4	Big 5
High *DLI* 1	0.6883	1.6858	2.3936	3.1619	4.7013
2	1.4885	2.5637	3.3076	4.1511	5.7973
3	2.0103	3.2055	4.0250	4.9553	6.6873
4	2.4612	3.7715	4.6935	5.7503	7.4202
Low *DLI* 5	2.9161	4.4122	5.4394	6.5299	8.2456
Whole Sample	1.5312	2.9019	3.9120	5.0684	7.0886

The default characteristics of the portfolios

Panel C: Average *DLI*					
	Small 1	2	3	4	Big 5
High *DLI* 1	27.4500	20.6530	17.8550	16.0280	14.2960
2	2.0050	1.7930	1.6770	1.5870	1.4260
3	0.3170	0.2670	0.2510	0.2600	0.2200
4	0.0590	0.0510	0.0420	0.0380	0.0380
Low *DLI* 5	0.0140	0.0110	0.0090	0.0060	0.0070
Whole Sample	11.6100	4.9351	2.5953	1.3932	0.6141

Therefore:

- The size effect is only present in the one quintile of stocks with the highest default probabilities.
- Once stocks with the highest default probabilities are excluded from the sample, small capitalization stocks no longer earn a higher return than big capitalization stocks.

The B/M effect after we control for the default probabilities of stocks

Panel A: Average Returns

	High *BM*	2	3	4	Low *BM*	High-Low	*t*-stat
High *DLI* 1	3.3636	2.0412	1.5164	1.2047	0.8170	2.5466	(9.8984)
2	1.7981	1.5438	1.2955	0.9946	0.7282	1.0699	(3.4716)
3	1.7420	1.4287	1.3053	1.2381	1.2338	0.5083	(1.5026)
4	1.6284	1.4604	1.1840	1.1864	1.3414	0.2870	(0.9575)
Low *DLI* 5	1.4415	1.2669	1.0932	1.0688	1.0074	0.4341	(1.5134)
Whole Sample	2.1572	1.4893	1.2267	1.0963	1.0128	1.1445	(4.5879)

The B/M characteristics of the portfolios

Panel B: Average *BM*

	High *BM*	2	3	4	Low *BM*
High *DLI* 1	3.7233	1.8967	1.3310	0.9007	0.4191
	2.0395	1.2307	0.8848	0.6070	0.2949
3	1.6616	1.0184	0.7399	0.5065	0.2462
4	1.4547	0.9154	0.6782	0.4705	0.2339
Low *DLI* 5	1.2970	0.8052	0.5733	0.3858	0.2009
Whole Sample	2.2137	1.1258	0.7861	0.5243	0.2472

The default characteristics of the portfolios

Panel C: Average *DLI*

	High *BM*	2	3	4	Low *BM*
High *DLI* 1	30.9210	19.4650	16.2910	14.7660	14.6620
2	2.0460	1.7450	1.6340	1.5400	1.5180
3	0.3150	0.2580	0.2500	0.2590	0.2320
4	0.0510	0.0470	0.0420	0.0460	0.0410
Low *DLI* 5	0.0130	0.0070	0.0110	0.0080	0.0080
Whole Sample	12.0360	3.6598	2.2206	1.6334	1.5062

Therefore:

- The B/M effect is only present in the two quintiles of stocks with the highest default probabilities.
- Once those stocks are excluded from the sample, value stocks no longer earn, on average, higher returns than growth stocks.

Default Portfolios after controlling for size/BM

Controlling for Size

	High *DLI*	2	3	4	Low *DLI*	High -Low	*t*-stat
Small	3.7315	2.1580	1.8666	1.4127	1.5020	2.2295	(5.9430)
2	0.7852	1.0599	1.3095	1.3212	1.3200	-0.5348	(-1.8543)
3	0.8748	1.2387	1.3406	1.3623	1.1947	-0.3198	(-1.7375)
4	1.1115	1.2662	1.4690	1.3171	1.2542	-0.1427	(-0.8505)
Big	1.3714	1.2954	1.2391	1.1717	1.0428	0.3286	(1.7074)

Controlling for BM

	High *DLI*	2	3	4	Low *DLI*	High -Low	*t*-stat
High *BM*	3.2285	2.1825	1.9488	1.8361	1.6243	1.6042	(3.9785)
2	1.3880	1.4370	1.5597	1.5544	1.5098	-0.1218	(-0.4580)
3	1.1506	1.2602	1.3190	1.1712	1.2307	-0.0802	(-0.3317)
4	0.9077	1.1734	1.1679	1.1064	1.1246	-0.2169	(-0.8294)
Low *BM*	0.7044	0.9765	1.2983	1.1074	0.9711	-0.2667	(-0.8369)

Fama-MacBeth Regression Analysis on the relative importance of size, B/M, and default risk in equity returns

	Constant	DLI	DLI2	Size	Size2	BM	BM2	SizeDLI	BMDLI
Coef	1.3087	-4.8980	17.8748	-0.0030	0.0000	0.5710	-0.0293	-0.6800	0.1071
t-value	4.4352	-2.7120	4.3832	-0.5061	-0.2406	5.5091	-1.5762	-3.8740	1.9802
Coef	1.3027	-6.2470	19.7108	-0.0072	0.0000			-0.7869	
t-value	4.3906	-3.3818	4.6873	-1.1187	0.2159			-4.2910	
Coef	1.2905	0.7063	2.1471			0.5899	-0.0477		0.1345
t-value	4.3421	0.5158	3.6537			5.7721	-2.4581		2.1236

The Fama-MacBeth regression tests are performed on individual equity returns. The variables size and BM are rendered orthogonal to DLI. The regressions relate individual stock returns to their past month's size, BM, and DLI characteristics. Size2, BM2, DLI2 denote the characteristics squared, whereas SizeDLI and BMDLI denote the products of the respective variables. Those products aim to capture the interaction effects of each pair of variables.

Do we receive a risk premium for bearing default risk?

The *EMKT*+Δ(*SV*) model

	Constant	*EMKT*	Δ(*SV*)	Test:	*J*-test	Wald(*b*)	*HJ*
Coefficient	1.0200	1.5398	-44.3823	Statistic	63.6054		0.8678
t-value	(39.2795)	(0.8804)	(-3.8607)	*p*-value	(0.0000)	(0.0001)	(0.0000)
Premium		0.0079	0.0043				
t-value		(2.8024)	(4.2752)				

The Fama-French model augmented by Δ(*SV*)

	Constant	*EMKT*	*SMB*	*HML*	Δ(*SV*)	Test:	*J*-test	Wald(*b*)	*HJ*
Coefficient	0.9322	4.6068	24.7941	-12.0076	-135.2905	Stat	46.8368		0.8032
t-value	(15.7444)	(1.6395)	(4.0315)	(-2.8654)	(-4.7691)	*p*-value	(0.0024)	(0.0000)	(0.0000)
Premium		0.0098	-0.0025	0.0082	0.0097				
t-value		(2.1551)	(-0.6916)	(2.6620)	(4.4788)				

Do we receive a risk premium for bearing default risk?

- Yes, we do.
- Some of this risk premium is captured by HML and SMB, but not all of it.
- SMB contains more default-related information than HML.
- The remaining information in HML and SMB is related to news about future GDP growth, and in particular, investment growth.

What about price momentum?

- Can we find a rational explanation for price momentum?
- Vassalou and Apedjinou (2003, WP) provide one, using the concept of Corporate Innovation (CI).

What do we mean by Corporate Innovation (CI)?

- CI is the proportion of a firm's change in Gross Profit Margin not explain by its change in capital and labor.
- Using terminology from the Real Business Cycle literature, CI can be understood as a firm-level Total Factor Productivity, or Solow residual.

Aggregate CI is priced in the cross-section of equity returns

Panel B: Market Factor and Aggregate Corporate Innovation (ACI) factor model

	Constant	Market	ACI	
Coefficient	1.2341	-3.7224	-8.6366	
t-value	18.7217	-3.9510	-2.7843	
Premium		0.0243	0.0134	
t-value		3.2472	2.4009	
	Over-identification Test	P-Wald(b)		Wald(UMD)
	23.8654			2.6668
p-value	0.4113	0.0000		0.1025

Panel C: Market Factor, Aggregate Corporate Innovation (CI) + Momentum (UMD) factor model

	Constant	Market	ACI	UMD
Coefficient	1.3474	-4.0012	-9.8423	-2.4365
One Step t-value	13.9764	-3.7236	-2.8814	-1.6415
Premium		0.0229	0.0146	0.0072
One Step t-value		3.0798	2.4940	1.0191
	Over-identification Test	P-Wald(b)		
	23.5373			
p-value	0.3719	0.0000		

Construct a momentum-type of zero-investment strategy based on CI (HLCI). Its spread is not explained by the popular asset pricing models

Panel C Regressions of HLCI on alternative sets of factors

	alpha	Market beta	HML beta	SMB beta	MOM beta
CAPM	**0.0066**	**0.0454**			
	(6.11)	**(1.57)**			
Fama-French	**0.0065**	**0.0592**	**0.0284**	**-0.0179**	
	(5.51)	**(1.53)**	**(0.41)**	**(-0.39)**	
Fama-French+MOM	**0.0050**	**0.0612**	**0.0772**	**-0.0147**	**0.2168**
	(4.46)	**(2.06)**	**(1.52)**	**(-0.39)**	**(5.34)**

But HLCI helps explain the returns of the momentum deciles

Panel A
Alphas of momentum deciles

Deciles	1	2	3	4	5	6	7	8	9	10	10-1
CAPM alpha	0.0008	0.0014	0.0025	0.0024	0.0036	0.0040	0.0032	0.0039	0.0047	0.0063	0.0055
	(0.29)	(0.70)	(1.54)	(1.51)	(2.46)	(2.89)	(2.44)	(3.00)	(3.32)	(3.06)	(2.11)
Fama-French alpha	-0.0010	-0.0006	0.0000	-0.0003	0.0009	0.0012	0.0007	0.0015	0.0026	0.0057	0.0067
	(-0.41)	(-0.38)	(0.03)	(-0.29)	(0.95)	(1.53)	(0.96)	(2.08)	(3.00)	(4.49)	(2.28)
Fama-French+HLCI alpha	0.0057	0.0025	0.0018	0.0007	0.0016	0.0013	0.0003	0.0009	0.0015	0.0043	-0.0014
	(1.40)	(1.22)	(1.19)	(0.58)	(1.48)	(1.49)	(0.39)	(1.23)	(1.73)	(3.38)	(-0.32)

Also, the momentum portfolios load significantly on HLCI

Panel B Betas of momentum deciles w.r.t to HLCI

Factors\Deciles	1	2	3	4	5	6	7	8	9	10	10-1
HLCI	-0.8327	-0.3022	-0.0942	0.0172	0.0638	0.1517	0.2351	0.261	0.3443	0.4024	1.2350
	(-1.61)	(-1.12)	(-0.46)	(0.10)	(0.43)	(1.07)	(1.64)	(1.74)	(2.02)	(1.75)	(3.38)
MKT+HLCI	-1.0606	-0.4954	-0.2706	-0.1533	-0.1028	-0.0164	0.0633	0.0837	0.1550	0.1709	1.2314
	(-2.48)	(-2.80)	(-2.34)	(-1.83)	(-1.70)	(-0.32)	(1.36)	(1.65)	(2.45)	(1.77)	(3.27)
Fama French+HLCI	-1.0280	-0.4835	-0.2690	-0.1560	-0.1090	-0.0211	0.0592	0.0855	0.1672	0.2194	1.2474
	(-2.65)	(-2.95)	(-2.38)	(-1.82)	(-1.65)	(-0.40)	(1.41)	(2.38)	(4.26)	(3.83)	(3.20)

Returns on CI-based strategy (HLCI)

(formation period: 2quarters/holding period: 6 months)

Panel A: Current Two-Quarter Corporate Innovation/6 Month Returns

	Returns	CI	ln(Size)	BM	Beta	Volatility	GPM Growth	constant	Capital	Labor
P 1 (Low CI)	0.0110	-0.6141	6.8325	1.1550	0.9183	13.8338	-0.5967	0.0158	0.2905	0.2977
	(3.76)									
P 2	0.0129	-0.1856	7.2493	1.0255	0.8918	11.7680	-0.1708	0.0402	0.1681	0.1945
	(4.93)									
P 3	0.0127	-0.0818	7.4550	1.0055	0.9006	10.9185	-0.0710	0.0457	0.1169	0.1314
	(4.92)									
P 4	0.0133	-0.0215	7.5816	0.9243	0.8841	9.8020	-0.0123	0.0469	0.1362	0.1288
	(5.26)									
P 5	0.0154	0.0219	7.6998	0.8834	0.8804	9.0536	0.0266	0.0513	0.1128	0.0719
	(6.15)									
P 6	0.0157	0.0604	7.7238	0.8917	0.9302	9.5002	0.0643	0.0533	0.1250	0.0665
	(6.01)									
P 7	0.0165	0.1031	7.7551	0.8499	0.9157	9.4133	0.1014	0.0593	0.0344	0.0830
	(6.43)									
P 8	0.0177	0.1619	7.6678	0.8745	0.9930	10.1960	0.1543	0.0648	-0.0037	0.0624
	(6.42)									
P 9	0.0177	0.2612	7.3799	0.9003	1.0075	11.1909	0.2449	0.0705	-0.0546	-0.0055
	(6.20)									
P 10 (High CI)	0.0180	0.6540	7.0083	0.9931	0.9541	11.9160	0.6156	0.0876	-0.3471	-0.1265
	(6.37)									
P 10 – 1 (High CI-Low CI)	0.0070				0.0409					
	(5.68)									

Returns of equivalent price momentum strategy

(formation period: 6 months/holding period: 6 months)

Panel B: 6-Month/6 Month Momentum

	Returns	CI	ln(Size)	BM	Beta	Volatility	GPM Growth	constant	Capital	Labor
P 1 (Losers)	0.0130	-0.0675	6.4198	1.3602	1.0920	17.9227	-0.0815	0.0499	0.1238	0.0550
	(3.31)									
P 2	0.0133	-0.0001	7.0681	1.1114	0.9420	11.3761	-0.0045	0.0530	0.0488	0.0705
	(4.59)									
P 3	0.0141	0.0174	7.3254	1.0336	0.8720	9.9151	0.0149	0.0510	0.0327	0.1176
	(5.47)									
P 4	0.0136	0.0254	7.4949	0.9649	0.8452	8.9149	0.0215	0.0514	0.0224	0.1270
	(5.55)									
P 5	0.0148	0.0398	7.5754	0.9324	0.8266	8.3982	0.0395	0.0523	0.0123	0.1163
	(6.24)									
P 6	0.0154	0.0486	7.6414	0.9089	0.8388	8.2985	0.0494	0.0519	0.0424	0.0886
	(6.49)									
P 7	0.0149	0.0529	7.7288	0.8991	0.8661	8.1940	0.0541	0.0525	0.0510	0.1176
	(6.17)									
P 8	0.0158	0.0607	7.7881	0.8311	0.8897	8.5832	0.0633	0.0541	0.0841	0.1115
	(6.37)									
P 9	0.0166	0.0742	7.7611	0.7865	0.9504	9.5022	0.0788	0.0574	0.0688	0.0688
	(6.22)									
P 10 (Winners)	0.0197	0.1189	7.3137	0.6821	1.1527	13.3605	0.1296	0.0627	0.0823	0.0209
	(5.71)									
P 10 – 1 (Winners-Losers)	0.0067				0.0657					
	(2.31)									

Bottom-line on comparison between CI and momentum strategies:

- The momentum deciles exhibit the same monotonicity w.r.t CI and GPM as the deciles sorted on CI.

Sequential Sorts:
First on CI, Then on Past Returns

CURRENT TWO-QUARTER CORPORATE INNOVATION

6 Month Past Returns

	Loser	P2	P3	P4	P5	P6	P7	P8	P9	Winner	WML
Low CI	0.0127	0.0076	0.0079	0.0106	0.0100	0.0112	0.0104	0.0104	0.0102	0.0121	-0.0006
	(1.92)	(1.69)	(2.25)	(3.35)	(3.48)	(3.93)	(4.06)	(4.17)	(3.67)	(3.33)	(-0.10)
P 2	0.0151	0.0115	0.0120	0.0099	0.0113	0.0117	0.0104	0.0132	0.0121	0.0167	0.0016
	(3.16)	(3.32)	(4.11)	(3.62)	(4.28)	(4.53)	(4.06)	(5.30)	(4.13)	(4.76)	(0.41)
P 3	0.0122	0.0110	0.0107	0.0105	0.0128	0.0129	0.0130	0.0119	0.0122	0.0162	0.0040
	(2.86)	(3.45)	(3.75)	(4.01)	(4.98)	(5.08)	(5.13)	(4.61)	(4.49)	(4.60)	(1.13)
P 4	0.0140	0.0134	0.0135	0.0134	0.0134	0.0127	0.0132	0.0133	0.0126	0.0138	-0.0002
	(3.27)	(4.38)	(5.04)	(4.98)	(5.24)	(4.99)	(5.06)	(5.33)	(4.54)	(4.23)	(-0.06)
P 5	0.0158	0.0152	0.0147	0.0144	0.0157	0.0153	0.0146	0.0149	0.0137	0.0165	0.0007
	(4.16)	(5.42)	(5.64)	(5.60)	(6.20)	(5.97)	(5.68)	(5.70)	(4.95)	(5.04)	(0.23)
P 6	0.0150	0.0163	0.0158	0.0146	0.0146	0.0164	0.0157	0.0144	0.0172	0.0155	0.0004
	(3.58)	(5.38)	(5.47)	(5.73)	(5.64)	(6.28)	(6.02)	(5.31)	(6.05)	(4.57)	(0.13)
P 7	0.0108	0.0139	0.0140	0.0139	0.0172	0.0163	0.0169	0.0174	0.0165	0.0216	0.0108
	(2.71)	(4.74)	(5.07)	(5.34)	(6.66)	(6.18)	(6.43)	(6.78)	(5.84)	(6.17)	(3.31)
P 8	0.0148	0.0154	0.0164	0.0164	0.0180	0.0180	0.0179	0.0181	0.0190	0.0223	0.0075
	(3.78)	(4.64)	(5.49)	(5.89)	(6.58)	(6.60)	(6.58)	(6.22)	(6.07)	(5.59)	(2.28)
P 9	0.0125	0.0150	0.0158	0.0169	0.0158	0.0158	0.0173	0.0177	0.0206	0.0213	0.0089
	(3.10)	(4.53)	(5.50)	(6.06)	(5.97)	(5.75)	(6.14)	(5.87)	(6.13)	(4.92)	(2.33)
High CI	0.0150	0.0157	0.0174	0.0155	0.0149	0.0169	0.0167	0.0177	0.0183	0.0257	0.0107
	(3.28)	(4.59)	(5.91)	(5.49)	(5.61)	(5.81)	(5.70)	(5.88)	(5.13)	(5.69)	(2.43)
High - Low	0.0023	0.0081	0.0094	0.0049	0.0049	0.0058	0.0063	0.0073	0.0081	0.0135	
	(0.53)	(3.05)	(4.29)	(2.67)	(2.77)	(3.11)	(3.51)	(4.33)	(3.93)	(4.89)	

Therefore:

- Price momentum strategies are profitable only when the "winners" are high CI firms.
- When the "winners" are firms with low-to-medium levels of CI, price momentum strategies deliver zero returns.

Sequential Sorts:
First on Past Returns, Then on CI

6 MONTH PAST RETURNS

Current Two-Quarter Corporate Innovation

	Low CI	P2	P3	P4	P5	P6	P7	P8	P9	High CI	High - Low
Loser	0.0084	0.0117	0.0143	0.0113	0.0147	0.0158	0.0128	0.0137	0.0139	0.0154	0.0070
	(1.47)	(2.29)	(3.21)	(2.63)	(3.56)	(3.61)	(3.12)	(3.33)	(3.46)	(3.45)	(1.82)
P 2	0.0073	0.0128	0.0110	0.0118	0.0130	0.0147	0.0152	0.0137	0.0137	0.0152	0.0079
	(2.28)	(3.85)	(3.70)	(3.86)	(4.08)	(4.74)	(4.83)	(4.28)	(4.19)	(4.61)	(4.03)
P 3	0.0102	0.0108	0.0101	0.0118	0.0139	0.0147	0.0147	0.0165	0.0152	0.0165	0.0063
	(3.38)	(3.95)	(3.78)	(4.41)	(5.20)	(5.37)	(5.18)	(5.63)	(5.01)	(5.61)	(3.54)
P 4	0.0091	0.0104	0.0112	0.0119	0.0147	0.0147	0.0134	0.0146	0.0165	0.0152	0.0061
	(3.27)	(4.03)	(4.33)	(4.67)	(5.73)	(5.55)	(5.08)	(5.47)	(5.67)	(5.45)	(3.80)
P 5	0.0130	0.0120	0.0129	0.0130	0.0141	0.0153	0.0153	0.0160	0.0181	0.0149	0.0019
	(5.00)	(4.71)	(5.01)	(5.13)	(5.54)	(5.98)	(5.83)	(6.02)	(6.59)	(5.59)	(1.35)
P 6	0.0106	0.0124	0.0141	0.0139	0.0154	0.0151	0.0166	0.0167	0.0166	0.0160	0.0054
	(4.07)	(5.07)	(5.66)	(5.52)	(5.93)	(5.89)	(6.41)	(6.40)	(6.22)	(6.03)	(3.93)
P 7	0.0099	0.0129	0.0130	0.0135	0.0139	0.0154	0.0167	0.0159	0.0158	0.0155	0.0056
	(3.87)	(5.02)	(5.30)	(5.26)	(5.48)	(6.10)	(6.33)	(6.05)	(5.79)	(5.71)	(4.20)
P 8	0.0093	0.0137	0.0125	0.0149	0.0156	0.0157	0.0179	0.0173	0.0173	0.0170	0.0077
	(3.56)	(5.33)	(4.77)	(5.51)	(5.81)	(5.88)	(6.55)	(6.41)	(6.21)	(5.88)	(4.92)
P 9	0.0145	0.0123	0.0142	0.0150	0.0150	0.0172	0.0198	0.0193	0.0190	0.0177	0.0032
	(4.47)	(4.28)	(4.99)	(5.20)	(5.42)	(5.77)	(7.02)	(6.30)	(6.04)	(5.90)	(1.59)
Winner	0.0146	0.0149	0.0159	0.0176	0.0191	0.0208	0.0212	0.0218	0.0232	0.0242	0.0096
	(3.57)	(4.03)	(4.33)	(4.94)	(5.50)	(5.46)	(5.45)	(5.50)	(5.49)	(5.71)	(3.58)
Winner - Loser	0.0062	0.0032	0.0016	0.0064	0.0045	0.0051	0.0084	0.0082	0.0093	0.0088	
	(1.26)	(0.72)	(0.42)	(1.76)	(1.35)	(1.35)	(2.55)	(2.46)	(2.59)	(2.13)	

Implication:

- CI-based strategies are profitable, independently of whether the past returns of the stocks involved were high or low.

Regression analysis:

Regressions of returns of popular momentum strategies on returns of CI strategies with similar FPs and HPs

Panel A: Contemporaneous regressions of the returns of momentum strategies on the returns of CI-based strategies

Formation Period \ Holding Period	3 Months			6 Months			9 Months			12 Months		
	C	CI	R-square	C	CI	R-square	C	CI	R-square	C	CI	R-square
One-Quarter CI, 3-M Past Returns	-0.01	0.86	0.16	0.00	1.21	0.26	0.00	1.34	0.27	0.00	1.27	0.24
	(-1.48)	(2.41)		(-1.23)	(3.39)		(-1.05)	(3.17)		(-0.67)	(5.17)	
Two-Quarter CI, 6-M Past Returns	0.00	1.04	0.23	0.00	1.21	0.27	0.00	1.22	0.27	0.00	1.18	0.27
	(-0.93)	(3.57)		(-0.69)	(3.81)		(-0.30)	(5.08)		(0.01)	(7.54)	
Three-Quarter CI, 9-M Past Returns	-0.01	1.07	0.25	0.00	1.11	0.28	0.00	1.04	0.26	0.00	1.07	0.26
	(-1.24)	(3.72)		(-0.58)	(6.02)		(-0.29)	(6.53)		(-0.22)	(6.81)	
Four-Quarter CI, 12-M Past Returns	-0.01	0.93	0.27	0.00	0.84	0.27	0.00	0.80	0.25	0.00	0.83	0.26
	(-1.49)	(5.02)		(-0.71)	(5.59)		(-0.78)	(5.23)		(-0.77)	(5.55)	

Regression analysis: Summary of results

- The returns of CI strategies can explain a substantial proportion of the time-series variation in the momentum strategies.
- The adj. R-square from a regression of the 6m/6m momentum on the 2q/6m CI is 0.27.
- The adj. R-square from a regression of the 12m/12m momentum on the 4q/12m CI is 0.26.

CI, Momentum, and Contrarian strategies: What is the relation?

60-Month/60-Month Momentum

	Returns	CI current	CI 1 year ahead	CI 2 year ahead	CI 3 year ahead	CI 4 year ahead	CI 5 year ahead	Volatility
P 1	0.0155	0.0057	0.047	0.1041	0.0384	0.0578	0.0537	17.8339
	-4.88							
P 2	0.0149	0.035	0.0828	0.045	0.0626	0.0632	0.0733	11.2878
	-5.39							
P 3	0.0144	0.0575	0.0749	0.0578	0.0596	0.0603	0.0536	9.2373
	-5.85							
P 4	0.015	0.0713	0.0697	0.0748	0.0604	0.0516	0.0487	8.2693
	-6.33							
P 5	0.0145	0.0848	0.0736	0.075	0.0682	0.0574	0.0485	7.6247
	-6.2							
P 6	0.0142	0.0719	0.0738	0.0719	0.0639	0.0654	0.0484	7.2392
	-6.16							
P 7	0.0136	0.0893	0.0722	0.0683	0.0722	0.0474	0.045	7.1944
	-5.92							
P 8	0.0134	0.1054	0.0831	0.0665	0.0561	0.0942	0.0387	7.3776
	-5.57							
P 9	0.0125	0.1078	0.07	0.072	0.0648	0.0464	0.0506	7.8698
	-4.88							
P 10	0.0117	0.1433	0.0819	0.0528	0.0574	0.0569	0.0402	8.8261
	-3.87							
P 10 -1	-0.0038							
	(-1.70)							

The spread on the long-horizon reversal strategy has a significant loading on HLCI.

	alpha	Market beta	HML beta	SMB beta	HLCI beta
CAPM	**-0.0036**	**0.2444**			
	(-1.87)	**(4.31)**			
FF	**-0.0006**	**0.1207**	**-0.4880**	**-0.3680**	
	(-0.36)	**(2.36)**	**(-5.69)**	**(-4.77)**	
FF+HLCI	**-0.0024**	**0.1047**	**-0.4957**	**-0.3631**	**0.2708**
	(-1.35)	**(2.01)**	**(-6.35)**	**(-4.87)**	**(3.46)**

Abnormal Equity Returns following downgrades

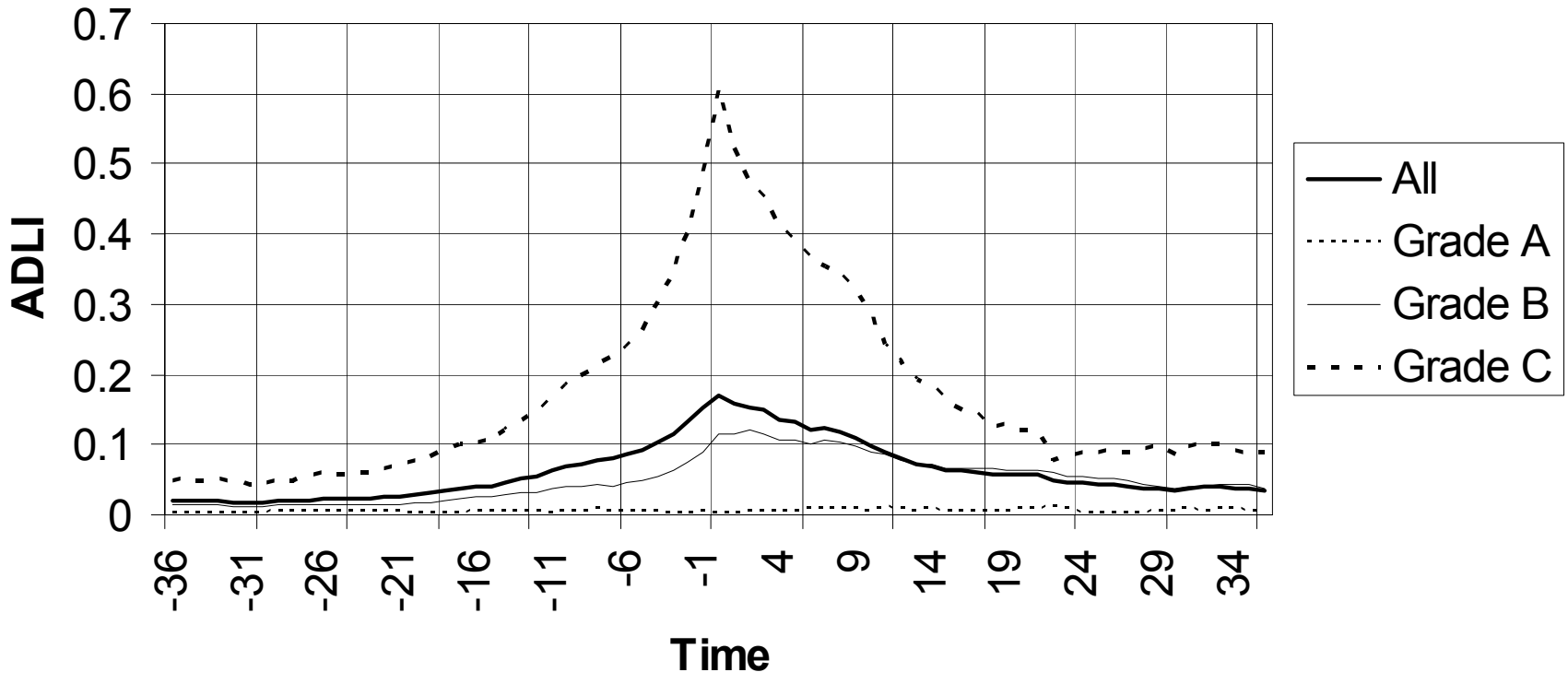
- Holthausen and Leftwich (1985), Hand, Holthausen and Leftwich (1992), and Dichev and Piotroski (2001) show that abnormal equity returns following downgrades are negative.
- This is considered an anomaly, since a downgrade is viewed as signaling an increase in default risk.
- Rational investors should require a higher, not lower, expected return following an increase in default risk.

Does the previous result constitute an asset pricing anomaly?

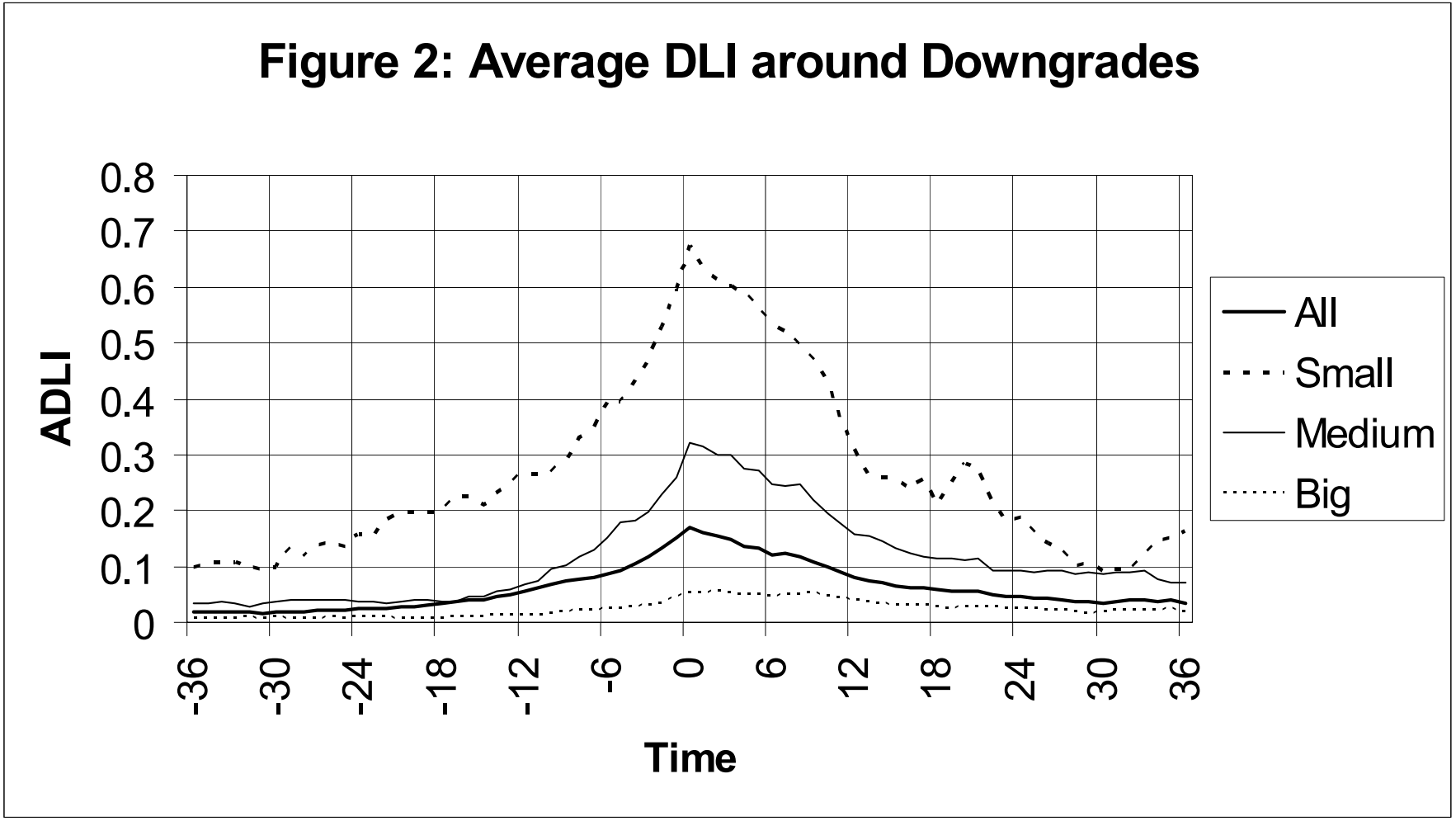
- NO!
- It is the result of an inadequate risk adjustment.
- The previous papers risk-adjust equity returns with respect to size and book-to-market.
- They do not risk-adjust with respect to default risk.
- However, default risk varies a lot around downgrades. In addition, default risk is priced, as I showed before.
- Vassalou and Xing (2003, WP) provides the evidence for the above statements.

Default risk around downgrades

Figure 1: Average DLI around Downgrades

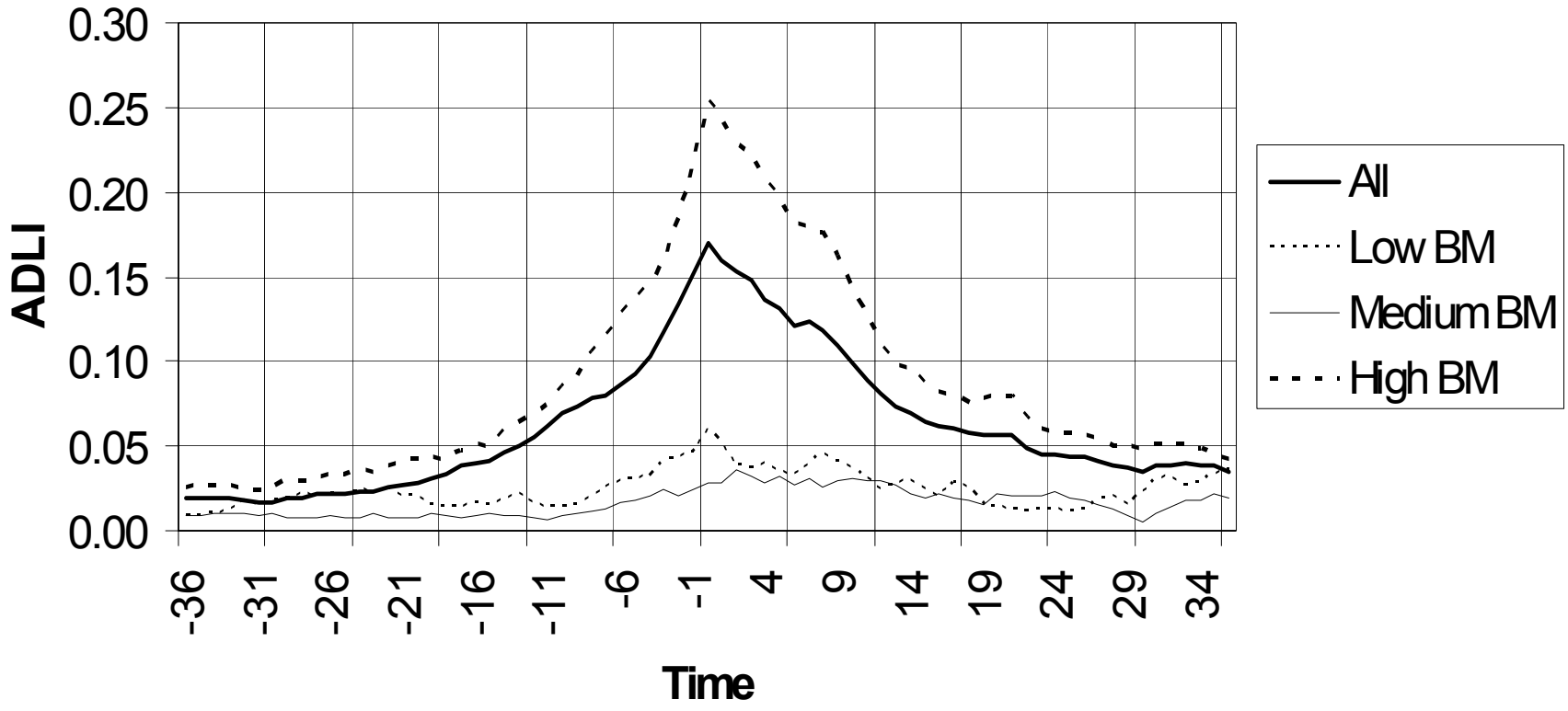


Default risk around downgrades contd

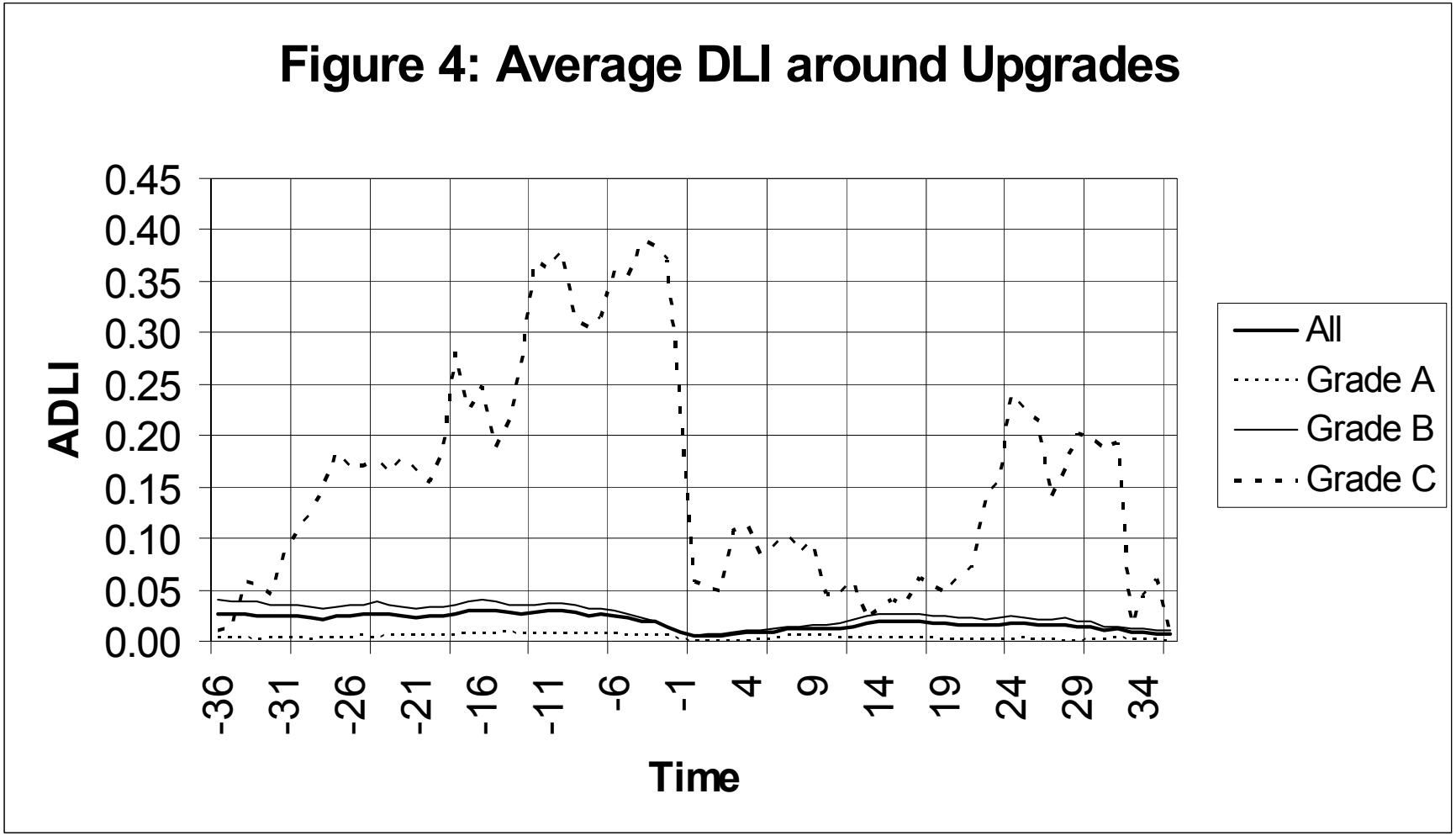


Default risk around downgrades contd

Figure 3: Average DLI around Downgrades



Default risk around upgrades



Abnormal returns following downgrades: The results in the literature

Table 6: Abnormal Returns Following Bond Downgrade- Adjusted by Size and Book-to-Market

	1-month	3-month	6-month	1-st year	2-nd year	3-rd year
All	-0.8460	-3.3443	-4.2027	-7.8916	-5.1395	-8.5022
	(-2.0336)	(-5.1884)	(-4.7018)	(-5.8908)	(-3.9601)	(-6.1031)
Grade A	-0.3323	-0.5758	-1.0797	-3.0000	-4.3575	-5.3410
	(-0.8667)	(-0.8287)	(-1.0958)	(-2.2255)	(-2.5039)	(-2.9274)
Grade B	-0.9652	-3.7019	-5.0828	-10.0440	-6.2635	-8.7730
	(-2.0250)	(-4.7483)	(-4.5309)	(-5.4974)	(-3.5882)	(-4.9127)
Grade C	-1.5575	-8.8350	-7.6304	-8.7690	-0.7550	-15.5690
	(-0.5872)	(-2.4154)	(-1.5957)	(-1.4459)	(-0.1427)	(-2.3471)

Raw Returns Following Downgrades

Table 7: The Long-Term Raw Return Following Bond Downgrade

	1-month	3-month	6-month	1-st year	2-nd year	3-rd year
All	0.5431	0.7580	3.5637	7.4568	8.9561	5.7313
	(1.2077)	(1.0207)	(3.4170)	(5.0765)	(6.4933)	(3.8484)
Grade A	1.3189	4.0181	8.6210	13.9890	10.9170	10.9770
	(2.7963)	(4.7721)	(7.0293)	(9.1994)	(5.9538)	(5.6839)
Grade B	0.3162	0.4473	2.6019	5.4270	7.5580	5.4680
	(0.6072)	(0.4888)	(1.9546)	(2.7059)	(4.0878)	(2.8919)
Grade C	-0.3910	-7.3087	-5.8599	0.3590	11.9080	-8.7720
	(-0.1295)	(-1.6821)	(-1.0463)	(0.0514)	(1.9526)	(-1.1343)

Abnormal returns following downgrades when changes in default risk are taken into account

Table 8: Abnormal Return Following Downgrade - Adjusted for Size, Book-to-Market, and default Risk (DLI)

	1-month	3-month	6-month	1-st year	2-nd year	3-rd year
All	-0.2775	-1.0109	-1.4168	-1.4893	-1.2487	-5.7926
	(-0.6052)	(-1.4549)	(-1.4136)	(-1.1293)	(-0.9135)	(-4.4818)
Grade A	0.1443	0.2052	0.7855	0.3541	-1.8005	-2.2031
	(0.3033)	(0.2459)	(0.6427)	(0.2240)	(-1.0184)	(-1.2610)
Grade B	-0.5829	-1.1177	-1.8158	-3.4344	-1.7867	-7.5508
	(-1.0683)	(-1.3441)	(-1.4921)	(-1.9650)	(-1.0227)	(-4.5131)
Grade C	0.5005	-4.7569	-6.6089	6.6343	4.9901	-5.6812
	(0.1444)	(-0.9652)	(-0.9618)	(0.9153)	(0.6159)	(-0.8038)

Abnormal returns following downgrades when default risk and subsequent downgrades are taken into account

Table 9: Abnormal Returns Following Downgrades for firms with no subsequent downgrades
Returns Adjusted for Size, Book-to-Market, and Default Risk (DLI)

	1-month	3-month	6-month	1-st year	2-nd year	3-rd year
All	-0.0012	0.0206	0.0165	0.0882	0.0881	-0.0220
	(-0.1369)	(1.4466)	(0.7223)	(3.5100)	(2.8063)	(-0.7794)
Grade A	0.0058	0.0293	0.0322	0.0629	0.0394	0.0400
	(0.5667)	(1.9572)	(1.1086)	(1.9935)	(1.6374)	(1.3571)
Grade B	-0.0012	0.0231	0.0352	0.0765	0.0611	-0.0988
	(-0.1255)	(1.3964)	(1.4616)	(2.2532)	(1.7225)	(-3.4901)
Grade C	-0.0102	0.0013	-0.0653	0.1594	0.2396	0.1507
	(-0.2879)	(0.0235)	(-0.7092)	(2.1394)	(1.9185)	(1.3150)

Therefore:

- The result in the literature that abnormal returns following downgrades are negative is specific to the way those abnormal returns are computed.
- Once changes in default risk and subsequent downgrades are taken into account, abnormal returns are no longer negative, and statistically or economically significant.
- Furthermore, increases in default risk lead to increases in subsequent returns and vice versa (see paper for evidence).

Conclusions (1)

- The performance of the Fama-French model can be replicated by a model that includes the market factor along with news related to future GDP growth.
- A model that includes only the investment component of GDP outperforms the Fama-French model, although it includes only macro factors and not return-based factors as the FF model does.
- Our investment-based model can price well small growth stocks, whereas the FF model cannot.

Conclusions (2)

- The previous results provide a risk-based explanation for the ability of the FF model to explain the cross-section of equity returns.
- A number of asset pricing anomalies can find rational explanations.
- The returns on HML and SMB are compensation for bearing business cycle related risk.
- Small caps and high B/M stocks act as leading indicators of future GDP growth.
- Whereas HML and B/M capture mainly GDP-news, SMB and the size effect contain mainly default-related information (which also varies with the business cycle).

Conclusions (3)

- Price momentum can also find a rational explanation using the concept of Corporate Innovation.
- Past winners are firms with the highest level of CI. CI in those cases accounts for the majority of the firm's profits.
- A pervasive drop in CI is seen as undesirable, and therefore investors require a risk premium to hold stocks with high sensitivity to CI.
- Since CI is not observable, but can be inferred, the process of revealing information about CI in the market, and its incorporation in the prices, gives rise to the observed return continuation on which the momentum strategy is based.

Conclusion (4)

- Investors act rationally, by requiring higher returns when default risk increases, and lower returns when it decreases.
- Overall, it is possible to find rational explanations for a number of asset pricing anomalies.
- This implies that abandoning the rational asset pricing paradigm may be premature.