Replication, Update, and Extension of Loughran and Ritter's 2000 *Journal of Financial Economics* article "Uniformly Least Powerful Tests of Market Efficiency"

April 2005

In the following tables, with the assistance of Ozgur Ince, the Table 6 results in our 2000 *JFE* article are extended from the 1973-1996 sample period to 1973-2003. In the published article, we report that an EW portfolio of IPOs underperforms by 24 basis points per month using the three Fama-French (1993) factors, and by 42 bp/month using purged factors, a difference of 18 bp/month. In the replication below, the corresponding numbers for the same sample period are underperformance of 18 bp/month and 35 bp/month, a difference of 17 bp/month. So we haven't been able to replicate the published results exactly, but we're close, especially when it comes to the difference between the unpurged and purged results.

It should be noted that in purging the universe of recent equity issuers, it is important to not only exclude CRSP-listed firms that issued IPOs or SEOs in the prior 60 months, but also to exclude all firms that have not been CRSP-listed for at least 60 months. Each year, CRSP adds about 200 new lists that are not picked up in the usual IPO databases, and these new listing tend to be small firms with very low returns during their first five years of public trading. Many of these are small bank mutual to stock company conversions or bankruptcy reorganizations. Indeed, this seemingly innocuous screen is a major reason why Loughran and Ritter (1995 *JF*) find more underperformance for IPOs than Brav and Gompers (1997 *JF*) do. Brav and Gompers include these "non-IPO new lists" in their candidate matching firms, whereas we screen them out. Many of these new lists are in fact IPOs, but are frequently screened out of IPO samples.

As inspection of the tables below shows, the addition of seven more years of data does not change our qualitative results. IPOs severely underperform following high volume periods, and don't underperform following low volume periods.

The monthly purged factor returns for January 1973-December 2003 are available on my website as an Excel file. We were not able to replicate the unpurged Fama-French factor returns exactly, although the differences in returns from those available on Ken French's website are mostly minor. For each month, the variables are

Month in YYYYMM format
Market: The monthly percentage return on the CRSP VW index.
Rf: The risk-free percentage monthly interest rate.
uSMB: The unpurged Small Minus Big factor monthly percentage return computed here.
uHML: The unpurged High Minus Low factor monthly percentage return computed here.
pSMB: The purged Small Minus Big factor monthly percentage return computed here.
pHML: The purged High Minus Low factor monthly percentage return computed here.
IPOreturn: The monthly percentage return on an EW portfolio of IPOs from months t-36 to t-1.
SEOreturn: The monthly percentage return on an EW portfolio of SEOs from months t-36 to t-1.
SMB: The Fama-French SMB monthly percentage return from Ken French.
HML: The Fama-French HML monthly percentage return from Ken French.
numIPO: The number of IPOs in the portfolio at the start of month t.
numSEO: The number of SEOs in the portfolio at the start of month t.

Table 1
Underperformance of IPOs by issue volume, 1973 to 1996

The sample period is January 1973 to December 1996 (288 months). The dependent variable is the equally weighted monthly percentage return on a portfolio of IPOs that have gone public during the prior 36 months. A coefficient of -0.18 represents underperformance of 18 basis points per month. r_{pt} - r_{ft} is the excess return over the risk-free rate on a portfolio in time period t, r_{mt} - r_{ft} is the realization of the market risk premium in period t, SMB_t is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period t, and HML_t is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period t. The Fama-French factor returns are supplied by Kenneth French, using "research factors" with annual rebalancing, as distinct from "benchmark factors" with quarterly rebalancing. Purged (decontaminated) HML and SMB factors have been constructed after purging from the universe of firms all stocks that publicly issued equity for cash during the prior five years, or have been CRSP-listed for less than five years. The 144 months when the ratio of recent equity issuers (IPOs + SEOs) to the total number of domestic operating firms on CRSP is highest are defined as high-volume markets. The other 144 months are designated as low-volume markets. The first row of each panel uses all months, the second row uses months with low-volume markets, and the third row uses months with high-volume markets. T-statistics are in parentheses.

$$r_{pt} - r_{ft} = a + b(r_{mt} - r_{ft}) + sSMB_t + hHML_t + e_{pt}$$

	a	b_t	s_t	h_t	R^2_{adj}
Panel A: The Fama – French method, IPOs					
All	-0.18	1.02	1.35	-0.14	89%
	(-1.26)	(28.78)	(25.35)	(-2.41)	
Low volume markets	0.01	0.97	1.54	-0.28	89%
	(0.03)	(17.81)	(17.69)	(-3.05)	
High volume markets	-0.52	1.05	1.15	-0.08	92%
	(-3.20)	(24.92)	(17.96)	(-1.10)	
Panel B: HML and SMB are purged of new issues, IPOs					
All	-0.35	1.11	1.33	-0.12	87%
	(-2.17)	(28.63)	(21.26)	(-1.59)	
Low volume markets	-0.02	1.07	1.47	-0.20	86%
	(-0.09)	(18.13)	(14.73)	(-1.77)	
High volume markets	-0.76	1.14	1.14	-0.08	89%
	(-4.09)	(23.91)	(14.86)	(-0.93)	

Table 2
Underperformance of IPOs excluding the lock-up period,
1973 to 1996 (Top Panels) and 1973-2003 (Bottom Panels)

The sample period is January 1973 to December 1996 (288 months) in Panels A and B and until December 2003 (372 months) in Panels C and D. For simplicity, lock-up expiration dates are assumed to be six months after the offerings. The first row of each panel includes all IPOs that have gone public during the prior 36 months, and the second row excludes IPOs that have gone public in the last six months. Previous research (Loughran and Ritter's 1995 *Journal of Finance* article) has shown no underperformance by IPOs in the first six months. Purged (decontaminated) HML and SMB factors have been constructed after purging from the universe of firms all stocks that publicly issued equity for cash during the prior five years, or have been CRSP-listed for less than five years. T-statistics are in parentheses.

$$r_{pt} - r_{ft} = a + b(r_{mt} - r_{ft}) + sSMB_t + hHML_t + e_{pt}$$

1973-1996	a	b_t	s_t	h_t	R^2_{adj}
Panel A: The Fama – French method, IPOs					
IPO returns in months (-1,-36)	-0.18	1.02	1.35	-0.14	89%
	(-1.26)	(28.78)	(25.35)	(-2.41)	
IPO returns in months (-7, -36)	-0.38	1.00	1.33	-0.11	89%
	(-2.57)	(27.97)	(24.80)	(-1.91)	
Panel B: HML and SMB are purged of new issues, IPOs					
IPO returns in months (-1,-36)	-0.35	1.11	1.33	-0.12	87%
	(-2.17)	(28.63)	(21.26)	(-1.59)	
IPO returns in months (-7, -36)	-0.54	1.09	1.32	-0.09	86%
	(-3.31)	(27.99)	(20.99)	(-1.27)	

1973-2003	a	b_t	s_t	h_t	R^2_{adj}
Panel C: The Fama – French method, IPOs					
IPO returns in months (-1,-36)	-0.17	1.14	1.18	-0.23	85%
	(-0.92)	(26.83)	(21.50)	(-3.69)	
IPO returns in months (-7, -36)	-0.32	1.13	1.16	-0.20	82%
	(-1.66)	(24.97)	(19.86)	(-2.89)	
Panel D: HML and SMB are purged of new issues, IPOs					
IPO returns in months (-1,-36)	-0.29	1.22	1.24	-0.34	82%
	(-1.48)	(27.12)	(19.09)	(-4.35)	
IPO returns in months (-7, -36)	-0.43	1.20	1.22	-0.30	80%
	(-2.10)	(25.52)	(17.89)	(-3.75)	

Table 3
Underperformance of IPOs by issue volume, 1973 to 2003

The sample period is January 1973 to December 2003 (372 months). The dependent variable is the equally weighted monthly percentage return on a portfolio of IPOs that have gone public during the prior 36 months. A coefficient of -0.17 represents underperformance of 17 basis points per month. $r_{pt} - r_{ft}$ is the excess return over the risk-free rate on a portfolio in time period t, $r_{mt} - r_{ft}$ is the realization of the market risk premium in period t, SMB_t is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period t, and HML_t is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period t. The Fama-French factor returns are supplied by Kenneth French, using "research factors" with annual rebalancing, as distinct from "benchmark factors" with quarterly rebalancing. Purged (decontaminated) HML and SMB factors have been constructed after purging from the universe of firms all stocks that publicly issued equity for cash during the prior five years, or have been CRSP-listed for less than five years. The 186 months when the ratio of recent equity issuers to the total number of domestic operating firms on CRSP is highest are defined as high-volume markets. The other 186 months are designated as low-volume markets. The first row of each panel uses all months, the second row uses months with low-volume markets, and the third row uses months with high-volume markets. T-statistics are in parentheses.

$$r_{pt} - r_{ft} = a + b(r_{mt} - r_{ft}) + sSMB_t + hHML_t + e_{pt}$$

	a	b_t	s_t	h_t	R^2_{adj}
Panel A: The Fama – French method, IPOs					
All	-0.17	1.14	1.18	-0.23	85%
	(-0.92)	(26.83)	(21.50)	(-3.69)	
Low volume markets	0.01	1.12	1.43	-0.29	86%
	(0.06)	(19.66)	(16.35)	(-3.08)	
High volume markets	-0.44	1.08	0.95	-0.38	84%
	(-1.73)	(16.65)	(12.35)	(-3.97)	
Panel B: HML and SMB are purged of new issues, IPOs					
All	-0.29	1.22	1.24	-0.34	82%
	(-1.48)	(27.12)	(19.09)	(-4.35)	
Low volume markets	-0.06	1.25	1.33	-0.23	81%
	(-0.20)	(19.95)	(12.59)	(-1.85)	
High volume markets	-0.56	1.15	1.07	-0.51	82%
	(-2.10)	(17.41)	(12.27)	(-4.82)	

Table 4
Underperformance of IPOs by sample period

The dependent variable is the equally weighted monthly percentage return on a portfolio of IPOs that have gone public during the prior 36 months. A coefficient of -0.18 represents underperformance of 18 basis points per month. r_{pt} - r_{ft} is the excess return over the risk-free rate on a portfolio in time period t, r_{mt} - r_{ft} is the realization of the market risk premium in period t, SMB_t is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period t, and HML_t is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period t. The Fama-French factor returns are supplied by Kenneth French, using "research factors" with annual rebalancing, as distinct from "benchmark factors" with quarterly rebalancing. Purged (decontaminated) HML and SMB factors have been constructed after purging from the universe of firms all stocks that publicly issued equity for cash during the prior five years, or have been CRSP-listed for less than five years. T-statistics are in parentheses.

$$r_{pt} - r_{ft} = a + b(r_{mt} - r_{ft}) + sSMB_t + hHML_t + e_{pt}$$

	a	b_t	s_t	h_t	R^2_{adj}
Panel A: The Fama – French method, IPOs					
Jan 1973 – Dec 1989 (N=204)	-0.18	1.02	1.33	-0.16	89%
	(-0.96)	(23.60)	(19.97)	(-2.21)	
Jan 1990 – Dec 1999 (N=120)	-0.12	1.04	1.24	-0.17	88%
	(-0.57)	(17.15)	(16.61)	(-1.99)	
Jan 1990 – Dec 2000 (N=132)	-0.47	1.11	0.97	-0.26	86%
	(-1.82)	(15.36)	(13.00)	(-2.76)	
Jan 2000 – Dec 2003 (N=48)	0.86	1.67	0.81	-0.49	82%
	(0.88)	(8.57)	(4.04)	(-1.91)	
Panel B: HML and SMB are purged of new issues, IPOs					
Jan 1973 – Dec 1989 (N=204)	-0.38	1.11	1.31	-0.11	87%
	(-1.84)	(24.22)	(16.75)	(-1.28)	
Jan 1990 – Dec 1999 (N=120)	-0.20	1.16	1.19	-0.29	84%
	(-0.81)	(16.43)	(13.40)	(-2.50)	
Jan 1990 – Dec 2000 (N=132)	-0.46	1.17	1.10	-0.41	84%
	(-1.66)	(15.16)	(12.90)	(-3.77)	
Jan 2000 – Dec 2003 (N=48)	0.41	1.75	1.02	-0.65	81%
	(0.42)	(8.94)	(4.28)	(-2.35)	

Table 5
Underperformance of SEOs by issue volume, 1973 to 1996

The sample period is January 1973 to December 1996 (288 months). The dependent variable is the equally weighted monthly percentage return on a portfolio of SEOs that have gone public during the prior 36 months. A coefficient of -0.39 represents underperformance of 39 basis points per month. r_{pt} - r_{ft} is the excess return over the risk-free rate on a portfolio in time period t, r_{mt} - r_{ft} is the realization of the market risk premium in period t, SMB_t is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period t, and HML_t is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period t. The Fama-French factor returns are supplied by Kenneth French, using "research factors" with annual rebalancing, as distinct from "benchmark factors" with quarterly rebalancing. Purged (decontaminated) HML and SMB factors have been constructed after purging from the universe of firms all stocks that publicly issued equity for cash during the prior five years, or have been CRSP-listed for less than five years. The 144 months when the ratio of recent equity issuers (IPOs + SEOs) to the total number of domestic operating firms on CRSP is highest are defined as high-volume markets. The other 144 months are designated as low-volume markets. The first row of each panel uses all months, the second row uses months with low-volume markets, and the third row uses months with high-volume markets. T-statistics are in parentheses.

$$r_{pt} - r_{ft} = a + b(r_{mt} - r_{ft}) + sSMB_t + hHML_t + e_{pt}$$

	a	b_t	s_t	h_t	R^2_{adj}
Panel A: The Fama – French method, SEOs					
All	-0.39	1.15	1.03	-0.13	96%
	(-4.57)	(54.37)	(32.60)	(-3.77)	
Low volume markets	-0.33	1.16	1.02	-0.12	95%
	(-2.40)	(35.51)	(19.56)	(-2.13)	
High volume markets	-0.44	1.14	1.02	-0.14	97%
	(-4.27)	(41.80)	(24.99)	(-3.10)	
Panel B: HML and SMB are purged of new issues, SEOs					
All	-0.52	1.21	1.03	-0.12	94%
	(-5.26)	(50.97)	(26.89)	(-2.66)	
Low volume markets	-0.36	1.21	1.01	-0.10	94%
	(-2.38)	(35.61)	(17.50)	(-1.44)	
High volume markets	-0.68	1.21	1.04	-0.13	94%
	(-5.15)	(36.00)	(19.04)	(-2.11)	

Table 6
Underperformance of SEOs by issue volume, 1973 to 2003

The sample period is January 1973 to December 2003 (372 months). The dependent variable is the equally weighted monthly percentage return on a portfolio of SEOs that have gone public during the prior 36 months. A coefficient of -0.49 represents underperformance of 49 basis points per month. r_{pt} - r_{ft} is the excess return over the risk-free rate on a portfolio in time period t, r_{mt} - r_{ft} is the realization of the market risk premium in period t, SMB_t is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period t, and HML_t is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period t. The Fama-French factor returns are supplied by Kenneth French, using "research factors" with annual rebalancing, as distinct from "benchmark factors" with quarterly rebalancing. Purged (decontaminated) HML and SMB factors have been constructed after purging from the universe of firms all stocks that publicly issued equity for cash during the prior five years, or have been CRSP-listed for less than five years. The 186 months when the ratio of recent equity issuers to the total number of domestic operating firms on CRSP is highest are defined as high-volume markets. The other 186 months are designated as low-volume markets. The first row of each panel uses all months, the second row uses months with low-volume markets, and the third row uses months with high-volume markets. T-statistics are in parentheses.

$$r_{pt} - r_{ft} = a + b(r_{mt} - r_{ft}) + sSMB_t + hHML_t + e_{pt}$$

	a	b_t	s_t	h_t	R^2_{adj}
Panel A: The Fama – French method, SEOs					
All	-0.49	1.21	0.84	0.03	93%
	(-4.67)	(49.05)	(26.57)	(0.90)	
Low volume markets	-0.38	1.20	0.97	-0.12	95%
	(-2.85)	(39.11)	(20.64)	(-2.38)	
High volume markets	-0.66	1.18	0.79	0.08	91%
	(-4.21)	(29.74)	(16.68)	(1.31)	
Panel B: HML and SMB are purged of new issues, SEOs					
All	-0.56	1.25	0.91	-0.02	92%
	(-5.20)	(50.39)	(25.52)	(-0.56)	
Low volume markets	-0.45	1.27	0.95	-0.11	93%
	(-2.95)	(38.24)	(16.99)	(-1.63)	
High volume markets	-0.68	1.22	0.89	0.00	91%
	(-4.43)	(31.77)	(17.52)	(0.04)	

Table 7
Underperformance of SEOs by sample period

The dependent variable is the equally weighted monthly percentage return on a portfolio of SEOs that have gone public during the prior 36 months. A coefficient of -0.42 represents underperformance of 42 basis points per month. r_{pt} - r_{ft} is the excess return over the risk-free rate on a portfolio in time period t, r_{mt} - r_{ft} is the realization of the market risk premium in period t, SMB_t is the return on a portfolio of small stocks minus the return on a portfolio of big stocks in period t, and HML_t is the return on a portfolio of value stocks minus the return on a portfolio of growth stocks in period t. The Fama-French factor returns are supplied by Kenneth French, using "research factors" with annual rebalancing, as distinct from "benchmark factors" with quarterly rebalancing. Purged (decontaminated) HML and SMB factors have been constructed after purging from the universe of firms all stocks that publicly issued equity for cash during the prior five years, or have been CRSP-listed for less than five years. T-statistics are in parentheses.

$$r_{pt} - r_{ft} = a + b(r_{mt} - r_{ft}) + sSMB_t + hHML_t + e_{pt}$$

	a	b_t	s_t	h_t	R^2_{adj}
Panel A: The Fama – French method, SEOs					
Jan 1973 – Dec 1989 (N=204)	-0.42	1.13	1.05	-0.16	96%
	(-3.74)	(43.36)	(26.00)	(-3.53)	
Jan 1990 – Dec 1999 (N=120)	-0.51	1.13	0.97	0.10	94%
	(-3.97)	(31.13)	(21.69)	(1.84)	
Jan 1990 – Dec 2000 (N=132)	-0.56	1.19	0.74	0.19	91%
	(-3.51)	(26.55)	(15.94)	(3.20)	
Jan 2000 – Dec 2003 (N=48)	0.34	1.36	0.53	-0.00	88%
	(0.66)	(13.27)	(4.98)	(-0.03)	
Panel B: HML and SMB are purged of new issues, SEOs					
Jan 1973 – Dec 1989 (N=204)	-0.58	1.20	1.06	-0.14	94%
	(-4.54)	(42.29)	(21.81)	(-2.45)	
Jan 1990 – Dec 1999 (N=120)	-0.56	1.21	0.96	0.04	93%
	(-3.98)	(30.85)	(19.45)	(0.58)	
Jan 1990 – Dec 2000 (N=132)	-0.53	1.22	0.83	0.11	92%
	(-3.39)	(28.06)	(17.13)	(1.87)	
Jan 2000 – Dec 2003 (N=48)	0.20	1.40	0.62	-0.05	87%
	(0.38)	(13.45)	(4.93)	(-0.32)	