The New Issues Puzzle: Testing the Investment-Based Explanation

Evgeny Lyandres
Rice University

Le Sun
University of Rochester and Goldman Sachs Asset Management

Lu Zhang
University of Michigan and NBER

An investment factor, long in low-investment stocks and short in high-investment stocks, helps explain the new issues puzzle. Adding the investment factor into standard factor regressions reduces the SEO underperformance by about 75%, the IPO underperformance by 80%, the underperformance following convertible debt offerings by 50%, and Daniel and Titman's (2006) composite issuance effect by 40%. The reason is that issuers invest more than nonissuers, and the investment factor earns a significantly positive average return of 0.57% per month.

Equity and debt issuers underperform matching nonissuers with similar characteristics in the post-issue years (e.g., Ritter, 1991; Loughran and Ritter, 1995; and Spiess and Affleck-Graves, 1995, 1999). We explore empirically the investment-based hypothesis of this underperformance. The q-theory of investment and the real options theory imply a negative relation between real investment and expected returns. If the proceeds from equity and debt issues are used to finance investment, then issuers should invest more and earn lower average returns than matching nonissuers.

We are grateful to Aydoğan Alti, Yakov Amihud, Michael Barclay, Gennaro Bernile, Michael Bradley, Michael Brandt, Alon Brav, Tim Burch, Sergei Davydenko, Bala Dharan, Chris Downing, Evan Dudley, Espen Eckbo, Jeff Fleming, Luis Garcia-Feijóo, Fangjian Fu, Louis Gagnon, Lorenzo Garlappi, Rick Green, John Griffin, Gustavo Grullon, Jay Hartzell, Burton Hollifield, Gautam Kaul, Ambrus Kecskés, Han Kim, Xi Li, Erik Lie, James Linck, Laura Liu, John Long, Øyvind Norli, Lukasz Pomorski, Jay Ritter, David Robinson, Paul Schultz, Richard Sloan, Laura Starks, Paul Tetlock, Sheridan Titman, S. Viswanathan, Jerry Warner, James Weston, Jeff Wurgler, Wei Yang, seminar participants at Duke University, Queens University, Rice University, Texas A&M University, University of Georgia, University of Miami, University of Michigan, University of Rochester, University of Texas at Austin, University of Toronto, the 2005 UBC Summer Finance Conference, the 2005 European Finance Association Annual Meetings, the 2005 Financial Management Association Annual Meetings, the 2005 Finance and Accounting in Tel-Aviv Conference, and the 2006 CRSP Forum for helpful comments. We are especially grateful to Matt Spiegel (the editor) and anonymous referees for extensive and insightful comments. This paper supersedes our working paper previously titled "Investment-Based Underperformance Following Seasoned Equity Offerings." All remaining errors are our own. Address correspondence to Lu Zhang, Finance Department, Stephen M. Ross School of Business, University of Michigan, 701 Tappan, ER 7605 Bus Ad, Ann Arbor MI 48109-1234; and NBER; telephone: (734) 615-4854, fax: (734) 936-0282, e-mail: zhanglu@bus.umich.edu.

doi:10.1093/rfs/hhm058 Advance Access publication December 12, 2007

Our central finding is that a new investment factor, long in low investment-to-assets stocks and short in high investment-to-assets stocks, explains a substantial part of the new issues puzzle. From 1970 to 2005, the investment factor earns a significant average return of 0.57% per month. More important, adding the investment factor into standard factor regressions reduces on average about 75% of the SEO underperformance, 80% of the IPO underperformance, 50% of the underperformance following convertible debt offerings, and 40% of Daniel and Titman's (2006) composite issuance effect.

Our evidence lends support to the investment-based explanation of the new issues puzzle (e.g., Zhang, 2005a; and Carlson, Fisher, and Giammarino, 2006). In their real options model, Carlson et al. argue that firms have expansion options and assets in place prior to equity issuance. This composition is levered and risky. If real investment is financed by equity, then risk and expected returns must decrease because investment extinguishes the risky expansion options.

Inspired by the negative relation between real investment and expected returns first derived by Cochrane (1991), Zhang (2005a) argues that investment is likely to be the main driving force of the new issues puzzle. Intuitively, real investment increases with the net present values (NPVs) of new projects (e.g., Brealey, Myers, and Allen, 2006, chapter 6). The NPVs of new projects are inversely related to their costs of capital or expected returns, given their expected cash flows. If the costs of capital are high, then the NPVs are low, leading to low investment. If the costs of capital are low, then the NPVs are high, leading to high investment. The average costs of equity for firms that take many new projects are reduced by the low costs of capital for the new projects. Further, firms' balance-sheet constraint implies that the sources of funds must equal the uses of funds. Therefore, firms raising capital are likely to invest more and earn lower expected returns, and firms distributing capital are likely to invest less and earn higher expected returns.

Consistent with theoretical predictions, we document that issuers invest more than matching nonissuers. The investment-to-assets spread between issuers and nonissuers is the highest in the IPO sample, followed by the SEO and convertible debt samples, and is the lowest in the straight debt sample. The relative magnitudes of the investment-to-assets spread across the four samples are consistent with the relative magnitudes of the post-issue underperformance. We also document that high composite issuance firms invest more than low composite issuance firms.

Most important, adding the investment factor into standard factor regressions reduces the magnitude of the underperformance following equity offerings. For example, the equal-weighted portfolio of firms that have conducted SEOs in the prior 36 months earns a CAPM alpha of -0.41% per month ($t = -2.43$). Adding the investment factor makes the alpha insignificant and reduces its magnitude by 82% to -0.07% per month. The equal-weighted portfolio of firms that have conducted IPOs in the prior 36 months earns a CAPM alpha of

-0.71% per month ($t = -2.60$). Adding the investment factor makes the alpha insignificant and reduces its magnitude by 59% to -0.29% per month.

The investment factor also helps explain the underperformance following debt offerings. For example, the equal-weighted portfolio of firms that have conducted convertible debt offerings in the prior 36 months earns a CAPM alpha of -0.63% per month ($t = -4.20$). Adding the investment factor reduces the alpha by 46% in magnitude to -0.34%, albeit still significant ($t = -2.04$). The underperformance following straight debt offerings is largely insignificant, except for the equal-weighted Fama-French alpha, -0.26% per month ($t = -2.35$). Adding the investment factor makes the alpha positive, 0.029% per month, and insignificant. The results on buy-and-hold abnormal returns (BHARs) are generally consistent with the factor regressions.

The investment factor explains part of Daniel and Titman's (2006) composite issuance effect. A zero-cost portfolio that buys stocks in the bottom 30% and sells stocks in the top 30% of their composite equity issuance measure earns an equal-weighted alpha of -0.56% per month ($t = -4.38$) from the CAPM. Adding the investment factor reduces the alpha to -0.40% ($t = -3.18$), a drop in magnitude of 28%. The value-weighted alpha from the Fama-French (1993) model is -0.36% per month ($t = -3.57$), and it drops by 57% in magnitude to -0.16% ($t = -1.49$) after we include the investment factor.

Our paper brings the insights from the theoretical literature on investment-based asset pricing to the empirical literature on the new issues puzzle. Our use of investment-to-assets as a key matching characteristic is motivated by the partial equilibrium models of Cochrane (1991, 1996); Carlson, Fisher, and Giammarino (2004, 2006); and Zhang (2005a, 2005b). Our use of the investment factor as a common factor of stock returns is motivated by the general equilibrium models of Gala (2005) and Pástor and Veronesi (2005).

Several papers document the negative relation between investment and average returns. Cochrane (1991) is among the first to show this relation in the time series. Titman, Wei, and Xie (2004) find a similar relation in the cross section but interpret the evidence as investors underreacting to overinvestment. Anderson and Garcia-Feijóo (2006) find that investment growth classifies firms into size and book-to-market portfolios. Anderson and Garcia-Feijóo (p. 191) also anticipate our analysis: "Many studies examine long-run returns to firms subsequent to new security offerings and report negative abnormal returns. Benchmarking long-run returns to changes in investment spending that may coincide with financing events might attenuate abnormal returns." Xing (2006) shows that real investment helps explain the value effect. Cooper, Gulen, and Schill (2007) report that the annual assets growth rate is the most important predictor in the cross section of returns, and interpret their evidence as investor overreaction. In contrast, we focus on the new issues puzzle, and interpret our evidence as consistent with the optimal investment behavior of firms.

Brav and Gompers (1997) and Brav, Geczy, and Gompers (2000) document that equity issuers are concentrated among small-growth firms, and suggest that their underperformance reflects the Fama-French (1993) size and book-to-market effects. Our evidence suggests that, because both equity issuers and small-growth firms invest more than other types of firms, real investment is likely to be the common link and the more fundamental driving force of their underperformance. Eckbo, Masulis, and Norli (2000) show that a six-factor macroeconomic model can explain the new issues puzzle. We show that using the investment factor is often sufficient. Carlson, Fisher, and Giammarino (2005) find that the market beta increases prior to seasoned equity issuance and declines thereafter. Our analysis differs because, instead of using the conditional CAPM framework, we augment traditional factor models with the investment factor.

The rest of the article is organized as follows. Section 1 develops the testable hypothesis. Section 2 describes our data. Section 3 reports the empirical results and Section 4 concludes.

1. Hypothesis Development

The investment-based explanation of the new issues puzzle argues that the post-issue underperformance is driven by the combination of two effects. First, the relation between real investment and expected returns is negative. Second, if firms issue new equity and debt to finance real investment, then issuers should earn lower expected returns than nonissuers.

1.1 Theoretical motivation

Figure 1 illustrates the negative relation between real investment and expected returns, a central prediction in the recent literature on investment-based asset pricing. Cochrane (1991) derives the negative investment-return relation from the q-theory of investment. In his model, firms invest more when their marginal q—the net present value of future cash flows generated from one additional unit of capital—is high. Controlling for expected cash flows, a high marginal q is associated with a low cost of capital. In the real options model of Carlson, Fisher, and Giammarino (2004), expansion options are riskier than assets in place. Real investment transforms riskier expansion options into less risky assets in place, thereby reducing risk and expected returns.[1]

These partial equilibrium models motivate real investment as a characteristic related to risk. In contrast, general equilibrium models help motivate a zero-cost portfolio sorted on real investment as a systematic, common factor in the cross section of returns. Gala (2005) constructs a general equilibrium production economy with heterogeneous firms. In his model, a firm's ability to provide consumption insurance depends on its ability to mitigate aggregate business cycle shocks through capital investment. Pástor and Veronesi (2005) develop

[1] The basic mechanisms in the real options and the q-theory models are qualitatively similar because the two approaches are mathematically equivalent (e.g., Abel, Dixit, Eberly, and Pindyck, 1996).

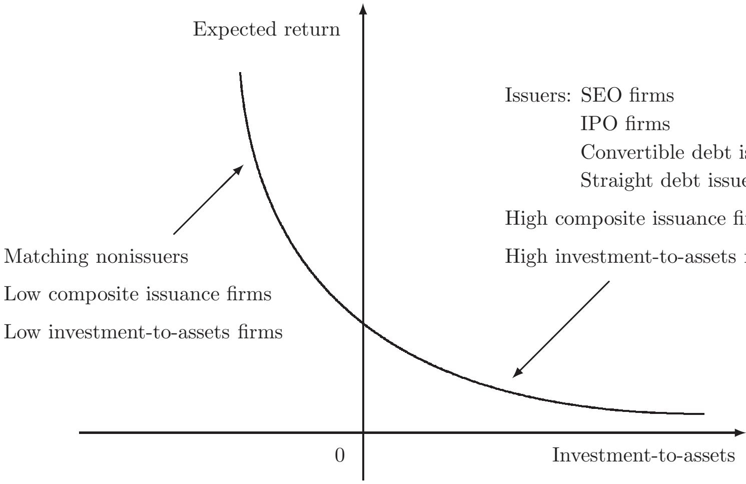

Figure 1
The investment-based explanation of the new issues puzzle

a general equilibrium model of optimal timing of initial public offerings, in which IPO waves are partially caused by declines in expected market returns. In their model, real investment of IPO firms can serve as a state variable—high investment suggests low expected market returns, high aggregate profitability, or both.[2]

Because capital raised from seasoned equity is likely to be invested, Zhang (2005a) and Carlson, Fisher, and Giammarino (2006) argue that SEO firms must earn lower expected returns than matching nonissuers. Intuitively, the balance-sheet constraint requires that the uses of funds must equal the sources of funds: Issuers are thus likely to invest more and earn lower average returns than nonissuers. More generally, this intuition also applies to the underperformance following IPOs (e.g., Ritter, 1991) and convertible and straight debt offerings (e.g., Spiess and Affleck-Graves, 1999), as well as the composite issuance effect (e.g., Daniel and Titman, 2006). To illustrate this point, Figure 1 shows that issuers are located at the right end of the curve, where expected returns are low, and nonissuers are located at the left end of the curve, where expected returns are high.

The investment-based explanation of the new issues puzzle and, more generally, the negative investment-return relation are conditional on a given level of profitability. High investment can result not only from low costs of capital, but also from high expected cash flows (profitability). More-profitable firms earn higher average returns than less-profitable firms (e.g., Piotroski, 2000; and

[2] Gomes, Kogan, and Zhang (2003) also construct a dynamic general equilibrium production economy to explicitly link expected returns to firm characteristics. However, Gomes et al. assume that each new project is allocated to a randomly chosen firm. As a result, there is no firm-level relation between real investment and expected returns in their economy.

Fama and French, 2006). Our results show that the differences in investment between issuers and nonissuers, rather than the differences in profitability, drive the new issues puzzle (see Section 3.3).

1.2 Empirical design

Our choice of empirical methods echoes the theoretical themes by using both the investment factor as a common factor of stock returns and investment as a matching characteristic.

Motivated by the partial equilibrium models (e.g., Cochrane, 1991; Zhang, 2005a; and Carlson, Fisher, and Giammarino, 2006), we examine the performance of issuers relative to matching nonissuers with similar characteristics including prior investment-to-assets ratios. The theoretical prior is that matching on investment-to-assets should reduce the magnitudes of buy-and-hold abnormal returns documented by previous studies that do not match on investment-to-assets. Motivated by the general equilibrium models (e.g., Gala, 2005; and Pástor and Veronesi, 2005), we add the investment factor into standard factor regressions. The theoretical prior is that doing so should reduce the magnitudes of the alphas documented by previous studies that do not include the investment factor.

Following Fama and French (1993, 1996), we interpret the investment factor as a common factor of stock returns. Fama and French go further and interpret their similarly constructed SMB and HML factors as risk factors motivated from ICAPM or APT. We do not take a stance on the risk interpretation of the investment factor. Arguments supporting the risk interpretation are clear. None of the theoretical papers that we use to motivate the investment factor assume any form of over- or underreaction. And unlike size and book-to-market, investment-to-assets does not involve the market value of equity and is therefore less likely to be affected by mispricing, at least directly.

General equilibrium models with behavioral biases (e.g., Barberis, Huang, and Santos, 2001), however, also can motivate the investment factor.[3] Moreover, investor sentiment can presumably affect investment policy through shareholders' discount rates (e.g., Polk and Sapienza, 2006). Perhaps more important, covariance-based and characteristic-based explanations of the average-return variations are not mutually exclusive, in contrast to the position taken by Daniel and Titman (1997) and Davis, Fama, and French (2000). Under certain conditions, there exists a one-to-one mapping between covariances and characteristics, suggesting that they are both sufficient statistics for expected returns (e.g., Zhang, 2005a). Accordingly, our goal is to search for a theoretically motivated and empirically parsimonious factor structure that can explain anomalies in asset pricing tests.

[3] More important, Barberis, Huang, and Santos's (2001) model does not admit over- or underreaction, and is therefore rational. Barberis et al. write that (p. 5): "While we do modify the investor's preferences to reflect experimental evidence about the sources of utility, the investor remains rational and dynamically consistent throughout."

2. Data

We examine four types of offerings: IPOs, SEOs, convertible debt issues, and straight debt issues. All four samples are from Thomson Financial's SDC database. The IPO, SEO, and convertible debt samples are from 1970 to 2005. The straight debt sample is from 1983 to 2005 because of data availability. We obtain monthly returns from the Center for Research in Security Prices (CRSP) and accounting information from the COMPUSTAT Annual Industrial Files. The monthly returns of the Fama and French (1993) factors and the risk-free rate are from Kenneth French's Web site.

Our sample selection largely follows previous studies.[4] To be included, a security offering must be performed by a U.S. firm that has returns on CRSP at some point during the three post-issue years. We exclude unit offerings and secondary offerings of SEOs, in which new shares are not issued. For SEOs, our results are also robust to the exclusion of mixed offerings. (A mixed offering is a combination of a primary offering, in which new shares are issued, and a secondary offering, in which shares change ownership but no new equity is issued). We exclude equity and debt offerings of firms that trade on exchanges other than NYSE, AMEX, and NASDAQ. Similar to Brav, Geczy, and Gompers (2000) and Eckbo, Masulis, and Norli (2000), we include utilities in our sample. Following Loughran and Ritter, we define utilities as firms with SIC codes ranging between 4910 and 4949. Excluding utilities does not materially impact our results (not reported). One possible reason is that the fraction of utilities in each sample is small: 6% for SEOs, 0.4% for IPOs, 2% for convertible debt issues, and 8% for straight debt issues. Further, many firms issue multiple tranches of debt on the same date. We deal with this issue by aggregating the amount issued on a given day but separating straight and convertible debt issues.

For each sample, Table 1 reports the number of offerings for each year, the number of offerings by non-utilities, and the number of offerings with valid data on size, book-to-market, and investment-to-assets.[5] These characteristics are used to select matching nonissuers. Our samples include 10,084 SEOs, 7732 IPOs, 1215 convertible debt offerings, and 2969 straight debt offerings. Because of the long sample period, our samples are among the largest in the literature. For comparison, Eckbo, Masulis, and Norli's (2000) sample includes 4766 SEOs; Loughran and Ritter's (1995) sample contains 3702 SEOs and 4753 IPOs; and Brav, Geczy, and Gompers's (2000) sample includes 4526 SEOs and 4622 IPOs. Spiess and Affleck-Graves's (1995, 1999)

---

[4] These studies include Loughran and Ritter (1995), Spiess and Affleck-Graves (1995), Eckbo, Masulis, and Norli (2000), Brav, Geczy, and Gompers (2000), and Mitchell and Stafford (2000) for SEOs; Loughran and Ritter (1995), Brav, Geczy, and Gompers (2000), and Eckbo and Norli (2005) for IPOs; and Lee and Loughran (1998) and Spiess and Affleck-Graves (1999) for straight and convertible debt offerings.

[5] We follow Brav, Geczy, and Gompers (2000) and Eckbo, Masulis, and Norli (2000) in including firms that perform multiple issues in our samples. Excluding such firms yields quantitatively similar results (not reported).

Table 1
The numbers of seasoned equity offerings, initial public offerings, convertible debt offerings, and straight debt offerings (1970–2005)

	Panel A: SEOs			Panel B: IPOs			Panel C: Convertible Debts			Panel D: Straight Debts		
Year	All	Non-Util	MBI	All	Non-Util	MBI	All	Non-Util	MBI	All	Non-Util	MBI
1970	55	45	32	1	1	1	18	18	12			
1971	143	132	103	0	0	0	40	39	26			
1972	146	135	118	22	22	12	16	16	13			
1973	73	60	45	37	37	17	6	6	3			
1974	32	19	21	5	4	3	4	4	3			
1975	92	67	73	5	5	3	14	14	13			
1976	115	91	96	28	28	23	13	12	9			
1977	74	53	64	20	20	13	9	8	5			
1978	110	89	87	18	18	13	7	7	4			
1979	103	81	83	43	43	31	18	18	11			
1980	226	199	184	70	70	52	62	62	49			
1981	223	199	173	195	193	157	64	63	42			
1982	234	204	166	67	67	46	42	42	33			
1983	535	514	439	416	416	294	70	70	52	15	13	9
1984	148	130	102	195	194	123	46	43	30	36	33	19
1985	269	257	167	210	209	143	93	91	62	61	56	43
1986	331	318	201	418	418	264	137	137	105	44	41	32
1987	209	200	165	332	331	205	104	101	72	35	33	20
1988	97	88	75	178	176	85	22	22	17	46	43	27
1989	165	148	123	149	148	94	47	46	37	83	80	50
1990	114	106	86	130	130	84	30	28	23	79	74	57
1991	343	325	271	271	271	206	27	27	20	125	116	86
1992	347	321	238	417	416	312	54	54	43	216	195	141
1993	526	502	373	580	577	394	58	58	42	264	248	177
1994	349	337	242	441	438	315	22	22	13	151	145	97
1995	470	461	339	395	395	326	30	30	25	232	228	140
1996	594	583	449	642	641	530	28	28	26	223	208	155
1997	583	574	381	468	467	382	32	31	27	243	233	153
1998	449	441	267	298	297	218	17	17	15	236	218	170
1999	377	372	313	450	448	349	23	21	20	162	148	119
2000	353	345	303	325	323	292	32	32	31	131	113	93
2001	371	352	248	115	114	65	28	27	26	182	157	134
2002	373	352	249	162	160	67	6	6	4	142	123	104
2003	461	438	292	125	125	55	9	7	7	134	118	87
2004	544	514	369	281	279	170	4	3	4	78	70	45
2005	450	436	261	223	221	2	5	5	5	51	44	21
All	10084	9488	7198	7732	7702	5346	1237	1215	929	2969	2737	1979

This table reports the number of observations in the samples of seasoned equity offerings (panel A), initial public offerings (panel B), convertible debt offerings (panel C), and straight debt offerings (panel D). In all panels, the column labeled "All" reports the total number of sample observations in the SDC having stock returns available on CRSP at some point during the three-year post-issue period. The column labeled "Non-Util" reports the number of non-utility sample observations. Firms with SIC codes ranging between 4910 and 4949 are considered utilities. The column labeled "MBI" reports the number of the sample points that have valid data of market value, book-to-market equity, and investment-to-assets ratios in COMPUSTAT.

samples include 1247 SEOs, 1557 straight debt offerings, and 672 convertible debt offerings.

To study the frequency distribution of issuers across size and book-to-market quintiles, we assign issuers to quintiles using the breakpoints from Kenneth French's Web site. For firms that have issued in the period from July of year t to June of year $t+1$, we determine the size and book-to-market quintiles at the fiscal year-end of calendar year $t-1$. If size or book-to-market is missing at that time (frequently for IPOs), we use the first available size and book-to-market if the available dates are no later than 12 months after the offering (24 months for IPOs).

Following Fama and French (1993), we measure the market value as the share price at the end of June times the number of shares outstanding. Book equity is stockholder's equity (item 216) minus preferred stock plus balance sheet deferred taxes and investment tax credit (item 35) if available, minus post-retirement benefit asset (item 330) if available. If stockholder's equity is missing, we use common equity (item 60) plus preferred stock par value (item 130). If these variables are missing, we use book assets (item 6) less liabilities (item 181). Preferred stock is preferred stock liquidating value (item 10), or preferred stock redemption value (item 56), or preferred stock par value (item 130) in that order of availability. To compute book-to-market, we use December closing price times number of shares outstanding.

Table 2 presents the frequency distribution of issuing firms and the relative amount of capital raised in the offerings. From the left four panels, small firms are more likely than large firms to issue equity and convertible debt, but are less likely to issue straight debt. Growth firms are more likely than value firms to issue equity and convertible debt and, to a lesser extent, straight debt. From panel A, small-growth firms perform 19% of SEOs, and big-value firms account for only 0.52% of SEOs. From panel B, the difference in issuing frequency is even wider for IPOs: 32% of IPOs are conducted by small-growth firms, in contrast to only 0.11% by big-value firms.

Panel C of Table 2 shows that the frequency distribution of the convertible debt sample is similar to that of the SEO sample. Twelve percent of the convertible debt issues are performed by small-growth firms, in contrast to only 0.58% undertaken by big-value firms. Prior studies show that small-growth firms have higher investment-to-assets ratios than other firms (e.g., Anderson and Garcia-Feijóo, 2006; and Xing, 2006). Our evidence that these firms are also the most frequent equity and convertible debt issuers is thus suggestive of the role of real investment in driving the new issues puzzle.[6]

The right four panels of Table 2 report the median new issue-to-assets ratios of issuers by size and book-to-market quintiles. We measure the new issue-to-assets ratio as the proceeds from the new shares/bonds issued (gross proceeds from primary parts of the issues) from SDC divided by the book value of assets at the fiscal year-end preceding the issue. Because of data limitations in the case of IPOs, we use the pre-IPO book value of assets from SDC, as in Loughran and Ritter (2004).

The distribution of the median new issue-to-assets is similar to the frequency distribution reported in the left panels of Table 2. Small-growth firms not only issue more frequently but also issue more as a percentage of their book

[6] Brav, Geczy, and Gompers (2000) report similar frequency distributions for SEO and IPO samples.

Table 2
The frequency distribution and the new issue-to-assets ratio of SEOs, IPOs, convertible debt offerings, and straight debt offerings across size and book-to-market quintiles (1970–2005)

Panel A:	Frequency distribution, SEOs						New issue-to-assets, SEOs				
	Small	2	3	4	Big	All	Small	2	3	4	Big
Low	18.92	9.56	5.68	3.59	3.08	40.84	0.689	0.318	0.182	0.076	0.012
2	8.30	4.20	3.00	2.10	1.26	18.86	0.337	0.144	0.069	0.030	0.016
3	6.69	3.45	2.61	1.65	1.13	15.52	0.217	0.075	0.044	0.028	0.018
4	7.21	3.34	2.21	1.38	1.03	15.17	0.136	0.052	0.030	0.019	0.013
High	5.73	1.44	1.23	0.69	0.52	9.61	0.104	0.035	0.031	0.013	0.010
All	46.84	21.99	14.73	9.42	7.02	100					

Panel B:	Frequency distribution, IPOs						New issue-to-assets, IPOs				
	Small	2	3	4	Big	All	Small	2	3	4	Big
Low	31.90	13.72	6.43	3.05	1.09	56.19	1.137	0.972	1.170	1.187	0.980
2	14.11	3.58	1.21	0.47	0.33	19.70	0.646	0.313	0.114	0.262	0.030
3	7.72	1.84	0.84	0.40	0.28	11.09	0.575	0.323	0.228	0.210	0.015
4	6.09	1.18	0.55	0.31	0.20	8.33	0.534	0.555	0.089	0.030	0.014
High	3.60	0.50	0.26	0.22	0.11	4.69	0.343	0.053	0.080	0.009	0.001
All	63.42	20.82	9.30	4.45	2.01	100					

Panel C:	Frequency distribution, convertible debts						New issue-to-assets, convertible debts				
	Small	2	3	4	Big	All	Small	2	3	4	Big
Low	12.12	9.62	7.69	6.15	6.06	41.63	0.672	0.514	0.356	0.243	0.111
2	9.81	5.38	3.56	3.27	2.60	24.62	0.429	0.294	0.213	0.101	0.049
3	3.94	4.23	2.12	2.88	1.73	14.90	0.377	0.144	0.101	0.072	0.042
4	4.42	2.31	1.63	1.54	1.06	10.96	0.188	0.066	0.083	0.048	0.011
High	3.46	2.12	1.15	0.58	0.58	7.88	0.191	0.062	0.045	0.039	0.027
All	33.75	23.65	16.15	14.42	12.02	100					

Panel D:	Frequency distribution, straight debts						New issue-to-assets, straight debts				
	Small	2	3	4	Big	All	Small	2	3	4	Big
Low	1.74	1.55	2.11	4.52	12.11	22.03	0.714	0.343	0.256	0.134	0.069
2	0.70	1.44	3.63	5.04	10.33	21.14	0.551	0.341	0.252	0.127	0.043
3	1.00	2.74	3.81	6.92	8.55	23.03	0.325	0.245	0.135	0.080	0.024
4	1.67	3.55	4.48	4.63	7.37	21.70	0.288	0.170	0.082	0.051	0.024
High	2.11	2.18	2.11	2.74	2.96	12.11	0.233	0.112	0.067	0.019	0.015
All	7.22	11.48	16.14	23.84	41.32	100					

This table reports the frequency distribution (in percent) and the median new issue-to-assets ratio across size and book-to-market quintiles for the SEO sample (panel A), the IPO sample (panel B), the convertible debt sample (panel C), and the straight debt sample (panel D). In each panel, the left subpanel reports the frequency distribution defined as the ratio (in percent) of the number of observations in a given size and book-to-market quintile divided by the total number of observations. The right subpanel reports the median new issue-to-assets ratio measured as the gross proceeds from new primary shares/bonds issued (from the SDC), divided by the book value of assets (COMPUSTAT annual item 6) at the end of the fiscal year preceding the issue of seasoned equity, convertible debt, and straight debt. Because of data limitations in the case of IPOs, we use pre-IPO book value of assets from SDC. We calculate size as the price per share at the end of June times the number of shares outstanding. We define book equity as stockholder's equity (item 216), minus preferred stock, plus balance sheet deferred taxes and investment tax credit (item 35) if available, minus post-retirement benefit asset (item 330) if available. If stockholder's equity value is missing, we use common equity (item 60) plus preferred stock par value (item 130). We measure preferred stock as preferred stock liquidating value (item 10) or preferred stock redemption value (item 56) or preferred stock par value (item 130) in that order of availability. If these variables are missing, we use book assets (item 6) minus liabilities (item 181). To calculate the book-to-market ratio, we use the market size at the end of the fiscal year times the number of shares outstanding. The breakpoints of size and book-to-market quintiles are from Kenneth French's Web site.

assets than big-value firms. From panel A, the median new seasoned equity-to-asset ratio of small-growth firms is 0.69. In contrast, the median ratio of big-value firms is only 0.01. Spreads of similar magnitudes are also present in the convertible and straight debt samples (panels C and D). From panel B, the IPO sample displays an even wider spread: The median new equity-to-asset ratio of small-growth firms is 1.137, in contrast to that of big-value firms, 0.001.

3. Empirical Results

We study the role of investment in driving the new issues puzzle using factor regressions (Section 3.1) and buy-and-holding abnormal returns (Section 3.2). Section 3.3 examines the investment and profitability behavior for issuers and matching nonissuers. Inspired by Daniel and Titman (2006), we study the link between investment and the composite issuance portfolio returns in Section 3.4.

3.1 Factor regressions

3.1.1 Evidence on the new issues puzzle. We measure the post-issue underperformance as Jensen's alphas in factor regressions. Lyon, Barber, and Tsai (1999) argue that factor regressions are one of the two methods that yield well-specified test statistics. (The other approach is buy-and-hold abnormal returns (BHARs); see Section 3.2.)

We use the CAPM and the Fama and French (1993) three-factor model. The dependent variables in the regressions are the new issues portfolio returns in excess of the one-month treasury bill rate. The new issues portfolios, including the SEO, IPO, convertible debt, and straight debt portfolios, consist of all firms that have issued seasoned equity, gone public, issued convertible debt, and issued straight debt in the past 36 months, respectively. Using firms that have issued in the prior 60 months yields similar results (not reported). Loughran and Ritter (2000) argue that the power of the tests can increase if we weight each firm equally, instead of weighting each period equally. We therefore estimate factor regressions using weighted least squares (WLS), in which the weight of each month corresponds to the number of event firms having non-missing returns during that month, as in Spiess and Affleck-Graves (1999). Using ordinary least squares yields similar results (not reported).

Table 3 reports strong evidence of underperformance following equity issuance (panels A and B). From panel A, the equal-weighted alpha from the CAPM regression of the SEO portfolio is −0.41% per month ($t = -2.43$), and that from the Fama-French (1993) model is −0.39% per month ($t = -3.52$). The value-weighted alphas are similar in magnitude. From panel B, the post-issue underperformance of IPOs from the CAPM is larger in magnitude than that of SEOs. The equal-weighted and value-weighted CAPM alphas of the IPO portfolio are −0.71% and −0.82% per month ($t = -2.60$ and -3.03), respectively. The alphas of the IPO portfolios from the Fama-French model are close to those of the SEO portfolios.

Table 3
Calendar-time factor regressions for the new issues portfolio excess returns (January 1970–December 2005)

	Panel A: SEOs				Panel B: IPOs			
	Equal weighted		Value weighted		Equal weighted		Value weighted	
	CAPM	Fama-French	CAPM	Fama-French	CAPM	Fama-French	CAPM	Fama-French
α	−0.407	−0.389	−0.435	−0.354	−0.713	−0.429	−0.816	−0.445
	(−2.43)	(−3.52)	(−3.76)	(−3.04)	(−2.60)	(−2.18)	(−3.03)	(−1.91)
MKT	1.291	1.173	1.200	1.145	1.349	1.117	1.438	1.182
	(34.00)	(34.17)	(34.19)	(29.35)	(22.89)	(19.46)	(21.07)	(20.05)
SMB		0.735		0.067		0.908		0.307
		(10.71)		(0.34)		(8.41)		(3.07)
HML		0.015		−0.118		−0.259		−0.552
		(0.29)		(−1.93)		(−2.86)		(−4.88)
Adj. R^2	78%	92%	88%	88%	64%	85%	73%	81%

	Panel C: Convertible debt issues				Panel D: Straight debt issues			
	Equal weighted		Value weighted		Equal weighted		Value weighted	
	CAPM	Fama-French	CAPM	Fama-French	CAPM	Fama-French	CAPM	Fama-French
α	−0.631	−0.540	−0.444	−0.257	0.126	−0.261	−0.007	−0.089
	(−4.20)	(−4.72)	(−3.38)	(−2.00)	(0.73)	(−2.35)	(−0.06)	(−0.90)
MKT	1.304	1.199	1.285	1.188	0.877	1.114	0.880	0.978
	(38.98)	(30.91)	(42.41)	(39.77)	(16.01)	(33.13)	(26.38)	(38.17)
SMB		0.707		0.113		0.182		−0.273
		(8.68)		(1.62)		(3.48)		(−7.77)
HML		−0.021		−0.267		0.649		0.128
		(−0.34)		(−4.21)		(13.46)		(3.17)
Adj. R^2	81%	90%	85%	86%	73%	88%	80%	89%

This table reports calendar-time factor regressions for the SEO, IPO, convertible debt, and straight debt portfolio excess returns. The portfolios consist of firms that have conducted SEOs (panel A), IPOs (panel B), convertible debt offerings (panel C), or straight debt offerings (panel D) during the 36 months prior to the month of portfolio formation. We use the CAPM and the Fama and French (1993) three-factor model. We obtain the factor returns of MKT, SMB, and HML from Kenneth French's Web site. We estimate the regressions using weighted least squares, and compute the t-statistics (in parentheses) using the White (1980) heteroskedasticity-consistent standard errors. We also report the adjusted R^2s (Adj. R^2) for all the regressions.

Somewhat surprisingly, Table 3 shows that the equal-weighted SEO underperformance is quantitatively similar in magnitude as the value-weighted underperformance. This evidence differs from that found in previous studies, as summarized by Ritter (2003, Table 3)—that is, the equal-weighted SEO underperformance is larger in magnitude than the value-weighted underperformance.

This difference is the result of our longer sample period. When we restrict our sample to the period comparable to previous studies, we largely replicate existing findings. For example, using the Fama and French (1993) model, Brav, Geczy, and Gompers (2000) report an equal-weighted alpha of −0.37% ($t = -4.81$) and a value-weighted alpha of −0.14% ($t = -1.36$) in their 1975–1992 period. Restricting our sample of SEOs to the same period, we find that the equal-weighted Fama-French alpha is −0.31% ($t = -2.83$) per month, whereas the value-weighted alpha is −0.16% ($t = -1.78$).

One possible reason why the longer sample delivers different results is that the size effect has been attenuated or disappeared since its initial discovery, a point emphasized by Schwert (2003). In particular, using the data from Kenneth French's Web site, we find that the average SMB return in the 1975–1992 period is 0.38% per month ($t = 2.14$). In contrast, the average return of SMB in the 1993–2005 period is almost halved, only 0.21% per month ($t = 0.67$).

Table 3 also reports reliable evidence of underperformance for convertible debt issuers, but not for straight debt issuers (panels C and D). The convertible debt portfolio earns equal-weighted alphas from the CAPM and the Fama-French (1993) model of −0.63% and −0.54% per month, respectively, comparable to those of equity issuers. Both have t-statistics above four. The value-weighted alphas are smaller in magnitude, −0.44% and −0.26%, but still significant ($t = -3.38$ and −2.00), respectively. In contrast, only the equal-weighted alpha from the Fama-French model, −0.26% per month, is significantly different from zero for the straight debt portfolio ($t = -2.35$). Our evidence that convertible debt issuers display higher magnitudes of underperformance than straight debt issuers is consistent with Spiess and Affleck-Graves (1999).

3.1.2 The investment factor. To test the investment hypothesis, we augment traditional factor models with a common factor based on real investment. We construct the investment factor as the zero-cost portfolio from buying stocks with the lowest 30% investment-to-assets ratios and selling stocks with the highest 30% investment-to-assets ratios, while controlling for size and book-to-market.

We measure investment-to-assets as the annual change in gross property, plant, and equipment (COMPUSTAT annual item 7) plus the annual change in inventories (item 3) divided by the lagged book value of assets (item 6). We use property, plant, and equipment to measure real investment in long-lived assets used in operations over many years such as buildings, machinery, furniture, computers, and other equipment. We use inventories to measure real investment in short-lived assets used in a normal operating cycle such as merchandise, raw materials, supplies, and work in progress.

We perform a triple sort on size, book-to-market, and investment-to-assets à la Fama and French (1993). We independently sort stocks in each June on size, book-to-market, and investment-to-assets into three groups, the top 30%, the medium 40%, and the bottom 30%. By taking intersections of these nine portfolios, we classify stocks into 27 portfolios. We define the investment factor, denoted INV, as the average returns of the nine low investment-to-assets portfolios minus the average returns of the nine high investment-to-assets portfolios. Formally, let p_{ijk} denote the value-weighted returns of portfolios consisting of firms in the ith group of size, the jth group of book-to-market, and the kth group of investment-to-assets, where $i, j, k = 1, 2, 3$. The investment factor is defined as $\text{INV} \equiv (1/9)\sum_{i=1}^{3}\sum_{j=1}^{3} p_{ij1} - (1/9)\sum_{i=1}^{3}\sum_{j=1}^{3} p_{ij3}$.

In untabulated results, we find that the investment factor earns an average return of 0.57% per month ($t = 7.13$) from January 1970 to December 2005. This average return is economically meaningful. For comparison, the average market excess return over the same period is 0.50% per month ($t = 2.28$) and the average HML return is 0.48% per month ($t = 3.24$). More important, standard factor models cannot capture much of the investment factor's average return or its variation. Regressing the investment factor on the market excess return and the Fama-French (1993) three factors yields alphas of 0.64% and 0.62% per month ($t = 6.98$ and 5.67), respectively. The R^2 is 12.44% in the CAPM regression and 13.05% in the Fama-French three-factor regression. The correlations between the investment factor and the market excess return, HML, and SMB are −0.35, 0.20, and −0.16, respectively. The evidence suggests that the investment factor captures cross-sectional variation in returns largely independent of the commonly used factors.

3.1.3 Factor regressions augmented with the investment factor. Our central finding is that adding the investment factor into standard factor regressions substantially reduces the magnitude of the post-issue underperformance and makes it mostly insignificant.

From panel A of Table 4, the equal-weighted alpha of the SEO portfolio from the CAPM regression decreases by 82% in magnitude from −0.41% to −0.07% per month, and its t-statistic drops from −2.43 to −0.40. The equal-weighted alpha from the Fama-French (1993) model decreases in magnitude from −0.39% to −0.08% per month, a reduction of 78%. Its t-statistic drops from −3.52 to −0.72. The results are similar for the value-weighted returns. The value-weighted CAPM alpha decreases from −0.44% without the investment factor to −0.14% with the investment factor, a reduction of 68% in magnitude. The corresponding t-statistic falls from −3.76 to −1.09. The value-weighted Fama-French alpha drops from −0.35% to −0.05%, a reduction of 85% in magnitude, and its t-statistic declines from −3.04 to −0.44. The loadings of the SEO portfolios on the investment factor are all negative and significant. With magnitudes ranging from −0.38 to −0.44, these loadings are economically important. Given the average return of 0.57% per month for the investment factor, these loadings account for 22–25 basis points per month of the SEO underperformance.

The IPO results are similar. From panel B of Table 4, the equal-weighted CAPM alpha of the IPO portfolio decreases by 59% from −0.71% to −0.29% per month. The t-statistic drops from −2.60 to −0.84. The value-weighted alpha decreases from −0.82% to −0.13% per month, a reduction of 84% in magnitude. And the t-statistic falls from −3.03 to −0.36. The results from the Fama-French (1993) regressions are similar. The equal-weighted alpha decreases by 88% in magnitude from −0.43% to −0.05%. The t-statistic drops

Table 4
Calendar-time factor regressions augmented with the investment factor for the new issues portfolio excess returns (January 1970–December 2005)

	Panel A: SEOs				Panel B: IPOs			
	Equal weighted		Value weighted		Equal weighted		Value weighted	
	CAPM	Fama-French	CAPM	Fama-French	CAPM	Fama-French	CAPM	Fama-French
α	−0.074	−0.084	−0.139	−0.054	−0.292	−0.052	−0.130	0.205
	(−0.40)	(−0.72)	(−1.09)	(−0.44)	(−0.84)	(−0.21)	(−0.36)	(0.69)
MKT	1.238	1.124	1.153	1.097	1.289	1.062	1.345	1.092
	(29.29)	(33.88)	(31.78)	(27.84)	(19.05)	(22.67)	(19.39)	(18.88)
SMB		0.728		0.059		0.897		0.278
		(12.75)		(1.14)		(9.49)		(3.46)
HML		0.010		−0.125		−0.268		−0.566
		(0.22)		(−2.21)		(−3.06)		(−5.33)
INV	−0.437	−0.395	−0.384	−0.384	−0.493	−0.437	−0.728	−0.686
	(−2.74)	(−4.78)	(−4.73)	(−4.99)	(−1.80)	(−2.55)	(−3.04)	(−4.13)
$\|\Delta\alpha\|/\|\alpha\|$	82%	78%	68%	85%	59%	88%	84%	–
Adj. R^2	79%	93%	89%	90%	65%	86%	75%	83%
	Panel C: Convertible debt issues				**Panel D: Straight debt issues**			
	Equal weighted		Value weighted		Equal weighted		Value weighted	
	CAPM	Fama-French	CAPM	Fama-French	CAPM	Fama-French	CAPM	Fama-French
α	−0.338	−0.373	−0.202	−0.071	0.458	0.029	0.156	0.056
	(−2.04)	(−3.26)	(−1.37)	(−0.53)	(2.56)	(0.27)	(1.12)	(0.51)
MKT	1.258	1.176	1.247	1.163	0.829	1.069	0.857	0.956
	(33.94)	(31.86)	(41.76)	(41.92)	(14.85)	(34.33)	(20.95)	(36.14)
SMB		0.694		0.100		0.180		−0.273
		(8.89)		(1.52)		(4.43)		(−9.03)
HML		−0.009		−0.256		0.637		0.121
		(−0.15)		(−4.10)		(15.07)		(3.19)
INV	−0.414	−0.250	−0.334	−0.269	−0.378	−0.321	−0.184	−0.159
	(−3.16)	(−2.09)	(−3.40)	(−2.51)	(−3.31)	(−5.39)	(−1.44)	(−2.59)
$\|\Delta\alpha\|/\|\alpha\|$	46%	31%	55%	72%	–	111%	–	–
Adj. R^2	81%	90%	85%	87%	76%	90%	81%	89%

This table reports calendar-time factor regressions augmented with the investment factor for the SEO, IPO, convertible debt, and straight debt portfolio excess returns. The portfolios consist of firms that have conducted SEOs (panel A), IPOs (panel B), convertible debt offerings (panel C), or straight debt offerings (panel D) during the 36 months prior to the month of portfolio formation. We augment the CAPM and the Fama and French (1993) three-factor model with the investment factor, denoted INV. We construct INV from a triple sort on size, book-to-market, and investment-to-assets. The investment-to-assets ratio is measured as the annual changes in gross property, plant, and equipment (COMPUSTAT annual item 7) plus the annual changes in inventories (item 3) divided by the lagged book value of assets (item 6). In June of each year, we sort all stocks in ascending order independently on size, book-to-market, and investment-to-assets, and classify them into three groups, the top 30%, the medium 40%, and the bottom 30%. We define the investment factor as the average returns of the nine low-investment portfolios minus the average returns of the nine high-investment portfolios. The factor returns MKT, SMB, and HML are from Kenneth French's Web site. We estimate the regressions using weighted least squares, and compute the t-statistics (in parentheses) using the White (1980) heteroskedasticity-consistent standard errors. $|\Delta\alpha|/|\alpha|$ denotes the reductions in alphas from the augmented factor regressions divided by the magnitudes of the corresponding alphas from the CAPM and the Fama-French three-factor model reported in Table 3. We also report the adjusted R^2s (Adj. R^2) for all the regressions.

from −2.18 to −0.21. The value-weighted alpha changes from a marginally significant −0.45% to an insignificant 0.21%. The investment factor loadings of the IPO portfolios are all negative and mostly significant. With magnitudes ranging from −0.44 to −0.73, these loadings are economically important and account for 25–42 basis points per month of the IPO underperformance.

The role of real investment in explaining the post-issue performance of convertible debt offerings is also sizable. Panel C of Table 4 shows that the equal-weighted CAPM alpha of the convertible debt portfolio decreases by 46% in magnitude from −0.63% to −0.34%, albeit still significant ($t = -2.02$). The equal-weighted alpha from the Fama-French (1993) model decreases by 31% from −0.54% to −0.37% ($t = -3.26$). The value-weighted results are somewhat stronger. The CAPM alpha decreases in magnitude by 55% from −0.44% to −0.20% per month, and the Fama-French alpha drops in magnitude by 72% from −0.26% to −0.07%. After adding the investment factor, both value-weighted alphas are no longer significant. The loadings of the convertible debt issuers on the investment factor are all negative and significant. Ranging from −0.25 to −0.41, these loadings explain 14–24 basis points per month of the post-issue underperformance.

From panel D of Table 3, the underperformance of straight debt issuers is significant only in the case of the equal-weighted Fama-French (1993) alpha, −0.26% per month ($t = -2.35$). From panel D of Table 4, adding the investment factor makes the alpha insignificantly positive.

3.1.4 Event-time factor regressions. To provide more detailed evidence on the role of the investment factor in explaining the new issues puzzle, we perform event-time factor regressions à la Ball and Kothari (1989). In contrast to having only one portfolio for a given type of security in calender-time regressions, we construct six different new issues portfolios for a given type of security in event-time regressions. The first portfolio consists of firms that have issued in the prior six months, the second portfolio consists of firms that have issued between 7 and 12 months ago, and so on. The last portfolio consists of firms that have issued between 31 and 36 months ago.

Figure 2 reports the event-time alphas of the new issues portfolios from the Fama-French (1993) factor regressions, with and without the investment factor (the thick broken line and the thick solid line, respectively). The thin broken lines correspond to two-standard-error bounds around the thick broken line. Using the CAPM instead of the Fama-French model yields largely similar results (not reported). The thick broken line in panel A shows that the underperformance of the equal-weighted SEO portfolio appears mostly in the second and third post-issue years. The magnitude of the underperformance from post-event month 13 to 30 is around 0.60% per month and significant. The most severe underperformance, 0.77% per month, appears during months 13–18.

Comparing the thick solid line and the thick broken line in panel A of Figure 2 reveals that the investment factor helps explain the post-issue alphas. The worst underperformance drops by 53% in magnitude to an insignificant level of −0.36% per month. In addition, the alphas in post-issue months 19–24 and 25–30 are close to zero. From the two thin broken lines, none of the alphas in the regressions augmented with the investment factor are significant. Using the value-weighted returns in panel E yields largely similar results.

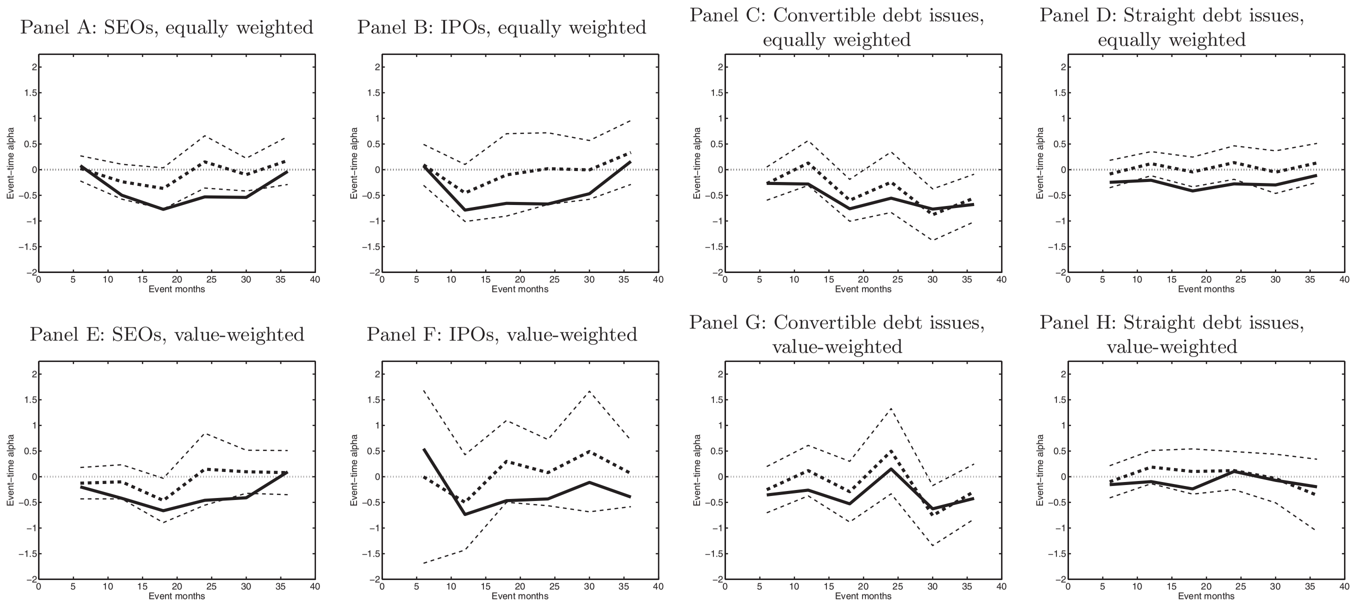

Figure 2
Event-time alphas from regressing the new issues portfolio excess returns on the Fama-French (1993) factors, with and without the investment factor
This figure reports the alphas from event-time factor regressions of SEO (panels A and E), IPO (panels B and F), convertible debt (panels C and G), and straight debt (panels D and H) portfolio excess returns. We perform the event-time factor regressions à la Ball and Kothari (1989). There are six portfolios on the left-hand side of the regressions. The first portfolio consists of firms that have issued a given type of security in the prior six months (1–6), the second portfolio consists of firms that have issued between 7 and 12 months ago (7–12), and so on. The sixth portfolio consists of firms that have issued between 30 and 36 months ago (30–36). There are four lines in each panel. The thick solid line plots the alphas from the event-time regressions of portfolio returns on the Fama-French (1993) three factors. The thick broken line plots the alphas from the event-time Fama-French regressions augmented with the investment factor. The two thin broken lines plot the two-standard-error bounds around the thick broken line. Panels A to D use the equal-weighted returns and panels E to H use the value-weighted returns as the dependent variables. We estimate the regressions using weighted least squares, and calculate the White (1980) heteroskedasticity-consistent standard errors. The investment-to-assets ratio is measured as the annual changes in gross property, plant, and equipment (COMPUSTAT annual item 7) plus the annual changes in inventories (item 3) divided by the lagged book value of assets (item 6). In June of each year, we sort all stocks in ascending order independently on size, book-to-market, and investment-to-assets, and classify them into three groups, the top 30%, the medium 40%, and the bottom 30%. We define the investment factor as the average returns of the nine low-investment portfolios minus the average returns of the nine high-investment portfolios.

The investment factor also plays an important role in explaining the IPO underperformance. From panel B of Figure 2, the equal-weighted IPO underperformance appears mostly in months 7–24 with its magnitude ranging from 0.47% per month in months 19–24 to 0.79% in months 7–12 (the thick solid line). Adding the investment factor eliminates the significance of this underperformance, and reduces its magnitude by 42% to 0.45% per month in months 7–12 and by 99% to 0.004% in months 19–24. From panel F, although the value-weighted IPO underperformance is largely insignificant, its average magnitude of around 0.50% per month in months 13–30 is economically important. Adding the investment factor eliminates this economic importance.

Panels C and G of Figure 2 show that the investment factor plays a more modest role in capturing the underperformance following convertible debt offerings. Although it goes in the right direction, the difference in magnitudes of the underperformance with and without the investment factor is small. The straight debt portfolio shows significant underperformance during months 13–18 using equal-weighted returns (panel D) but not using value-weighted returns (panel H). From panel D, the investment factor largely eliminates the significant equal-weighted underperformance.

3.2 Buy-and-hold abnormal returns

Having shown that the investment factor helps explain the alphas of the new issues portfolios, we now evaluate the role of investment as a matching characteristic. We use the buy-and-hold abnormal returns (BHARs) relative to the returns of reference portfolios (e.g., Lyon, Barber, and Tsai, 1999).[7] Consistent with factor regressions, matching on investment helps explain the new issues puzzle.

We compare BHARs from using two types of reference portfolios. We construct the first type by matching each event firm to a portfolio of firms that (i) have not issued a given type of security in the prior 36 months, and (ii) belong to the same size and book-to-market quintile as the event firm. To construct the second type of reference portfolio, we match each event firm to a portfolio of firms that (i) have not issued a given type of security in the prior 36 months, and (ii) belong to the same size, book-to-market, and investment-to-assets quintile as the event firm. The size and book-to-market breakpoints are from Kenneth French's Web site. We calculate the investment-to-assets breakpoints using all firms that have valid investment-to-assets data.

We match firms on size and book-to-market, with and without matching on investment-to-assets. The reason is that, as argued by Lyon, Barber, and Tsai (1999), firms from non-random samples should be compared to the general population on the basis of characteristics that are the best at explaining the cross section of returns. Size and book-to-market are two such characteristics.

[7] We use BHARs, as opposed to cumulative abnormal returns (CARs), because the CARs are biased predictors of the long-run abnormal returns (e.g., Barber and Lyon, 1997).

We follow Lyon, Barber, and Tsai (1999) to construct the reference portfolios and calculate the BHARs in a way that is sensitive to the new listing bias, the rebalancing bias, and the skewness bias.[8] We assign firms to a reference portfolio only once for each event. We do so in the month of issuance or in the first post-issue month when the size and book-to-market data become available for an event firm, but no later than 12 post-issue months (24 post-issue months for IPOs). Once constructed, the composition of a reference portfolio does not change throughout the holding period, except for delisted firms. Following Lyon et al., we fill the returns of delisted firms with the average monthly returns of the remaining firms in the reference portfolios.

To calculate the BHARs, we first calculate the buy-and-hold returns (BHR) for each event firm for a period ranging from one month to 36 months: $\text{BHR}_{i\tau} = \prod_{t=1}^{\tau}(1 + R_{i\tau}) - 1$, where i is the event-firm index, and τ is the horizon over which BHR is computed. We then compute the buy-and-hold returns for a reference portfolio as: $\text{BHR}_{p_i\tau} = \sum_{j=1}^{n_{p_i}} \frac{\prod_{t=1}^{\tau}(1+R_{jt}^{p_i})-1}{n_{p_i}}$, where p_i is the index for the reference portfolio of the event firm i, n_{p_i} is the number of firms in the reference portfolio, and $R_{jt}^{p_i}$ is the return of firm j in the reference portfolio p_i during the event month t. The mean BHARs are then calculated as $\text{BHAR}_\tau = \frac{\sum_{k=1}^{N_\tau}(\text{BHR}_{k\tau} - \text{BHR}_{p_k\tau})}{N_\tau}$, where N_τ is the number of event firms that have BHRs at the event month τ. Because long-horizon abnormal returns are positively skewed (e.g., Barber and Lyon, 1997; and Lyon, Barber, and Tsai, 1999), standard t-statistics are negatively biased. To control for this skewness bias, we follow Lyon et al. and use the skewness-adjusted t-statistics: $t_\tau = \sqrt{N_\tau}(S + \frac{1}{3}\widehat{\gamma}S^2 + \frac{1}{6N_\tau}\widehat{\gamma})$, where $S = \frac{\text{BHAR}_\tau}{\sigma(\text{BHR}_{i\tau} - \text{BHR}_{p_i\tau})}$ and $\sigma(\text{BHR}_{i\tau} - \text{BHR}_{p_i\tau})$ is the standard deviation of abnormal returns for the sample of N_τ event firms. $\widehat{\gamma} = \frac{\sum_{i=1}^{N_\tau}((\text{BHR}_{i\tau} - \text{BHR}_{p_i\tau}) - \text{BHAR}_\tau)^3}{N_\tau\sigma(\text{BHR}_{i\tau} - \text{BHR}_{p_i\tau})^3}$ is an estimate of the skewness, and $\sqrt{N_\tau}S$ is the conventional t-statistic of BHARs.

Figure 3 reports the BHARs of new issues portfolios during the five post-issue years. From panel A, the BHARs of seasoned equity issuers over the first two and three post-issue years are −21.9% and −34.6%, respectively (the thick solid line). Matching on investment-to-assets reduces the magnitudes of the BHARs by about 26% to −16.1% and −25.2%, respectively (the thick broken line). However, the BHARs remain highly significant. Panel B shows a more important role of real investment in driving the IPO underperformance. Matching on size and book-to-market yields significantly negative BHARs for

[8] The new listing bias arises because sample firms are tracked for a long post-event period, while firms that constitute the reference portfolio include firms that begin trading subsequent to the event month. The rebalancing bias arises because the compounded returns of a reference portfolio are calculated with periodic rebalancing, but the returns of sample firms are compounded without rebalancing. The skewness bias occurs because the distribution of long-run abnormal stock returns is positively skewed. The new listings create a positive bias in test statistics, but the rebalancing and skewness create a negative bias. See Lyon, Barber, and Tsai (1999) for details.

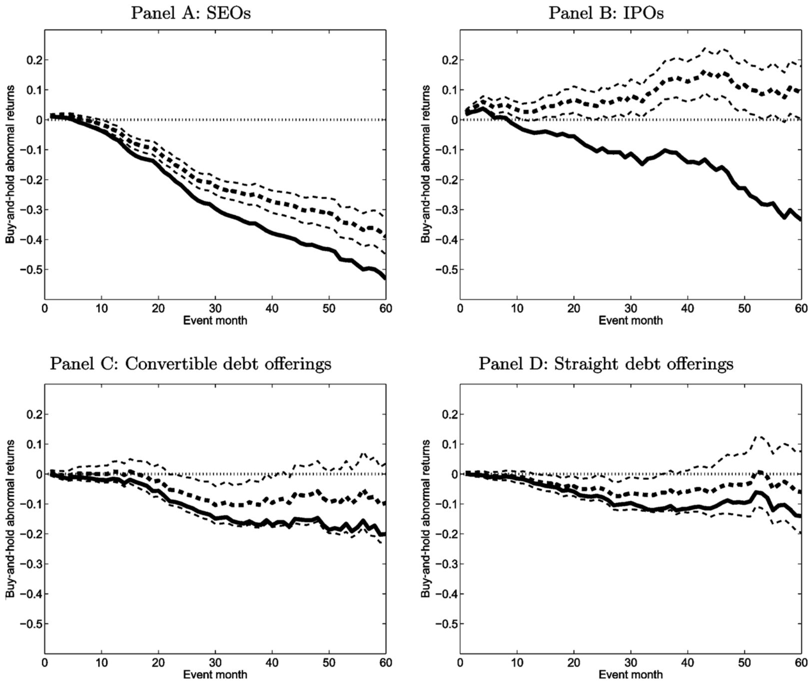

Figure 3
Event-time buy-and-hold abnormal returns of the new issues portfolios during the 60 post-issue months (January 1970–December 2005)
This figure reports the buy-and-hold abnormal returns (BHARs) for the SEO (panel A), IPO (panel B), convertible debt (panel C), and straight debt (panel D) portfolios. The thick solid line reports the mean BHAR relative to the reference portfolio constructed by matching on size and book-to-market. The thick broken line reports the mean BHAR relative to the reference portfolio constructed by matching on size, book-to-market, and investment-to-assets. The two thin broken lines above and below the thick broken line are the corresponding two-standard-error bounds. To calculate the BHARs, we first calculate the buy-and-hold returns (BHR) for each event firm for a period ranging from 1 month to 36 months: $\mathrm{BHR}_{i\tau} = \prod_{t=1}^{\tau}(1 + R_{i\tau}) - 1$, where i is the event-firm index, and τ is the horizon over which BHR is computed. We then compute the buy-and-hold returns for a reference portfolio as $\mathrm{BHR}_{p_i\tau} = \sum_{j=1}^{n_{p_i}} \frac{\prod_{t=1}^{\tau}(1+R_{jt}^{p_i})-1}{n_{p_i}}$, where p_i is the index for the reference portfolio of the event firm i, n_{p_i} is the number of firms in the reference portfolio, and $R_{jt}^{p_i}$ is the return of firm j in the reference portfolio p_i during the event-month t. The mean BHARs are then calculated as $\mathrm{BHAR}_\tau = \frac{\sum_{k=1}^{N_\tau}(\mathrm{BHR}_{k\tau}-\mathrm{BHR}_{p_k\tau})}{N_\tau}$, where N_τ is the number of event firms that have BHRs at the event-month τ. To control for the skewness bias, we follow Lyon, Barber, and Tsai (1999) and use the skewness-adjusted t-statistic $t_\tau = \sqrt{N_\tau}(S + \frac{1}{3}\widehat{\gamma}S^2 + \frac{1}{6N_\tau}\widehat{\gamma})$, where $S = \frac{\mathrm{BHAR}_\tau}{\sigma(\mathrm{BHR}_{i\tau}-\mathrm{BHR}_{p_i\tau})}$ and $\widehat{\gamma} = \frac{\Sigma_{i=1}^{N_\tau}((\mathrm{BHR}_{i\tau}-\mathrm{BHR}_{p_i\tau})-\mathrm{BHAR}_\tau)^3}{N_\tau\sigma(\mathrm{BHR}_{i\tau}-\mathrm{BHR}_{p_i\tau})^3}$, to infer the standard error bounds.

the IPO portfolio, for example, −10.6% by year two and −20.8% by year four. Matching on investment-to-assets eliminates this underperformance.

From Panel C of Figure 3, controlling for investment-to-assets helps explain the underperformance following convertible debt offerings. The BHARs from matching on size and book-to-market are −15.8% and −20% after three and five post-issue years, respectively. Controlling for investment-to-assets reduces this underperformance by 41% and 52% to −9.4% and −9.6%, respectively. The size and book-to-market post-issue BHARs of convertible debt issuers become significant after around month 18. Matching on investment-to-assets largely eliminates this significance.

Panel D of Figure 3 shows that investment also helps explain the post-issue underperformance of straight debt issuers. The underperformance from matching on size and book-to-market is 7.3% and 11.4% by months 24 and 36, respectively. Controlling for investment-to-assets reduces this underperformance by 39% and 46% in magnitude to 4.4% and 6.2%, respectively. The post-issue BHARs of straight debt issuers are significant after month 12. Matching on investment-to-assets largely eliminates this significance.

In general, with the exception of SEOs, the calendar-time results in Tables 3 and 4 are consistent with the event-time results in Figure 3 in that controlling for investment reduces the post-issue underperformance to largely insignificant levels. But the investment factor is much more successful in reducing the SEO underperformance than the investment-to-assets characteristic. There are unresolved difficulties in computing unbiased inferences using buy-and-hold returns, as discussed in, for example, Barber and Lyon (1997), Kothari and Warner (1997), Fama (1998), Mitchell and Stafford (2000), and Butler, Grullon, and Weston (2005). These difficulties might contribute to the differences between the calendar-time and event-time results on SEOs.[9]

In untabulated results, we have computed the BHARs by matching on investment-to-assets alone. As a benchmark, we use the BHARs in which the reference portfolio is the equal-weighted market returns. For the SEO, IPO, and convertible debt samples, matching on investment-to-assets reduces substantially the magnitudes of the BHARs. But for the straight debt sample, the BHARs from the two matching approaches have similar magnitudes. Noteworthy, matching on investment-to-assets alone eliminates the IPO underperformance. Except for the straight debt sample, the incremental explanatory power of investment-to-assets is largely similar to that reported in Figure 3.

3.3 Why does real investment help explain the new issues puzzle?

To shed light on the driving forces behind our results, we examine the investment and profitability behavior for issuers and matching nonissuers with similar size and book-to-market.

3.3.1 Investment. To preview the results, issuers invest more than matching nonissuers for two to three years after issuance. The investment-to-assets spread between issuers and matching nonissuers is the highest in the IPO sample, followed by the SEO and convertible debt samples, and is the lowest in the straight debt sample. Because of the significantly positive average return of

[9] In addition, although our matching procedure is robust to the potential biases identified by Lyon, Barber, and Tsai (1999), the evidence from BHARs is potentially subject to the pseudo-market-timing bias of Schultz (2003). This bias might explain, at least to some extent, why our factor regression results of SEOs are more successful than their corresponding BHAR results.

the low-minus-high investment factor (0.57% per month), the investment-to-assets spread helps explain the new issues puzzle. The relative magnitudes of the investment-to-assets spread are also in line with the relative magnitudes of the underperformance across samples. The underperformance is the highest for IPOs, followed by SEOs and convertible debt issues, and is the lowest for straight debt issues (see Table 3).

To identify the matching portfolio for each issuer of a given type of security, we sort independently all firms that have not issued this type of security in the prior 36 months into size and book-to-market quintiles in each June. We use the breakpoints from Kenneth French's Web site to identify the matching portfolio for each issuer out of the 25 size and book-to-market portfolios. We then compare the median investment-to-assets ratios of the matching portfolios with those of the issuers.

Figure 4 reports the median investment-to-assets ratios for issuers and matching nonissuers during the five post-issue years. Panel A documents a large investment-to-assets spread between seasoned equity issuers and matching nonissuers. In the first two post-issue years, SEO firms have a median investment-to-assets ratio of around 0.15, while the matching nonissuers have a median investment-to-assets ratio of roughly 0.09, about 40% lower. This spread remains stable for two post-issue years, and converges to zero around month 36.

The IPO sample displays a more dramatic investment-to-assets spread between issuers and nonissuers. Panel B of Figure 4 shows that during the first six post-issue months, the investment-to-assets ratio of IPO firms is around 1.20, about 12 times the level for matching nonissuers (around 0.10). Investment-to-assets declines rapidly for the IPO firms in the post-event window; it drops to 0.60 by month 12, to 0.30 by month 24, and largely converges to that of nonissuers by month 36.

Panel C of Figure 4 reports quantitatively similar results for the convertible debt sample as those for the SEO sample. In the first two post-issue years, convertible debt issuers have a median investment-to-assets ratio of around 0.17, while the matching nonissuers have a median investment-to-assets ratio of around 0.11, about 35% lower. The spread converges to zero around month 36. From Panel D, the investment-to-assets spread between straight debt issuers and matching nonissuers is only about 0.01 during the first two post-issue years, and is negative afterwards. We also follow Loughran and Ritter (1997) and use Wilcoxon matched-pairs signed-rank tests to measure the statistical significance of the investment-to-assets spread. The spread is significant across all samples, including the straight debt sample during the first two post-event years (not reported).

Supplementing Figure 4, we find in untabulated results that high-investment firms issue disproportionately more equity and convertible debt than low-investment firms. We sort nonissuing firms in each June on investment-to-assets to obtain the decile breakpoints, and then assign each issuer to the deciles based

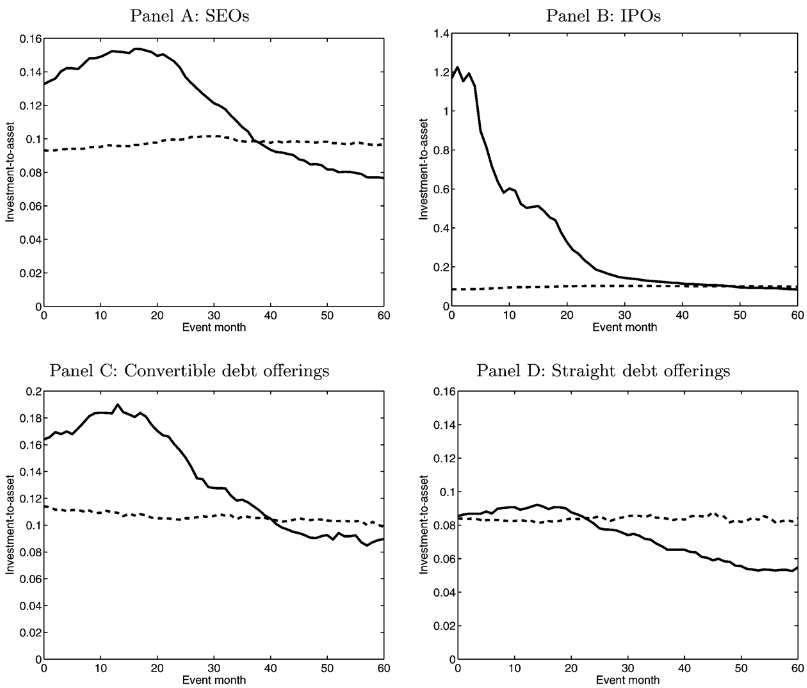

Figure 4
Event-time evolution of investment-to-assets of issuers and matching nonissuers during the 60 post-issue months (January 1970 to December 2005)
This figure plots issuers' and matching nonissuers' median investment-to-assets ratios during the 60 months after SEOs (panel A), IPOs (panel B), convertible debt issues (panel C), and straight debt issues (panel D). Month zero is the offering month. The investment-to-assets ratio is measured as the annual changes in gross property, plant, and equipment (COMPUSTAT annual item 7) plus the annual changes in inventories (item 3) divided by the lagged book value of assets (item 6). The solid lines are for issuers and the broken lines are for matching nonissuers. To identify the matching portfolio for each issuer of a given type of security, we sort independently all firms that have not issued this type of security in the prior 36 months into size and book-to-market quintiles in each June. We use the breakpoints from Kenneth French's Web site to identify the matching portfolio for each issuer out of the 25 size and book-to-market portfolios. We then compare the median investment-to-assets ratios of the matching portfolios with those of the issuers.

on the breakpoints. Firms in the highest investment-to-assets decile conduct 60.7%, 17.5%, and 15.9% of the IPOs, SEOs, and convertible debt offerings, while firms in the lowest investment-to-assets decile conduct only 5.5%, 7.8%, and 4.9%, respectively. But the frequency distribution of straight debt issuers does not appear monotonic across the investment-to-assets deciles.

Our evidence complements that of Loughran and Ritter (1997), who document that seasoned equity issuers have higher ratios of capital expenditure plus R&D expense to book assets than nonissuers for four years after issuance. We extend their evidence to the IPO and convertible debt samples. More important, their Figure 1 shows that this ratio is about 10% for issuers and 6.5% for nonissuers in the first two post-issue years. Our evidence shows that this spread is mostly driven by real investment because we do not include R&D expense in our measure of investment.

This difference is important. Our analysis is motivated by the theoretical models of Zhang (2005a) and Carlson, Fisher, and Giammarino (2006), who study the relation between average returns and real investment (not R&D). Unlike the negative relation between investment-to-assets and average returns, the relation between R&D-to-assets and average returns is positive (e.g., Chan, Lakonishok, and Sougiannis, 2001; Chambers, Jennings, and Thompson, 2002; and Eberhart, Maxwell, and Siddique, 2004). One explanation offered by Chu (2005) is that R&D generates risky expansion options, whereas real investment transforms them into less risky assets in place.

3.3.2 Profitability. We find that issuers are more profitable than matching nonissuers, but the profitability spread is much smaller in magnitude than the investment-to-assets spread.

This evidence is important. As argued in Section 1, the negative relation between investment-to-assets and average returns is conditional on profitability. High investment can result not only from low costs of capital, but also from high profitability. Further, more-profitable firms earn higher average returns than less-profitable firms (e.g., Piotroski, 2000; and Fama and French, 2006). The investment difference between issuers and matching nonissuers goes the right way in explaining the new issues puzzle, but the profitability difference goes the wrong way. Our evidence shows that the investment-to-assets spread is more important quantitatively than the profitability spread.

Figure 5 reports event-time profitability for issuers and nonissuers in the five post-issue years. We measure profitability as net income before extraordinary items (COMPUSTAT annual item 18) divided by the lagged book value of equity. Panel A shows that, in the first two post-issue years, the profitability spread between seasoned equity issuers and matching nonissuers is only about 0.01. This spread converges to zero around month 32. From panel B, IPO firms have a median profitability of 0.24, about three times of nonissuers' median profitability, 0.08, in the first six post-issue months. But even this profitability spread is small relative to the corresponding spread in investment-to-assets: IPO firms invest roughly ten times more than nonissuers during the same post-event period (see panel B of Figure 4). The profitability spread between IPO firms and matching nonissuers converges to zero around month 18. But their investment-to-assets spread is still around 0.40 at month 18, and only converges to zero around month 36.

Similar results also apply to the convertible debt sample. The investment-to-assets spread is about 40% of the nonissuers' investment-to-assets in the first two post-issue years (see panel C of Figure 4). In contrast, panel C of Figure 5 shows that the profitability spread is less than 10% of the nonissuers' profitability in the corresponding period. Comparing panel D of Figures 4 and 5, both the profitability and investment spreads between straight debt issuers

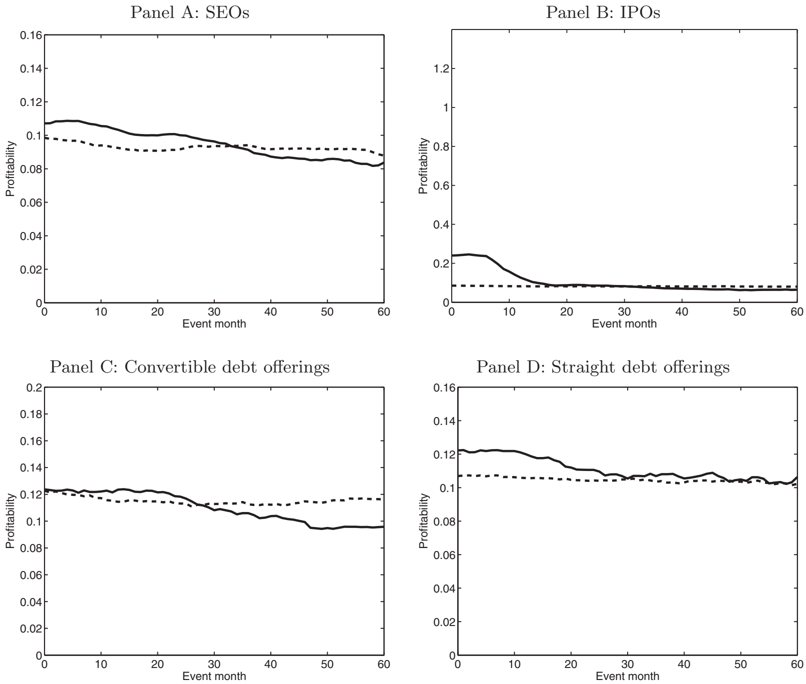

Figure 5
Event-time evolution of profitability of issuers and matching nonissuers during the 60 post-issue months (January 1970 to December 2005)
This figure plots issuers' and matching nonissuers' median profitability during the 60 months after SEOs (panel A), IPOs (panel B), convertible debt issues (panel C), and straight debt issues (panel D). Month zero is the offering month. We measure profitability as net income before extraordinary items (item 18) divided by lagged book value of equity. We define book equity as stockholder's equity (item 216), minus preferred stock, plus balance sheet deferred taxes and investment tax credit (item 35) if available, minus post-retirement benefit asset (item 330) if available. If stockholder's equity is missing, we use common equity (item 60) plus preferred stock par value (item 130). We measure preferred stock as preferred stock liquidating value (item 10) or preferred stock redemption value (item 56) or preferred stock par value (item 130) in that order of availability. If these variables are missing, we use book assets (item 6) minus liabilities (item 181). The solid lines are for issuers and the broken lines are for matching nonissuers. To identify the matching portfolio for each issuer of a given type of security, we sort independently all firms that have not issued this type of security in the prior 36 months into size and book-to-market quintiles in each June. We use the breakpoints from Kenneth French's Web site to identify the matching portfolio for each issuer out of the 25 size and book-to-market portfolios. We then compare the median profitability of the matching portfolios with the median profitability of the issuers.

and matching nonissuers are around 10% of the corresponding nonissuers' medians.

Collectively, Figures 4 and 5 show that the investment-to-assets spread between issuers and matching nonissuers is quantitatively more important than the profitability spread in the SEO, IPO, and convertible debt samples, but not in the straight debt sample. This evidence helps interpret the larger magnitudes of the underperformance following equity and convertible debt offerings than the magnitude of the underperformance following straight debt offerings.

3.4 Composite issuance

Our analysis so far has focused on the underperformance following various types of equity and debt issues. We now integrate the pieces of evidence by examining the role of investment in reducing the abnormal returns of high-minus-low composite issuance portfolios (e.g., Daniel and Titman, 2006; and Fama and French, 2007). Our main finding in this subsection is that the investment factor helps explain on average 40% of the composite issuance effect.

Daniel and Titman (2006) define the composite (equity) issuance, denoted $\iota_i(t-\tau, t)$, for firm i in year t as the growth in the market value of equity not attributable to stock returns:

$$\iota_i(t-\tau, t) = \log\left(\frac{\mathrm{ME}_{it}}{\mathrm{ME}_{it-\tau}}\right) - r_i(t-\tau, t)$$

where ME_{it} is the market equity at year t and $r_i(t-\tau, t)$ is the stock return from year $t-\tau$ to year t. Equity issuance such as seasoned equity issues, employee stock option plans, and share-based acquisitions increase ι, while repurchase activity such as share repurchases and dividends reduce ι.

Daniel and Titman (2006) find that a zero-investment portfolio long in stocks with high composite equity issuance measures and short in stocks with low composite equity issuance measures earns significantly negative average returns. Daniel and Titman interpret this evidence as investors overreacting to intangible information, defined as the component of news about future stock returns unrelated to past accounting performance. They also suggest that managers time their issues and repurchases to exploit this mispricing—issuing shares after the realizations of favorable intangible information and repurchasing shares after the realizations of unfavorable intangible information.

We explore the investment-based explanation of the composite issuance effect. If firms with high composite issuance invest more than firms with low composite issuance, the negative relation between investment and expected returns can at least partially explain Daniel and Titman's (2006) evidence. Our test design is simple. After measuring the composite issuance effect using alphas from factor regressions, we examine how adding the investment factor into the regressions affects the alphas.

We also extend Daniel and Titman's (2006) analysis and examine the combined effect of debt issuance on returns by constructing the composite debt issuance measure. For firm i in year t, the composite debt issuance is defined as the growth in the book value of a firm's liabilities:

$$\iota_{iD}(t-\tau, t) = \log\left(\frac{\mathrm{BD}_{it}}{\mathrm{BD}_{it-\tau}}\right)$$

where BD denotes the book value of debt, measured as the sum of long-term debt (COMPUSTAT annual item 9) and debt in current liabilities (item 34). Debt issuance activity increases ι_D, while debt repayment activity decreases ι_D.

Table 5
Calendar-time factor regressions of the zero-investment composite issuance portfolio returns, with and without the investment factor (January 1970 to December 2005)

	Panel A: Composite equity issuance				Panel B: Composite debt issuance			
	Equal weighted		Value weighted		Equal weighted		Value weighted	
	CAPM	Fama-French	CAPM	Fama-French	CAPM	Fama-French	CAPM	Fama-French
α	−0.558	−0.367	−0.590	−0.359	−0.532	−0.551	−0.309	−0.265
	(−4.38)	(−4.45)	(−4.94)	(−3.57)	(−8.59)	(−8.31)	(−2.80)	(−2.34)
MKT	0.435	0.235	0.348	0.187	0.150	0.157	0.105	0.083
	(15.25)	(9.00)	(12.13)	(6.19)	(10.49)	(8.34)	(3.90)	(2.67)
SMB		0.400		0.156		0.010		−0.004
		(9.76)		(3.23)		(0.29)		(−0.10)
HML		−0.383		−0.404		0.029		−0.071
		(−10.78)		(−9.20)		(0.92)		(−1.33)
Adj. R^2	39%	75%	31%	54%	24%	24%	5%	5%
	Equal weighted		Value weighted		Equal weighted		Value weighted	
	CAPM	Fama-French	CAPM	Fama-French	CAPM	Fama-French	CAPM	Fama-French
α	−0.399	−0.240	−0.364	−0.156	−0.357	−0.377	−0.180	−0.139
	(−3.18)	(−3.08)	(−2.93)	(−1.49)	(−5.73)	(−5.91)	(−1.47)	(−1.14)
MKT	0.408	0.212	0.307	0.151	0.118	0.127	0.082	0.061
	(10.69)	(8.48)	(9.09)	(5.07)	(8.18)	(8.16)	(2.98)	(2.79)
SMB		0.398		0.153		0.007		−0.007
		(9.55)		(3.50)		(0.27)		(−0.15)
HML		−0.380		−0.400		0.033		−0.067
		(−10.87)		(−9.50)		(1.30)		(−1.25)
INV	−0.234	−0.189	−0.333	−0.302	−0.264	−0.265	−0.196	−0.192
	(−1.82)	(−3.00)	(−3.09)	(−5.16)	(−5.55)	(−5.66)	(−2.23)	(−2.22)
$\|\Delta\alpha\|/\|\alpha\|$	28%	35%	38%	57%	33%	32%	42%	48%
Adj. R^2	40%	76%	35%	57%	33%	33%	6%	6%

This table reports calendar-time factor regressions of the zero-investment composite issuance portfolio returns. In panel A, we follow Daniel and Titman (2006) and define the composite equity issuance for a firm in year t, denoted $\iota(t-\tau, t)$, as the growth in the market value of its equity that is not attributable to its stock returns from year $t-\tau$ to year t. That is, $\iota(t-\tau,t) = \log(\mathrm{ME}_t/\mathrm{ME}_{t-\tau}) - r(t-\tau,t)$ where $r(t-\tau,t)$ is the stock return from year $t-\tau$ to t, adjusted for stock splits and stock dividends, ME_t is the market value of equity at year t, and $\tau = 5$. We measure the market value of equity as the stock price per share at the end of June times the number of shares outstanding. In panel B, we define the composite debt issuance as the growth in the book value of debt: $\iota_D(t-\tau) = \log(\mathrm{BD}_t/\mathrm{BD}_{t-\tau})$, where $\mathrm{BD}_{t-\tau}$ is the book value of debt and $\tau = 5$. We measure the book value of debt as the sum of long-term debt (COMPUSTAT annual item 9) and debt in current liabilities (item 34). In June of year t, we match returns from July of year t to June of year $t+1$ with the composite issuance measures determined at the fiscal year-end in calendar year $t-1$. We then sort firms into deciles each month based on their composite issuance measures. The zero-investment composite issuance portfolio returns are defined as the average high composite issuance (highest three deciles) portfolio returns minus the average low composite issuance (lowest three deciles) portfolio returns. We estimate the regressions using weighted least squares and calculate the t-statistics (in parentheses) using the White (1980) heteroskedasticity-consistent standard errors. We also report the adjusted R^2s (Adj. R^2).

Welch (2004) uses a similar definition to measure net debt issuance activities. We set $\tau = 5$ in calculating both composite equity and debt issuance measures.

We sort stocks in June of year t into deciles on their composite issuance measures at the end of fiscal year $t-1$, and record monthly returns from July of year t to June of year $t+1$ for these resulting portfolios. The zero-cost composite issuance portfolios are constructed by buying stocks in the top three deciles and selling stocks in the bottom three deciles of composite issuance.

Panel A of Table 5 shows that the composite equity issuance portfolio earns significantly negative alphas. The equal-weighted CAPM and Fama-French (1993) alphas are −0.56% and −0.37% per month (t = −4.38 and −4.45), respectively. The value-weighted alphas are −0.59% and −0.36% per month (t = −4.94 and −3.57), respectively. Adding the investment factor into the factor regressions reduces the magnitudes of the equal-weighted alphas by 28% and 35% to −0.40% and −0.24% per month, albeit still significant. The value-weighted alphas decrease by 38% and 57% to −0.36% and −0.16% per month (t = −2.93 and −1.49), respectively. The loadings of the composite issuance portfolio returns on the investment factor, with magnitudes ranging from 0.19 to 0.33, are uniformly negative and in most cases significant.

Panel B of Table 5 reports that, similar to the composite equity issuance portfolio, the composite debt issuance portfolio also earns significantly negative alphas. The equal-weighted CAPM and Fama-French (1993) alphas are −0.53% and −0.55% per month, respectively, both being highly significant. The value-weighted alphas are lower, −0.31% and −0.27% per month (t = −2.80 and −2.34), respectively. Adding the investment factor reduces the equal-weighted alphas by about 32% in magnitude to −0.36%, but it remains highly significant. The investment factor lowers the value-weighted CAPM alpha by 42% in magnitude to −0.18% and the value-weighted Fama-French alpha by 48% in magnitude to −0.14% per month. Both are no longer significant. The loadings on the investment factor, ranging from −0.27 to −0.19, are all significantly negative.

To help interpret our results, we use the event-study framework to study the investment behavior of the two extreme composite issuance terciles. In untabulated results, we find that firms in the highest tercile of composite equity issuance have median investment-to-assets ratios higher than those of firms in the lowest tercile of composite equity issuance for 11 years around the portfolio formation year. The results from the composite debt issuance portfolios are quantitatively similar. Further, the extreme terciles have largely similar profitability. The evidence suggests that real investment can partially explain Daniel and Titman's (2006) composite equity issuance effect and its extension to composite debt issuance.

4. Conclusion

Real investment is an important driving force behind the new issues puzzle. The investment factor, long in low investment-to-assets stocks and short in high investment-to-assets stocks, earns a significant average return of 0.57% per month. In addition, firms that issue equity and convertible debt invest much more than matching nonissuers. Consequently, adding the investment factor into standard factor regressions explains on average about 75% of the SEO underperformance, 80% of the IPO underperformance, 50% of the underperformance following convertible debt offerings, and 40% of Daniel and

Titman's (2006) composite issuance effect. Our evidence lends support to the theoretical predictions of Zhang (2005a) and Carlson, Fisher, and Giammarino (2006). However, our tests do not rule out mispricing stories (e.g., Ritter, 1991; Loughran and Ritter, 1995; Richardson and Sloan, 2003; and Titman, Wei, and Xie, 2004).

References

Abel, A. B., A. K. Dixit, J. C. Eberly, and R. S. Pindyck. 1996. Options, the Value of Capital, and Investment. *Quarterly Journal of Economics* 111:753–77.

Anderson, C. W., and L. Garcia-Feijóo. 2006. Empirical Evidence on Capital Investment, Growth Options, and Security Returns. *Journal of Finance* 61(1):171–94.

Ball, R., and S. P. Kothari. 1989. Nonstationary Expected Returns: Implications for Tests of Market Efficiency and Serial Correlation in Returns. *Journal of Financial Economics* 25:51–74.

Barber, B. M., and J. D. Lyon. 1997. Detecting Long-Run Abnormal Stock Returns: The Empirical Power and Specification of Test Statistics. *Journal of Financial Economics* 43:341–72.

Barberis, N., M. Huang, and T. Santos. 2001. Prospect Theory and Asset Prices. *Quarterly Journal of Economics* 116:1–53.

Brav, A., C. Geczy, and P. A. Gompers. 2000. Is the Abnormal Return Following Equity Issuances Anomalous? *Journal of Financial Economics* 56:209–49.

Brav, A., and P. A. Gompers. 1997. Myth or Reality? The Long-Run Underperformance of Initial Public Offerings: Evidence from Venture and Nonventure Capital-backed Companies. *Journal of Finance* 52:1791–812.

Brealey, R.A., S.C. Myers, and F. Allen. 2006. *Principles of Corporate Finance*, 8th ed. New York: Irwin McGraw-Hill.

Butler, A. W., G. Grullon, and J. P. Weston. 2005. Can Managers Forecast Aggregate Market Returns? *Journal of Finance* 60:963–86.

Carlson, M., A. Fisher, and R. Giammarino. 2004. Corporate Investment and Asset Price Dynamics: Implications for the Cross-Section of Returns. *Journal of Finance* 59(6):1009–34.

Carlson, M., A. Fisher, and R. Giammarino. 2005. SEOs, Real Options, and Risk Dynamics: Empirical Evidence. Working Paper, University of British Columbia.

Carlson, M., A. Fisher, and R. Giammarino. 2006. Corporate Investment and Asset Price Dynamics: Implications for SEO Event Studies and Long-Run Performance. *Journal of Finance* 61(3):1009–34.

Chambers, D., R. Jennings, and R.B. Thompson II. 2002. Excess Returns to R&D Intensive Firms. *Review of Accounting Studies* 7:133–58.

Chan, L. K. C., J. Lakonishok, and T. Sougiannis. 2001. The Stock Market Valuation of Research and Development Expenditures. *Journal of Finance* 56:2431–56.

Chu, Y. 2005. R&D, Capital Investment, and Stock Returns. Working Paper, University of Rochester.

Cochrane, J. H. 1991. Production-Based Asset Pricing and the Link Between Stock Returns and Economic Fluctuations. *Journal of Finance* 46:209–37.

Cochrane, J. H. 1996. A Cross-Sectional Test of an Investment-Based Asset Pricing Model. *Journal of Political Economy* 104:572–621.

Cooper, M. J., H. Gulen, and M. J. Schill. 2007. Asset Growth and the Cross-Section of Stock Returns. *Journal of Finance*, forthcoming.

Daniel, K., and S. Titman. 1997. Evidence on the Characteristics of Cross Sectional Variation in Stock Returns. *Journal of Finance* 52:1–33.

Daniel, K., and S. Titman. 2006. Market Reactions to Tangible and Intangible Information. *Journal of Finance* 61:1605–43.

Davis, J. L., E. F. Fama, and K. R. French. 2000. Characteristics, Covariances, and Average Returns: 1929 to 1997. *Journal of Finance* 55:389–406.

Eberhart, A. C., W. F. Maxwell, and A. R. Siddique. 2004. An Examination of Long-Term Abnormal Stock Returns and Operating Performance Following R&D Increases. *Journal of Finance* 59(2):623–50.

Eckbo, E. B., R. W. Masulis, and Ø. Norli. 2000. Seasoned Public Offerings: Resolution of the New Issues Puzzle. *Journal of Financial Economics* 56:251–91.

Eckbo, E. B., and Ø. Norli. 2005. Liquidity Risk, Leverage, and Long-Run IPO Returns. *Journal of Corporate Finance* 11:1–35.

Fama, E. F. 1998. Market Efficiency, Long-Term Returns, and Behavioral Finance. *Journal of Financial Economics* 49:283–306.

Fama, E. F., and K. R. French. 1993. Common Risk Factors in the Returns on Stocks and Bonds. *Journal of Financial Economics* 33:3–56.

Fama, E. F., and K. R. French. 1996. Multifactor Explanations of Asset Pricing Anomalies. *Journal of Finance* 51:55–84.

Fama, E. F., and K. R. French. 2006. Profitability, Investment, and Average Returns. *Journal of Financial Economics* 82:491–518.

Fama, E. F., and K. R. French. 2007. Dissecting Anomalies. Working Paper, University of Chicago.

Fama, E. F., and J. MacBeth. 1973. Risk, Return, and Equilibrium: Empirical Tests. *Journal of Political Economy* 81:607–36.

Gala, V. D. 2005. Investment and Returns. Working Paper, University of Chicago.

Gomes, J., L. Kogan, and L. Zhang. 2003. Equilibrium Cross Section of Returns. *Journal of Political Economy* 111(4):693–732.

Kothari, S. P., and J. B. Warner. 1997. Measuring Long-Horizon Security Price Performance. *Journal of Financial Economics* 43:301–39.

Lee, I., and T. Loughran. 1998. Performance Following Convertible Bond Issuance. *Journal of Corporate Finance* 4:185–207.

Loughran, T., and J. R. Ritter. 1995. The New Issues Puzzle. *Journal of Finance* 50:23–51.

Loughran, T., and J. R. Ritter. 1997. The Operating Performance of Firms Conducting Seasoned Equity Offerings. *Journal of Finance* 52:1823–50.

Loughran, T., and J. R. Ritter. 2000. Uniformly Least Powerful Tests of Market Efficiency. *Journal of Financial Economics* 55:361–89.

Loughran, T., and J. R. Ritter. 2004. Why Has IPO Underpricing Changed Over Time? *Financial Management* 33:5–37.

Lyon, J. D., B. M. Barber, and C. Tsai. 1999. Improved Methods for Tests of Long-Run Abnormal Stock Returns. *Journal of Finance* 54:165–201.

Mitchell, M. L., and E. Stafford. 2000. Managerial Decisions and Long-Term Stock Price Performance. *Journal of Business* 73:287–320.

Pástor, Ĺ., and P. Veronesi. 2005. Rational IPO Waves. *Journal of Finance* 60(4):1713–57.

Piotroski, J. D. 2000. Value Investing: The Use of Historical Financial Statement Information to Separate Winners from Losers. *Journal of Accounting Research* 38:1–51.

Polk, C., and P. Sapienza. 2006. The Stock Market and Corporate Investment: A Test of Catering Theory. *Review of Financial Studies*, forthcoming.

Richardson, S. A., and R. G. Sloan. 2003. External Financing, Capital Investment, and Future Stock Returns. Working Paper, University of Pennsylvania.

Ritter, J. R. 1991. The Long-Run Performance of Initial Public Offerings. *Journal of Finance* 46:3–27.

Ritter, J. R. 2003. Investment Banking and Security Issuance, in George Constantinides, Milton Harris, and René Stulz (eds.), *Handbook of Economics and Finance*, Amsterdam: North Holland.

Schultz, P. 2003. Pseudo Market Timing and the Long-Run Underperformance of IPOs. *Journal of Finance* 58:483–517.

Schwert, G. W. 2003. Anomalies and Market Efficiency, in George Constantinides, Milton Harris, and Rene Stulz (eds.), *Handbook of the Economics of Finance*, Amsterdam: North-Holland.

Spiess, K. D., and J. Affleck-Graves. 1995. Underperformance in Long-Run Stock Returns Following Seasoned Equity Offerings. *Journal of Financial Economics* 38:243–67.

Spiess, K. D., and J. Affleck-Graves. 1999. The Long-Run Performance of Stock Returns Following Debt Offerings. *Journal of Financial Economics* 54:45–73.

Titman, S., K. C. J. Wei, and F. Xie. 2004. Capital Investments and Stock Returns. *Journal of Financial and Quantitative Analysis* 39:677–700.

Welch, I. 2004. Capital Structure and Stock Returns. *Journal of Political Economy* 112:106–31.

White, H. L., Jr. 1980. A Heteroskedasticity-Consistent Covariance Matrix Estimator and A Direct Test for Heteroskedasticity. *Econometrica* 48:817–38.

Xing, Y. 2006. Interpreting the Value Effect Through the *Q*-Theory: An Empirical Investigation. *Review of Financial Studies*, forthcoming.

Zhang, L. 2005a. Anomalies, NBER Working Paper 11322.

Zhang, L. 2005b. The Value Premium. *Journal of Finance* 60(1):67–103.