# Going Public with IPOs and SPAC Mergers

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**Abstract**

The vast majority of "liquidity events" by successful venture capital (VC)-backed companies are trade sales in which the company is sold to a larger firm in the same industry. Many of the most prominent companies, however, remain independent and go public either by conducting an initial public offering (IPO) or, more recently, merging with a special purpose acquisition company (SPAC). Companies conducting an IPO when they have more than $100 million in inflation-adjusted sales have produced much higher returns for public market investors than have smaller companies, whether VC-backed or not. Since 1999, VC-backed IPOs have had higher first-day returns than other IPOs, but have had lower long-run returns. For deSPACs from 2017-2022, VC-backed companies have underperformed relative to other deSPACs and relative to VC-backed IPOs.

Keywords: Initial Public Offerings, SPACs, deSPACs, VC-backed IPOs, tech IPOs, life science IPOs

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Private equity (PE) funds, including both venture capital (VC) and buyout funds, normally must exit investments within 10-12 years of the creation of the fund, either by selling a stake in a portfolio company for cash or by distributing shares in the company to limited partners (LPs). The two main types of exits for successful VC-backed portfolio companies are to either sell the portfolio company for cash to a larger company in the same industry, known as a trade sale, or to take the portfolio company public and distribute shares to the LPs, who can then individually decide whether to keep or sell the shares. A trade sale is typically a cleaner "liquidity event," in that the sale may be entirely for cash, whereas in going public most or all pre-issue shareholders are typically "locked up" for 180 days or more. In the 1980s, taking a company public by conducting an IPO was the most common exit for successful portfolio companies. In the 1990s, trade sales became more common, and since 2001 have been the predominant method for exiting for successful VC-backed companies. Figure 1 here, an updated version of Figure 2 in Gao, Ritter, and Zhu (2013), shows that for VC-backed companies, only about 10% of successful exits have been via IPOs over the last twenty years. Recently, as VC-backed companies have stayed private longer, VC firms sometimes exit by selling their shares to another VC firm or to another investor, such as a mutual fund, with the cash (net of any carried interest earned) distributed to the LPs and the portfolio company remaining private.

Even though there have been, on average, many hundreds of companies acquired by buyout firms each year for many decades (Strömberg, 2008), on average less than 30 buyout-backed IPOs have occurred per year during 2001-2022, as shown in Table 1. This low rate of IPO activity by buyout-backed firms suggests that most exits occur with either trade sales or by selling the portfolio company to another fund. Some exits also occur with portfolio companies

being sold to a continuation fund managed by the same general partner (GP), with the company remaining private (see Table 4 of Jenkinson, Kim, and Weisbach (2022)). Brown and Volckmann (2023, Figure 2), using Burgiss data, estimate that 40% of PE exits have been sales to another PE fund in the past decade. They report (Figure 3) that in 2018-2023 only about 5% of buyout exits have been via IPOs.

In this chapter, we discuss why exiting via a trade sale rather than going public has become much more common. We document the returns earned by public market investors on companies going public, and compare the returns on VC-backed and buyout-backed companies with those of other companies. During 1980-1998, for investors buying at the market close on the first day of public trading, VC-backed IPOs outperformed other IPOs. Since 1999, however, VC-backed IPOs have underperformed other IPOs. We show that there has been poor performance of both life science and tech IPOs since 1999. We report that small company IPOs, whether VC-backed or not, have underperformed larger company IPOs by an economically significant 30% in the three years after going public. The decline in IPO volume has been concentrated in these small companies. The poor post-issue returns on these companies suggest that public market investors have been helped rather than harmed by the lack of opportunities to invest in them.

For portfolio companies going public, merging with a publicly traded special purpose acquisition company (SPAC) rather than conducting an IPO became somewhat common starting in recent years. 2022 was the first year in which there were more exits via SPAC mergers than via traditional IPOs, partly due to a very low number of IPOs.

We document the returns earned by IPO investors versus those earned by investors after a merger between an operating company and a SPAC. These so-called deSPACs have produced

lower returns for public market investors than the returns earned on traditional IPOs, as also documented by Groh, Proelss, Sannajust, and Schweizer (2022). We show that the returns on the VC-backed deSPACs from 2017-2022 have been much worse than the returns on VC-backed IPOs, consistent with the hypothesis that many low quality companies go public by merging with a SPAC.

**Why Have Public Market Exits Become Less Common?**

Table 1 shows that the fraction of operating company IPOs that are VC-backed has grown over time, from an average of 25% in 1980-1989 to 52% in 2001-2022. Table 1 also shows that in 1980-2000 the number of operating companies going public in the U.S. averaged 310 per year, before dropping dramatically to an average of 119 per year during 2001-2022, in spite of a larger economy. Adding mergers with SPACs to the numbers adds only another 21 or so new listings per year in the last 22 years. The low rate of IPO activity since 2001 contributed to a 50% fall in the number of domestic operating companies listed on major U.S. exchanges between 1997 and 2013, with the number of listed operating companies being roughly constant since then. There is a growing consensus among academics that two main forces are responsible for this dramatic drop in the attractiveness of being publicly listed.

Initially, the most popular explanation for the drop in the number of listed firms in the U.S. following the 1997 peak was that excessive regulation of public firms was responsible. The academic literature, however, provides at most limited support for this explanation. Gao et al. (2013) find little evidence that the Sarbanes-Oxley Act of 2002, known as SOX, and the 2003 Global Settlement caused the decline in IPO activity, whose start predated regulations such as

SOX. Two more recent papers provide some evidence that regulatory changes played a role. Chemmanur et al. (2022) show that the decline in the propensity of U.S. firms to go public can be partially attributed to regulatory events such as SOX. Ewens, Xiao, and Xu (2023) find that increased regulatory costs explain only a small fraction of the reduction in IPOs. In spite of the mixed empirical evidence, the relaxation of IPO regulations in the 2012 Jumpstart Our Business Startups (JOBS) Act, however, is largely based on the argument that regulatory burdens have caused significant negative effects on IPO activity.

Alternative explanations for the drop in the number of IPOs focus on cash flow channels and financing channels. The cash flow channel is discussed in Gao et al. (2013), who emphasize the disadvantages facing small firms in many industries due to the increased importance of economies of scale and scope driven by technology. For an entrepreneur, whether to remain independent by going public or to sell the firm via a merger generally involves the choice of growing organically or immediately becoming part of a larger organization. A private target company may be able to use an acquirer's established platform to bring a product to market more quickly. In many industries, due to a drop in communication and transportation frictions over time, getting big faster and being big have become increasingly important. Consistent with this economies-of-scope argument, Gao et al. show that a larger fraction of the small firm IPOs since 1997 have been unprofitable in the 3 years after their IPO than was previously the case. Importantly, Eckbo & Lithell (2023) find that the decline in U.S. public listings would disappear if one counted the target firms of public acquirers as independent firms.

Irani, Pinto, & Zhang (2022) posit that globalization can have a negative impact on IPO activity. It may be more costly to establish sales and supply channels in foreign countries than domestically. As a result, a firm operating in a more globalized industry may find it more cost

effective to merge with an established partner, resulting in less IPO activity in more globalized industries, everything else being equal. The authors use the average percentage of foreign sales over total sales of all Compustat-listed firms in an industry as a measure of industry-level globalization. They show that, in time series and cross-sectionally, this globalization measure is negatively associated with U.S. IPO activity in the industry. Using tariffs as an instrumental variable and the 1994 North American Free Trade Agreement (NAFTA) as an exogenous shock, they also show that the negative impact of globalization on IPO activity is likely to be causal.

Cash flow considerations are not the only reasons for the declining popularity of traditional IPOs in the U.S. de Fontenay (2016) posits that one of the reasons that many startup firms are remaining private longer is that it is easier for a private firm to raise large amounts of equity capital than it used to be, emphasizing this financing channel. Ewens & Farre-Mensa (2020) document that the supply of equity capital to private firms has increased since 1996. They posit that the deregulation of securities laws, especially the National Securities Markets Improvement Act (NSMIA) in 1996, has increased the supply of capital to private firms and has enabled them to stay private longer. The increased supply of capital to private firms likely has had a negative effect on IPO activity, or at least would result in a delay in the age at which a startup goes public.

Although there is no doubt that there is more venture capital money available than in earlier years, there is another explanation for this increase in supply in addition to regulatory changes. This alternative view, as discussed in Ewens and Farre-Mensa (2022), is that the increase in VC funding is due to inflows of money into this asset class due to two reasons that are unrelated to regulatory changes. The first reason is that money chases past returns. In particular, the success of the "Yale model" widely attributed to David Swenson, the long-serving head of Yale University's endowment, has resulted in many university endowments and pension funds

allocating a significant fraction of their assets to illiquid investments such as private equity. The logic for why returns have been high is that the higher returns are earned as compensation for illiquidity. The second reason for the inflow of money is that state and local government pension plans, which bizarrely are allowed to calculate the present value of their liabilities at the expected return on their assets, no matter what the risk and maturity of the assets are, has created an incentive for these pension plans to place a larger fraction of assets in opaque and illiquid assets such as VC funds, for which the pension plans assume high expected returns.

A recent working paper by Jackson, Ling, & Naranjo (2023) offers yet another reason for the growth of fund flows into private markets, in spite of the high fees charged by general partners. They posit that many investors desire assets for which there are overstated and smoothed returns, so that the investors (or their agents) can report higher risk-adjusted portfolio returns in the short run.

Even without regulatory changes, Stulz (2020) posits that the increased importance of the technology and healthcare sectors, where start-ups are mainly investing in intellectual property, would have resulted in an increased demand for venture capital to finance these companies. Stulz (2020) and Fahlenbrach et al. (2023) posit that startup firms with a lot of organizational capital as assets are better off staying private longer than other firms. This idea is consistent with the evidence that life science firms, which have high cash burn rates but only modest organizational capital, would go public at an earlier age than tech startups.[1]

[1] Table 4g of Jay Ritter's IPO Statistics (Ritter, 2023) reports a median age at the IPO of 6 years for 632 life science firms in 2001-2022. Table 2 here reports that for 733 tech companies going public during 2001-2022 with financial sponsor-backing, the median age each year varies from 6 to 14 years, with 15 of the 22 years having a median age of 10 or more years.

As private equity markets have grown, the illiquidity associated with private equity has decreased. A number of venues now exist in which existing shareholders of some VC-backed firms can sell their holdings, even though the company is still private. There was an active market in Facebook stock on SharesPost and Second Markets before its 2012 IPO. Today, Nasdaq Private Markets, EquityZen, and Forge Global all offer platforms for transactions in VC-backed companies, albeit with higher fees than if the companies were publicly listed.

Even after going public, existing shareholders generally do not have immediate liquidity. With an IPO or SPAC merger, the shareholders of the operating company, including those held by a VC firm, are typically locked up for 180 calendar days. Even after the lockup ends, it is common for a GP to distribute shares to limited partners in several tranches, with only some of the shares received as soon as the lockup ends.

The increased VC investment in startup firms is thus a result of both supply and demand: a higher demand from startups because many of these firms benefit from staying private longer, and a higher supply from institutional investors such as endowments, state and local government pension funds, and mutual funds.[2] This financing explanation for why IPO activity has been low since 2001 has two testable implications. The first prediction, which is supported by the evidence, is that the median age of recent IPOs should be older than in the pre-2001 period. The second prediction, which is rejected by the evidence, is that after a pause of a few years, IPO volume should have returned to higher levels as the now-older firms conducted their delayed

[2] Kwon, Lowry, and Qian (2020), Chernenko, Lerner, and Zeng (2021), and Huang, Mao, Wang, and Zhou (2021) document an increase in investments by mutual funds in late-stage startups in the last decade. Mutual funds are permitted to invest up to 15% of assets in illiquid investments. Some VC-backed IPO firms receive additional VC funds even after the IPO. Iliev and Lowry (2020) document that 15% of VC-backed IPO firms received additional venture financing within five years after the IPO. VC firms also frequently participate in private investment in public equity (PIPE) transactions (Dai (2007) and Brophy, Ouimet, and Sialm (2009)).

IPOs. The failure of this second prediction suggests that the financing channel can explain only some of the dramatic decline in IPO activity that has occurred.

**Returns earned by LPs on PE and VC funds**

Harris, Jenkinson, Kaplan, and Stucke (2023) analyze the returns earned by LPs in U.S. PE funds (buyout and VC). Their main metric is the Public Market Equivalent (PME), which is the ratio of the gross returns earned by LPs relative to what they would have earned if they had invested in a public market benchmark such as the S&P 500 at the same time as they contributed capital to a fund, selling the benchmark at the same time as they received distributions. A PME above 1.0 indicates outperformance for the PE fund. Using data from Burgiss, which collects information from LPs, they report that the average buyout fund formed in a cohort year had a PME above 1.0 for every cohort from 1994 to 2015, with returns calculated through December 2020. The average PME for their entire sample of 929 funds, involving approximately $1 trillion of capital commitments starting with cohort year 1987, is 1.18.

For VC funds, Harris et al. (2023) report an average PME through December 2020 of 1.29 for 1,408 VC funds from 1984-2015, using the total return on the S&P 500 as the benchmark, although the consistency of outperformance is not as high as for buyout funds.[3] In particular, 7 of the 8 cohort years from 1999-2006 produced PMEs of below 1.0, although all 9 years from 2007-2015 produced average PMEs of above 1.0. Because VC funds are typically smaller than buyout funds, the total capital commitments in the VC funds tracked by Burgiss is about $350 billion.

[3] See Table 1B of Harris et al. (2023) using VC vintage years of 1984-2015 and returns through December 2020, using Burgiss data.

**The equilibrium supply of private equity money**

For an operating company, the choice of being private or public is largely determined by differences under the two regimes in expected cash flows and in the cost of funds. A publicly traded firm might have lower net cash flows due to higher director and officer (D&O) insurance costs, higher public reporting costs, higher expected litigation costs, and greater owner-manager agency costs. Since some of these costs are fixed costs, they might be particularly onerous for small companies, resulting in it being optimal to be private if a company is small. Financial sponsors (a term that includes both VC- and buyout fund-investors) might assist the company in generating higher cash flows by giving good advice. On the other hand, the required return from public market equity investors should be less than that from financial sponsor investors, both because private market investors may demand an (il)liquidity premium, and because GPs are collecting management fees and carried interest that can create a wedge of more than 2% per year between the cost to the operating company and the net returns to LPs. If there is too much private capital, financial sponsors may be forced to pay too high a price when investing in operating companies, lowering both pre- and post-fee expected returns, and the VCs may lose the ability to reduce private benefits of control.[4]

Several recent papers question whether there is a positive illiquidity premium in private equity. Gupta and Van Nieuwerburgh (2021) suggest that many institutional investors such as

[4] There has been an increase in dual-class share structures in recent years among VC-backed IPOs (see Aggarwal, Eldar, Hochberg, and Litov (2022) and Field and Lowry (2022)), and anecdotal reports of unconstrained behavior by founders at companies such as Uber Technologies (see Isaac, 2019) and WeWork (see Brown and Farrell, 2021).

endowments seem to value illiquid securities that they do not have to mark-to-market. Jackson et al. (2023) hypothesize that some LPs are willing to accept a negative illiquidity premium on opaque assets with smoothed returns. Highly disappointing returns following trading frenzies such as those of Internet stocks in 1999-2000 might have contributed to the preference of many institutional investors for illiquid securities.

In equilibrium, one would expect that money will flow into PE funds until the expected returns earned by LPs are just sufficient to generate an (il)liquidity premium. If this is the case, retail investors that do not have access to this asset class are not missing out on an attractive investment opportunity.

**Changes Over Time in the Characteristics and Valuation Multiples of Tech IPOs**

Table 2 shows that among financial sponsor-backed tech IPOs, there has been a substantial change over time in the median inflation-adjusted sales, the median age, and the probability of being profitable.

Table 2 also shows that a measure of valuation, the median price-to-sales ratio valued at the first closing market price, has crept up over time, being below 5.0 in all but two years from 1980 to 1993, but exceeding 10.0 in each year during 2018-2022, as well as surrounding the internet bubble during 1998-2001. Thus, the returns earned by VC investors, as well as buyout investors and public market investors, have partly been driven by multiple expansion. Average realized returns have thus been partly at the expense of lower expected future returns, as investors in recent years are buying in at higher multiples than was true in the past.

Table 3 is identical to Table 2, except that it excludes buyout-backed tech IPOs. The patterns are similar to those shown in Table 2. In 2022, there was only one VC-backed tech IPO, partly because some VC-backed firms delayed going public during this year, when the stock market lost over 20%, or chose to merge with SPACs. In 2022, there were only six tech IPOs (see Table 6) and 54 VC-backed tech and non-tech deSPACs (see Table 13).

**Long-run Performance of VC-backed IPOs**

If the market underestimates the value of VC-backing at the IPO, VC-backed IPOs will be followed by higher long-run stock returns than nonVC-backed IPOs. Brav and Gompers (1997) provide evidence consistent with this conjecture, using a sample of 934 VC-backed IPOs from 1972-1992 and 3,407 non-VC-backed IPOs from 1975-1992.

Table 4 shows that VC-backed IPOs have outperformed other IPOs in the three years after the IPO, although this pattern is driven by the outperformance of VC-backed IPOs from the 1980-1998 cohorts. The pattern for VC-backing from 1980-1998 is largely consistent with the findings of Brav and Gompers (1997). However, VC-backed IPOs have not outperformed other IPOs since 1999. The average three-year market-adjusted returns following VC-backed IPOs and other IPOs in 1999-2000 are -40.5% and -17.8%, respectively. Correspondingly, the average three-year market-adjusted returns following these two groups of IPOs in 2001-2022 are -9.0% and -6.7%, respectively. The declining long-run returns following VC-backed IPOs from 1980-1998 to 1999-2022 are largely consistent with the time-series pattern of price-to-sales ratios for VC-backed tech IPOs in Table 3. Other things being held equal, low long-run stock returns follow high valuations (e.g., price-to-sales multiples) at the time of the IPO.

In Table 5, we categorize IPOs on the basis of both whether they had VC-backing and whether their inflation-adjusted trailing twelve months sales were higher or lower than $100 million, using dollars of 2022 purchasing power. Panels A and B measure long-term returns from the first closing market price. Panels C and D measure long-term returns from the offer price. The cross-sectional patterns are similar. The table shows that although the low sales companies on average have slightly higher first-day returns, they then underperform on average. The large companies have had substantially better long-run performance, whether or not they were VC-backed. The differences are economically large: the high sales companies have 3-year buy-and-hold and 3-year market-adjusted returns that are roughly 30% higher than those for the low sales companies.

The poor performance of small company IPOs has implications for the suggestions to create a junior market for small companies to go public, allowing individual investors to have access to investing in small companies. The decline in the number of operating company IPOs since 2001 has been most pronounced among small companies. If these companies severely underperform, on average, what opportunity are retail investors missing out on?

Table 6 shows that in the 1980s and 1990s, the median tech company going public was small, with trailing annual sales of less than $75 million (2022 purchasing power) in every year from 1980-2001. Since then, the median inflation-adjusted sales number has been higher than $75 million in every single year. From 1980-1995, in spite of the typical tech IPO being small, 65% or more were profitable in the 12 months before the IPO in every single year, but since then the percentage being profitable has been below 65% in all but two years, with the vast majority of the larger, older tech companies being unprofitable in the last decade. The increase in the proportion of unprofitable tech IPO firms is consistent with the findings of Denis and McKeon

(2021). They document that negative net cash flows have became more common among publicly traded companies in the U.S. during 1978-2000. After the IPO, many unprofitable firms need to raise additional equity capital from public or private investors (DeAngelo, DeAngelo, and Stulz (2010), Huang and Ritter (2021), and Huang and Ritter (2022)).

In addition to financing tech companies, venture capitalists also extensively finance startup health care companies. Health care can be divided into three categories: medical technology, life sciences (biotech and pharma), and healthcare services such as managed care. Life sciences is sometimes referred to as biotech, although purists sometimes distinguish between pharmaceuticals (chemical-based drugs) and biotech (biology-based drugs). In the 1980s and 1990s, many large pharmaceutical firms realized that they were not earning high returns on the massive amounts that they were spending on new drug development. As a result, they cut their R&D staffs, but they still wanted new drugs to sell. The industry changed from being vertically integrated to one in which startups, many of them offshoots from universities, were funded by venture capital to do early stage R&D. If the early results look promising, the company frequently then goes public. Because of the long process of drug development, these firms typically have no revenue from product sales and have high cash burn rates (they burn through money). A common practice is for the public company to raise additional funds through follow-on equity offerings. If the drug development continues to look promising, the company typically gets acquired by a big pharmaceutical company, which has experience at arranging expensive phase III clinical trials, regulatory approval, production, and marketing. In 2013-2022, approximately 30% of all U.S. operating company IPOs were conducted by life science startups, as shown in Table 6.

Table 7 shows that among VC-backed IPOs, tech stocks have done better than life science stocks during the three years after the IPO. VC-backed tech IPOs outperform other tech IPOs and do not underperform style-matched non-issuers, suggesting that the market underestimates the value of VC-backing for tech companies at the IPO. In contrast, VC-backed life science IPOs underperform style-matched non-issuers and other life science IPOs, suggesting that the market overestimates the value of VC-backing for life science companies at the IPO.

Table 8 uses a shorter sample period, the 1999-2021 period during which VC-backed IPOs have underperformed other IPOs. The table shows that low VC-backed long-run returns are present for both tech and life science companies. The relatively high average first-day return on VC-backed tech companies is partly due to the 1999-2000 and 2020-2021 periods during which valuation ratios, as shown in Tables 2 and 3, rapidly escalated and then peaked. These periods also saw low long-run returns.

Because the vast majority of buyout-backed companies conducting IPOs have substantial sales, it is important to control for sales when analyzing the relative performance of buyout-backed IPOs. Panel A of Table 9 shows that financial-sponsor-backed IPOs outperform other IPOs during the three years after the IPO, consistent with the Table 5 results in which IPOs were categorized on the basis of VC-backing and sales. Panel B of Table 9 suggests that this pattern is driven by the poor performance of small firms. Among IPOs with at least $50 million in LTM sales (2022 purchasing power), buyout-backed and non-buyout-backed IPOs have similar performance and do not underperform style-matched non-issuers.

**SPACs**

In the last few years, merging with a SPAC has become an important way for a private company to enter public markets. Table 10 documents the explosive growth and collapse of the SPAC IPO market, with the 2020 and 2021 cohorts having 63% (861 of 1,356) of the SPAC IPOs during 1990-2022, and an even higher share of the proceeds. In 2021 and 2022, approximately 300 operating companies went public by merging with a SPAC, as shown in Table 11.

A SPAC is a blank check company that is created by a sponsor, which goes public in an IPO and then places the IPO proceeds into a trust account, which is normally invested in short-term T-bills. The sponsor has a set period of time, generally two years after the IPO, to consummate a merger with a private operating company. If no merger occurs, the money in the escrow account is returned to public shareholders, generally with interest. If a merger is negotiated, each public shareholder (frequently a hedge fund) has the right to redeem its shares, receiving the principal and interest. Further details about SPACs are explained in Klausner, Ohlrogge, and Ruan (2022) and Gahng, Ritter, and Zhang (2023), among other places.

Klausner et al. (2022) and Klausner and Ohlrogge (2023) analyze deSPACs. They document that mergers with high redemption rates, on average, deliver less cash per share to the merged entity than those with low redemption rates. The reason for this pattern is that SPAC sponsors almost always have founder shares equal to 25% of the number of shares issued in the SPAC IPO, and unless the sponsor relinquishes some of these shares or attracts a large PIPE investment, these founder shares become a larger fraction of the SPAC shares when there are high redemptions of the public shares. Because the cash comes from public shares that aren't redeemed and PIPE shares, the founder shares dilute the cash per share. The authors report that the cash per share delivered is positively related to deSPAC returns.

Table 11 reports the redemption rates, by quarter, for deSPACs. The table shows that in the last quarter of 2020 and the first two quarters of 2021, the average redemption rate was less than 30%. In contrast, in all four quarters of 2022, the average redemption rate was above 80%. The dramatic changes in average redemption ratios can be attributed to several factors. First, because there is a delay of several months between when deal terms are announced and redemption decisions are made, changes in market conditions affect the attractiveness of the merger. Probably more importantly, however, changes in investor sentiment also come into play. In late 2020 and early 2021, when investors were enthusiastic about both SPAC mergers and some of the industries represented among the operating companies, such as electric vehicles, the redemption ratios were much lower than they have subsequently been.

We also report the average redemption rates separately for VC-backed and non-VC-backed deSPACs based on whether the operating company in a deSPAC merger is VC-backed or not in Table 11. Although VC-backed deSPACs have lower long-run returns than other deSPACs as reported in Tables 12 and 13, the redemption rates for these two groups are similar.

Many people view the 2020-2021 boom in SPAC IPOs and announced mergers as a bubble. If so, why did it occur? Although one can only make conjectures, Robert Shiller's book *Narrative Economics* (2019) posits that sometimes a story "goes viral." It may not be a coincidence that the SPAC bubble occurred at about the same time that cryptocurrency prices peaked, and so-called "meme stocks" such as Bed Bath & Beyond (ticker BBBY), AMC (ticker AMC), and Gamestop (ticker GME) shot up in price, only to collapse later on.[5]

[5] These three companies were money-losing companies that many thought were heading for bankruptcy in 2020. BBBY went from less than $5 per share in March 2020 to over $35 in January 2021 before falling to less than $0.25 per share in April 2023. AMC went from less than $1.50 per share in December 2020 to over $35 in June of 2021

At this point, there is no well received theory to explain why some firms might find it optimal to go public with a SPAC merger while others conduct a traditional IPO or direct listing. In Gahng et al. (2023, Table 2), the authors run a probit regression using inflation-adjusted sales, age, and profitability to explain the choice, but report a pseudo R-squared value of less than 1%.

**Long-run Performance of VC-backed deSPACs**

Panel A of Table 12 reports the post-merger returns for deSPACs from 2012-2021. The table shows that over a one-year or three-year horizon (ending on Friday, Dec. 30, 2022 for the 2020-2022 cohorts), the equally weighted (EW) average buy-and-hold returns have been negative, with the market-adjusted returns even worse. These negative market-adjusted returns are much lower than the long-run returns on IPOs from 2001-2021, reported in Panel E of Table 4. The poor performance of the deSPACs is consistent with the joint hypothesis that many of the operating companies merging with SPACs are of low quality, and that the market did not rationally adjust to this fact by lowering the valuations placed on the target company at the time of the merger.

Although the EW deSPAC returns are low, it should be noted that, due to high redemption rates on the mergers that subsequently did worst, when returns are weighted by the amount of cash delivered by public market investors net of redemptions, this public cash-weighted average return has not been as bad as the EW average return. As documented in Gahng

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before declining to less than $5 per share in April 2023 before a 1-10 reverse split, with the stock falling even more by September 2023. GME went from less than $1 in July of 2020 to over $80 in January 2021 before falling to about $10 per share less than a month later. Bitcoin prices went from less than $7,000 in March 2020 to over $60,000 in April 2021 before declining to less than $17,000 in late 2022.

et al. (2023, Panel B of Table 4), the public cash-weighted one-year return of -3.0% for deSPACs from 2012-2020 is not as negative as the EW average return of -11.3%.

Panel B of Table 12 categorizes deSPACs by whether they were VC-backed or not. During 2017-2022, VC-backed deSPACs have been followed by lower stock returns than other deSPACs during the one-year and three-year periods after the deSPAC. The average one-year market-adjusted returns for VC-backed deSPACs and other deSPACs are -56.4% and -34.0%, respectively. Thus, the market appears to overestimate the value of VC-backing at the deSPAC during 2012-2022, consistent with the results on IPOs in Table 4. Although not shown, very few of these deSPACs have been life science companies.

Table 13 shows the three-year returns following deSPACs (Panel A) and IPOs (Panel B) in each year of 2017-2022, sorted by VC-backing. In each cohort year, VC-backed deSPACs have lower average three-year market-adjusted returns than other IPOs. VC-backed IPOs have higher average three-year market-adjusted returns than other IPOs in 2017, 2018, and 2022, but the opposite is true in 2019-2021. Overall, VC-backed IPOs and other IPOs during 2017-2022 have similar average three-year market-adjusted returns.

Groh et al. (2022) analyze VC-backed companies that exit via SPAC mergers and compare them with those that exit via an IPO. They conclude that the VC-backed companies that exit via SPAC mergers are on average of lower quality than those conducting IPOs. A comparison of VC-backed deSPACs in Panel A of Table 13 and VC-backed IPOs in Panel B provides support for their interpretation.

Taken together, the results in Table 3, Table 4, Table 8, Panel B of Table 12, and Table 13 provide some evidence that the market has on average overestimated the value of VC-backing for IPOs since 1999 and for deSPACs since 2012.

## Conclusions

For successful portfolio companies financed with venture capital, the most common exit in recent decades has been to merge the company with a larger company in the same industry, known as a trade sale. Many of the most prominent exits, however, have been with an IPO or, more recently, going public by merging with a SPAC. The reduction in the number of IPOs since 2001 has largely been driven by two factors: the increase in the availability of VC money has allowed companies to stay private longer, and the increasingly attractive business strategy of merging to achieve scale faster, instead of remaining independent. The second factor appears to be more important in explaining the reduced IPO volume, in that if companies were merely staying private a few years longer, there would be older, and not necessarily fewer, companies going public.

On average, VC-backed IPOs have had better performance than nonVC-backed IPOs in the three years after the IPO. Using 9,089 U.S. IPOs from 1980-2021, Table 4 reports a three-year average market-adjusted return of -11.5% for VC-backed IPOs, whereas nonVC-backed IPOs had an average market-adjusted return of -23.5%. For IPOs from 1999-2021, however, Table 8 reports that the average market-adjusted return following nonVC-backed IPOs has become less negative, whereas it has become worse for VC-backed IPOs. The long-run returns on small company IPOs have been substantially worse than those on large company IPOs, whether VC-backed or not. The poor performance for public market investors of these small company IPOs suggests that the reduction in the number of small company IPOs that has occurred since 2000 may be good for retail investors.

In recent years, merging with a SPAC has also become a common way for a company to go public. In 2012-2022, 451 operating companies completed a merger with a SPAC and started to trade on Nasdaq or the NYSE. Of these 451 so-called deSPACs, the average three-year market-adjusted buy-and-hold return has been -57.4%, substantially worse than the -8.0% average for 2,570 IPOs during 2001-2021. It should be noted, however, that some of the deSPACs with high redemption rates had a very small public float after the deSPAC, so that the dollar amount of money lost by public market investors was not large for those deals. For deals from 2017-2022, our Table 13 shows that deSPACs have resulted in far worse returns than IPOs, with the VC-backed deSPACs doing especially poorly. These return patterns are consistent with the hypothesis that on average the operating companies merging with SPACs are disproportionately of low quality.

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**Figure 1**

**VC Exits**

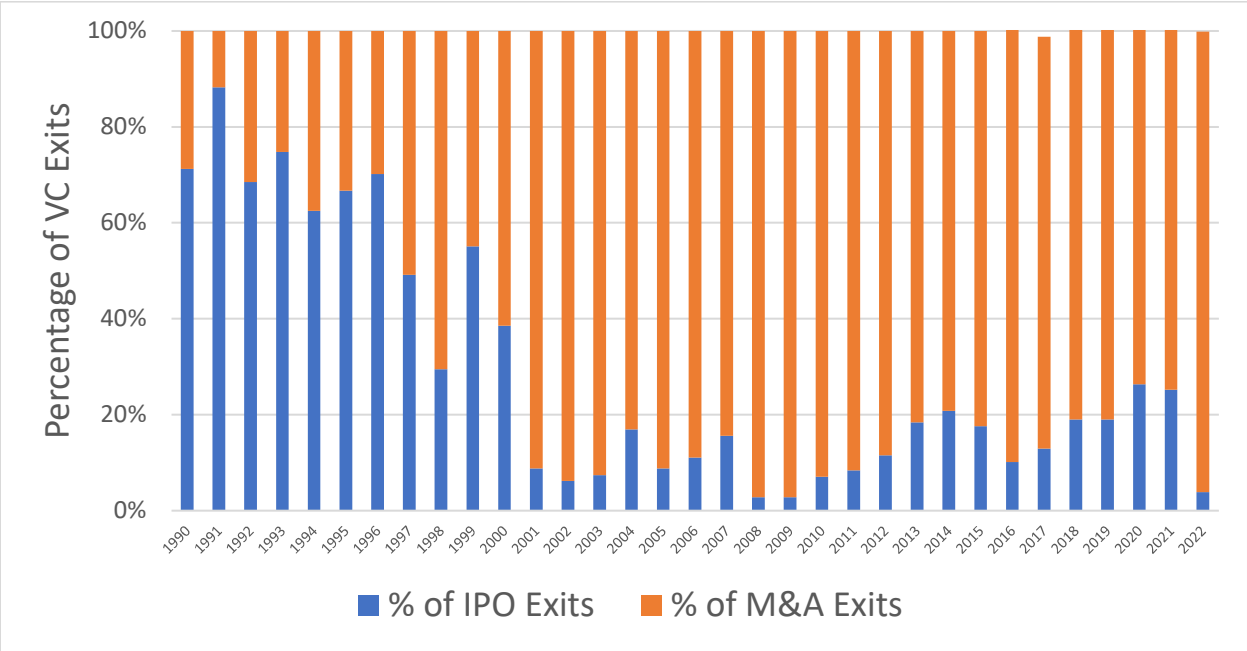


Figure 1 (an updated version of Figure 2 in Gao, Ritter, and Zhu (2013)) shows that the percentage of successful portfolio companies that exit via an IPO rapidly declined during the 1990s before plateauing at roughly 10% after 2000. Most other exits are either trade sales (M&A), with some sales to financial buyers and, especially in 2021 and 2022, mergers with SPACs (which could also be classified as IPOs, since the portfolio company goes public via the merger). Data are from NVCA Yearbooks, Pitchbook/NVCA Quarterly Reports, and JP Morgan *Private Equity Distribution Management* newsletters (for 2016-2022).

## Table 1

## VC-backed and Buyout-backed IPOs, 1980-2022

There are 9,127 IPOs after excluding those with an offer price below $5.00 per share, unit offers, ADRs, closed-end funds, natural resource limited partnerships, special purpose acquisition companies (SPACs), REITs, bank and S&L IPOs, small best efforts offerings, and firms not listed on CRSP within six months of the IPO. Jerry Cao has provided some information on which IPOs are buyout-backed, and Will Gornall and Ilya Strebulaev have supplied information on VC-backed IPOs. VC-backing classification is based on whether an IPO has an independent venture capital firm as a shareholder at the time of the IPO.

(table on the next page)

| Year | Number of IPOs | Financial sponsor-backed | | VC-backed | | Buyout-backed | |
|---|---|---|---|---|---|---|---|
| | | No. | % | No. | % | No. | % |
| 1980 | 71 | 24 | 34% | 23 | 32% | 1 | 1% |
| 1981 | 192 | 54 | 28% | 53 | 28% | 1 | 1% |
| 1982 | 77 | 23 | 30% | 21 | 27% | 2 | 3% |
| 1983 | 451 | 133 | 29% | 116 | 26% | 17 | 4% |
| 1984 | 171 | 49 | 29% | 44 | 26% | 5 | 3% |
| 1985 | 186 | 57 | 31% | 39 | 21% | 18 | 10% |
| 1986 | 393 | 121 | 31% | 79 | 20% | 42 | 11% |
| 1987 | 285 | 107 | 38% | 66 | 23% | 41 | 14% |
| 1988 | 105 | 41 | 39% | 32 | 30% | 9 | 9% |
| 1989 | 116 | 50 | 43% | 40 | 34% | 10 | 9% |
| 1990 | 110 | 55 | 50% | 42 | 38% | 13 | 12% |
| 1991 | 286 | 188 | 66% | 115 | 40% | 73 | 26% |
| 1992 | 412 | 236 | 57% | 138 | 33% | 98 | 24% |
| 1993 | 510 | 251 | 49% | 172 | 34% | 79 | 15% |
| 1994 | 402 | 151 | 38% | 129 | 32% | 22 | 5% |
| 1995 | 462 | 220 | 48% | 190 | 41% | 30 | 6% |
| 1996 | 677 | 300 | 44% | 266 | 39% | 34 | 5% |
| 1997 | 474 | 172 | 36% | 134 | 28% | 38 | 8% |
| 1998 | 283 | 110 | 39% | 80 | 28% | 30 | 11% |
| 1999 | 476 | 310 | 65% | 280 | 59% | 30 | 6% |
| 2000 | 380 | 277 | 73% | 245 | 64% | 32 | 8% |
| 2001 | 80 | 53 | 66% | 32 | 40% | 21 | 26% |
| 2002 | 66 | 43 | 65% | 23 | 35% | 20 | 30% |
| 2003 | 63 | 46 | 73% | 25 | 40% | 21 | 33% |
| 2004 | 173 | 122 | 71% | 79 | 46% | 43 | 25% |
| 2005 | 159 | 113 | 71% | 45 | 28% | 68 | 43% |
| 2006 | 157 | 122 | 78% | 56 | 36% | 66 | 42% |
| 2007 | 159 | 109 | 69% | 79 | 50% | 30 | 19% |
| 2008 | 21 | 12 | 57% | 9 | 43% | 3 | 14% |
| 2009 | 41 | 31 | 76% | 12 | 29% | 19 | 46% |
| 2010 | 91 | 68 | 74% | 40 | 44% | 28 | 29% |
| 2011 | 81 | 63 | 78% | 46 | 57% | 17 | 21% |
| 2012 | 93 | 77 | 83% | 49 | 53% | 28 | 30% |
| 2013 | 158 | 118 | 75% | 81 | 52% | 37 | 23% |
| 2014 | 206 | 170 | 83% | 132 | 64% | 38 | 18% |
| 2015 | 118 | 98 | 83% | 78 | 65% | 20 | 17% |
| 2016 | 75 | 62 | 83% | 49 | 65% | 13 | 17% |
| 2017 | 106 | 82 | 77% | 64 | 60% | 18 | 17% |
| 2018 | 134 | 106 | 79% | 91 | 68% | 15 | 11% |
| 2019 | 113 | 88 | 79% | 77 | 69% | 11 | 10% |
| 2020 | 165 | 135 | 82% | 113 | 68% | 22 | 13% |
| 2021 | 311 | 242 | 78% | 175 | 56% | 67 | 22% |
| 2022 | 38 | 15 | 39% | 13 | 38% | 2 | 5% |
| 1980-1989 | 2,047 | 659 | 32% | 513 | 25% | 146 | 7% |
| 1990-1998 | 3,616 | 1,683 | 47% | 1,266 | 35% | 417 | 12% |
| 1999-2000 | 856 | 587 | 69% | 525 | 61% | 62 | 7% |
| 2001-2022 | 2,608 | 1,975 | 76% | 1,368 | 52% | 607 | 23% |
| **1980-2022** | **9,127** | **4,904** | **54%** | **3,672** | **40%** | **1,232** | **13%** |

## Table 2

## Financial Sponsor-backed Technology Company IPOs, 1980-2022

There are 2,225 IPOs are tech companies with a financial sponsor (VC or buyout firm), after excluding those with an offer price below $5.00 per share, unit offers, ADRs, closed-end funds, best effort offers, natural resource limited partnerships (and most other LPs, but not buyout firms such as Carlyle Group), special purpose acquisition companies (SPACs), direct listings, REITs, bank and S&L IPOs, and firms not listed on CRSP. Missing and questionable numbers from the SDC new issues database are supplemented by direct inspection of prospectuses on EDGAR, information from Dealogic for IPOs after 1991, Howard and Co.'s *Going Public: The IPO Reporter* from 1980-1985, and the Graeme Howard-Todd Huxster collection of IPO prospectuses for 1975-2006. Tech stocks are defined as internet-related stocks plus other technology stocks including telecom, but not including life sciences. Loughran and Ritter (2004) list the SIC codes in their appendix 3 and sources of founding dates in appendix 1. The definition of technology stocks has been changed from that in Loughran and Ritter (2004 *Financial Management*), with SIC=3559, 3576 (computer communications equipment code for 21 companies, including Cisco Systems), 3844, and 7389 added to tech. Some 7389 (business services) companies have had their SIC codes changed into non-tech categories, such as consulting and two new SIC codes that Jay Ritter made up: 5614 for telemarketing firms and 7388 for non-tech business services such as Sotheby's Auctions .

For buyout-backed IPOs, the founding date of the predecessor company is used. Price-to-sales ratios are computed using both the offer price (OP) and the first closing market price (MP) for computing the market capitalization of equity. Market cap is calculated using the post-issue shares outstanding, with all share classes included in the case of dual-class companies. The undiluted number of shares is used, which is some cases (e.g., Facebook, Twitter, and Castlight Health) understates the market cap due to the existence of substantial amounts of in-the-money employee stock options that are highly likely to be exercised. Sales are the last twelve months (LTM) revenues as reported in the prospectus. The median sales, in millions, is expressed in both nominal dollars and in dollars of 2022 purchasing power using the CPI. The median age, in years, is the number of years between the calendar year of the founding date and the calendar year of the IPO. Martin Kenney and Don Patton have contributed to the data on founding dates. The percentage of IPOs that are profitable measures profitability using trailing LTM earnings (usually using after extraordinary items earnings, and usually using pro forma numbers that are computed assuming that any recent or concurrent mergers have already occurred, and the conversion of convertible preferred stock into common stock). In some cases, last fiscal year earnings are used when LTM earnings are unavailable.

(table on the next page)

| Year | Number of Financial-sponsor-backed tech IPOs | Median Price-to-sales | | Median sales, $mm | | Median age | % profitable |
|---|---|---|---|---|---|---|---|
| | | OP | MP | Nominal | $2022 | | |
| 1980 | 14 | 3.0 | 3.4 | 16.9 | 61.2 | 6.5 | 93% |
| 1981 | 29 | 3.8 | 4.3 | 11.9 | 38.5 | 9 | 90% |
| 1982 | 15 | 6.1 | 7.6 | 18.9 | 56.5 | 3 | 67% |
| 1983 | 68 | 7.3 | 8.3 | 12.0 | 34.4 | 4.5 | 65% |
| 1984 | 26 | 2.3 | 2.3 | 21.9 | 60.4 | 5 | 81% |
| 1985 | 16 | 3.0 | 3.3 | 17.1 | 45.7 | 5 | 81% |
| 1986 | 34 | 4.0 | 4.5 | 19.4 | 49.8 | 5 | 71% |
| 1987 | 41 | 3.2 | 3.2 | 22.3 | 56.4 | 5 | 88% |
| 1988 | 18 | 2.7 | 2.7 | 29.2 | 71.0 | 6 | 94% |
| 1989 | 24 | 3.3 | 3.7 | 36.2 | 84.1 | 7.5 | 83% |
| 1990 | 24 | 3.9 | 4.5 | 28.6 | 63.0 | 7.5 | 100% |
| 1991 | 52 | 2.7 | 3.2 | 39.6 | 82.8 | 9 | 73% |
| 1992 | 83 | 3.5 | 3.7 | 24.7 | 50.3 | 8 | 55% |
| 1993 | 92 | 3.0 | 3.6 | 26.1 | 51.4 | 8 | 73% |
| 1994 | 67 | 4.1 | 5.2 | 20.8 | 40.0 | 8 | 67% |
| 1995 | 126 | 5.0 | 6.5 | 21.3 | 39.9 | 8 | 71% |
| 1996 | 157 | 9.6 | 10.9 | 14.7 | 26.8 | 7 | 36% |
| 1997 | 78 | 6.2 | 7.7 | 20.1 | 35.6 | 7 | 40% |
| 1998 | 62 | 10.2 | 13.9 | 20.8 | 36.1 | 6 | 24% |
| 1999 | 264 | 28.1 | 53.7 | 11.3 | 19.4 | 4 | 9% |
| 2000 | 202 | 35.6 | 60.1 | 10.2 | 16.9 | 5 | 8% |
| 2001 | 19 | 13.7 | 14.6 | 24.6 | 39.5 | 6 | 16% |
| 2002 | 17 | 2.9 | 3.1 | 101.1 | 160.5 | 10 | 41% |
| 2003 | 16 | 3.5 | 4.1 | 86.2 | 133.4 | 8.5 | 44% |
| 2004 | 50 | 6.6 | 7.1 | 51.7 | 78.5 | 8 | 40% |
| 2005 | 34 | 4.8 | 5.1 | 66.8 | 98.6 | 9 | 29% |
| 2006 | 39 | 5.3 | 5.9 | 59.2 | 84.0 | 9 | 54% |
| 2007 | 65 | 6.5 | 8.0 | 72.5 | 97.6 | 8 | 28% |
| 2008 | 5 | 4.2 | 5.6 | 240.3 | 320.1 | 14 | 60% |
| 2009 | 11 | 3.3 | 4.0 | 180.4 | 240.3 | 10 | 64% |
| 2010 | 32 | 3.4 | 3.9 | 132.8 | 172.2 | 11 | 63% |
| 2011 | 34 | 5.3 | 6.5 | 160.1 | 204.4 | 10.5 | 35% |
| 2012 | 38 | 4.3 | 4.9 | 119.8 | 148.7 | 10.5 | 42% |
| 2013 | 40 | 5.2 | 5.8 | 110.3 | 134.7 | 9.5 | 25% |
| 2014 | 46 | 6.2 | 7.0 | 99.4 | 119.4 | 10 | 17% |
| 2015 | 36 | 5.3 | 6.2 | 126.3 | 151.9 | 11 | 22% |
| 2016 | 17 | 4.2 | 4.3 | 109.5 | 130.1 | 10 | 29% |
| 2017 | 27 | 4.9 | 6.5 | 162.6 | 188.3 | 13 | 11% |
| 2018 | 33 | 7.7 | 11.7 | 184.9 | 209.7 | 12 | 12% |
| 2019 | 30 | 9.4 | 13.3 | 205.8 | 230.0 | 11 | 20% |
| 2020 | 38 | 14.9 | 25.3 | 220.4 | 240.4 | 12 | 21% |
| 2021 | 105 | 15.5 | 18.4 | 208.4 | 224.1 | 12 | 20% |
| 2022 | 1 | 20.6 | 24.0 | 70.4 | 70.4 | 14 | 0% |
| **1980-2022** | **2,225** | **6.8** | **8.4** | **28.3** | **53.3** | **8.0** | **40%** |

## Table 3

## VC-backed Tech IPOs. 1980-2022

There are 1,992 VC-backed tech IPOs, after excluding those with an offer price below $5.00 per share, unit offers, ADRs, closed-end funds, best effort offers, natural resource limited partnerships (and most other LPs, but not buyout firms such as Carlyle Group), special purpose acquisition companies (SPACs), direct listings, REITs, bank and S&L IPOs, and firms not listed on CRSP. The definition of tech stocks is described in the caption to Table 2.

Price-to-sales ratios are computed using both the offer price (OP) and the first closing market price (MP) for computing the market capitalization of equity. Market cap is calculated using the post-issue shares outstanding, with all share classes included in the case of dual-class companies. The undiluted number of shares is used, which is some cases (e.g., Facebook, Twitter, and Castlight Health) understates the market cap due to the existence of substantial amounts of in-the-money employee stock options that are highly likely to be exercised. Sales are the last twelve months (LTM) revenues as reported in the prospectus. The median sales, in millions, is expressed in both nominal dollars and in dollars of 2022 purchasing power using the CPI. The median age, in years, is the number of years since the calendar year of the founding date and the calendar year of the IPO. The percentage of IPOs that are profitable measures profitability using trailing LTM earnings (usually using after extraordinary items earnings, and usually using pro forma numbers that are computed assuming that any recent or concurrent mergers have already occurred, and the conversion of convertible preferred stock into common stock). In some cases, last fiscal year earnings are used when LTM earnings are unavailable.

Even concepts like market cap (for the price-to-sales ratios) become ambiguous when you realize that companies like Facebook have many deep in-the-money options outstanding, so whether you use the fully diluted number of shares or the undiluted number can affect the calculations substantially for some companies.

(table on the next page)

| Year | Number of VC-backed tech IPOs | Median Price-to-sales | | Median sales, $mm | | Median age | % profitable |
|---|---|---|---|---|---|---|---|
| | | OP | MP | Nominal | $2022 | | |
| 1980 | 14 | 3.0 | 3.4 | 16.9 | 61.2 | 6.5 | 93% |
| 1981 | 29 | 3.8 | 4.3 | 11.9 | 38.5 | 9 | 90% |
| 1982 | 15 | 6.1 | 7.6 | 18.9 | 56.5 | 3 | 67% |
| 1983 | 67 | 7.2 | 8.1 | 11.7 | 33.6 | 5 | 66% |
| 1984 | 26 | 2.3 | 2.3 | 21.9 | 60.4 | 5 | 81% |
| 1985 | 16 | 3.0 | 3.3 | 17.1 | 45.7 | 5 | 81% |
| 1986 | 31 | 4.3 | 4.7 | 17.0 | 43.6 | 5 | 71% |
| 1987 | 39 | 3.2 | 3.2 | 22.0 | 55.6 | 5 | 87% |
| 1988 | 17 | 2.6 | 2.7 | 28.2 | 68.5 | 6 | 94% |
| 1989 | 23 | 3.4 | 3.7 | 35.5 | 82.5 | 7 | 83% |
| 1990 | 24 | 3.9 | 4.5 | 28.6 | 63.0 | 7.5 | 100% |
| 1991 | 45 | 3.2 | 3.5 | 35.9 | 75.0 | 9 | 71% |
| 1992 | 67 | 3.9 | 4.4 | 22.0 | 44.8 | 7 | 61% |
| 1993 | 88 | 3.1 | 3.6 | 24.3 | 47.9 | 8 | 72% |
| 1994 | 64 | 4.3 | 5.2 | 18.9 | 36.4 | 8 | 66% |
| 1995 | 115 | 5.5 | 6.9 | 19.7 | 36.9 | 8 | 70% |
| 1996 | 154 | 9.8 | 11.3 | 14.3 | 26.0 | 7 | 35% |
| 1997 | 73 | 6.9 | 8.3 | 19.3 | 34.1 | 6 | 38% |
| 1998 | 55 | 11.6 | 14.8 | 18.8 | 32.7 | 6 | 22% |
| 1999 | 250 | 30.9 | 56.6 | 11.0 | 18.9 | 4 | 9% |
| 2000 | 183 | 41.4 | 65.7 | 9.3 | 15.5 | 5 | 6% |
| 2001 | 17 | 14.9 | 17.4 | 22.8 | 36.6 | 6 | 12% |
| 2002 | 13 | 3.5 | 3.9 | 87.3 | 138.6 | 6 | 31% |
| 2003 | 12 | 5.2 | 6.1 | 65.0 | 100.6 | 7 | 50% |
| 2004 | 40 | 6.9 | 7.9 | 41.0 | 62.3 | 7 | 30% |
| 2005 | 22 | 6.4 | 7.2 | 46.5 | 68.6 | 7.5 | 23% |
| 2006 | 27 | 6.2 | 8.1 | 51.2 | 72.7 | 8 | 52% |
| 2007 | 58 | 7.3 | 8.3 | 66.5 | 89.5 | 8 | 26% |
| 2008 | 4 | 4.1 | 4.7 | 156.7 | 208.7 | 12 | 50% |
| 2009 | 6 | 4.6 | 5.8 | 105.7 | 140.7 | 9.5 | 50% |
| 2010 | 23 | 3.2 | 3.9 | 112.9 | 146.5 | 10 | 61% |
| 2011 | 30 | 6.8 | 7.2 | 117.2 | 149.7 | 9.5 | 37% |
| 2012 | 35 | 4.6 | 5.0 | 103.7 | 128.7 | 9 | 37% |
| 2013 | 35 | 5.8 | 7.1 | 104.2 | 127.2 | 9 | 17% |
| 2014 | 40 | 6.5 | 8.2 | 86.8 | 104.4 | 10 | 18% |
| 2015 | 29 | 6.0 | 7.5 | 76.6 | 92.2 | 10 | 21% |
| 2016 | 15 | 4.5 | 5.9 | 101.7 | 120.8 | 9 | 27% |
| 2017 | 24 | 5.0 | 6.9 | 158.4 | 183.5 | 13 | 13% |
| 2018 | 30 | 8.6 | 12.4 | 173.6 | 196.8 | 12 | 13% |
| 2019 | 26 | 9.8 | 13.7 | 146.6 | 163.9 | 10.5 | 15% |
| 2020 | 33 | 15.7 | 27.2 | 201.3 | 219.5 | 11 | 18% |
| 2021 | 77 | 20.3 | 26.6 | 136.4 | 146.7 | 11 | 16% |
| 2022 | 1 | 20.6 | 24.0 | 70.4 | 70.4 | 14 | 0% |
| **1980-2022** | **1,992** | **7.6** | **9.7** | **23.9** | **46.0** | **7** | **39%** |

## Table 4

### Long-run Returns on IPOs Categorized by VC-backing, by Subperiod

The sample is composed of 9,089 IPOs from 1980-2021, with returns calculated through the end of December 2022. IPOs with an offer price below $5.00 per share, unit offers, small best efforts offerings, ADRs, REITs, closed end funds, SPACs, natural resource limited partnerships, banks and S&Ls, and IPOs not listed on CRSP within six months of the offer date are excluded. Buy-and-hold returns are calculated from the first closing market price until the earlier of the three-year anniversary or the delisting date (Friday, Dec. 30 of 2022 for IPOs from 2020 and 2021). Market-adjusted returns use the CRSP value-weighted index. Style adjustments use firms matched by market cap and book-to-market ratio with at least five years of CRSP listing and no follow-on equity issues in the prior five years. Specifically, the firm with the closest book-to-market ratio within the size decile of the IPO is used for the matching firm. Market capitalization (size) is calculated using the first closing market price after the IPO. All returns are equally weighted averages and include dividends and capital gains, including the index returns.

**Panel A: IPOs from 1980-2021 categorized by venture capital backing**

| VC-backed or not | Number of IPOs | Average First-day Return | Average 3-year Buy-and-hold Return | | |
|---|---|---|---|---|---|
| | | | IPOs | Market-adjusted | Style-adjusted |
| VC-backed | 3,659 | 27.0% | 21.6% | -11.5% | -2.8% |
| NonVC-backed | 5,430 | 13.4% | 18.2% | -23.5% | -11.7% |
| All | 9,089 | 18.9% | 19.6% | -18.7% | -8.1% |

**Panel B: IPOs from 1980-1989**

| VC-backed or not | Number of IPOs | Average First-day Return | Average 3-year Buy-and-hold Return | | |
|---|---|---|---|---|---|
| | | | IPOs | Market-adjusted | Style-adjusted |
| VC-backed | 513 | 8.6% | 31.9% | -14.0% | 14.0% |
| NonVC-backed | 1,534 | 6.8% | 19.3% | -25.5% | -1.8% |
| All | 2,047 | 7.2% | 22.5% | -22.6% | 2.2% |

**Panel C: IPOs from 1990-1998**

| VC-backed or not | Number of IPOs | Average First-day Return | Average 3-year Buy-and-hold Return | | |
|---|---|---|---|---|---|
| | | | IPOs | Market-adjusted | Style-adjusted |
| VC-backed | 1,266 | 17.3% | 60.7% | -1.1% | 27.0% |
| NonVC-backed | 2,350 | 13.5% | 28.4% | -31.8% | -14.9% |
| All | 3,616 | 14.8% | 39.7% | -21.0% | -0.2% |

**Panel D: IPOs from 1999-2000**

| VC-backed or not | Number of IPOs | Average First-day Return | Average 3-year Buy-and-hold Return | | |
|---|---|---|---|---|---|
| | | | IPOs | Market-adjusted | Style-adjusted |
| VC-backed | 526 | 80.8% | -62.3% | -40.5% | -62.6% |
| NonVC-backed | 330 | 38.8% | -38.5% | -17.8% | -53.1% |
| All | 856 | 64.6% | -53.1% | -31.8% | -58.9% |

**Panel E: IPOs from 2001-2021**

| VC-backed or not | Number of IPOs | Average First-day Return | Average 3-year Buy-and-hold Return | | |
|---|---|---|---|---|---|
| | | | IPOs | Market-adjusted | Style-adjusted |
| VC-backed | 1,355 | 22.2% | 13.7% | -9.0% | -14.0% |
| NonVC-backed | 1,215 | 14.6% | 12.6% | -6.7% | -6.8% |
| All | 2,570 | 18.6% | 13.1% | -8.0% | -10.6% |

## Table 5
## Long-run Returns on IPOs Categorized by VC-backing and Real Sales

The sample is composed of 9,088 IPOs from 1980-2021, with returns calculated through the end of December 2022. IPOs with an offer price below $5.00 per share, unit offers, small best efforts offerings, ADRs, REITs, closed end funds, SPACs, natural resource limited partnerships, banks and S&Ls, and IPOs not listed on CRSP within six months of the offer date are excluded. Buy-and-hold returns are calculated from the first closing market price in Panels A and B, and from the offer price in Panels C and D, until the earlier of the three-year anniversary or the delisting date (Dec. 30 of 2022 for IPOs from 2020 and 2021). Market-adjusted returns use the CRSP value-weighted index. Style adjustments use firms matched by market cap and book-to-market ratio with at least five years of CRSP listing and no follow-on equity issues in the prior five years. Sales are the trailing twelve month revenues listed in the IPO prospectus, measured in terms of dollars of January 2022 purchasing power using the CPI.

**Panel A: IPOs with Sales<$100 million from 1980-2021 categorized by VC-backing**

| | | Average | Average 3-year Buy-and-hold Return | | |
|---|---|---|---|---|---|
| VC-backed or not | Number of IPOs | First-day Return | IPOs | Market-adjusted | Style-adjusted |
| VC-backed | 2,710 | 28.6% | 12.4% | -19.9% | -8.1% |
| NonVC-backed | 2,582 | 17.1% | 2.4% | -42.7% | -24.1% |
| All | 5,292 | 23.0% | 7.5% | -31.0% | -15.9% |

**Panel B: IPOs with Sales>$100 million from 1980-2021 categorized by VC-backing**

| | | Average | Average 3-year Buy-and-hold Return | | |
|---|---|---|---|---|---|
| VC-backed or not | Number of IPOs | First-day Return | IPOs | Market-adjusted | Style-adjusted |
| VC-backed | 949 | 22.5% | 48.1% | 12.5% | 12.2% |
| NonVC-backed | 2,847 | 10.0% | 32.6% | -6.1% | -0.5% |
| All | 3,796 | 13.1% | 36.4% | -1.5% | 2.7% |

**Panel C: IPOs with Sales<$100 million, with returns measured from the offer price**

| | | Average | Average 3-year Buy-and-hold Return | | |
|---|---|---|---|---|---|
| VC-backed or not | Number of IPOs | First-day Return | IPOs | Market-adjusted | Style-adjusted |
| VC-backed | 2,710 | 28.6% | 34.9% | 2.6% | 14.4% |
| NonVC-backed | 2,582 | 17.1% | 15.4% | -29.7% | -11.1% |
| All | 5,292 | 23.0% | 25.4% | -13.2% | 2.0% |

**Panel D: IPOs with Sales>$100 million, with returns measured from the offer price**

| | | Average | Average 3-year Buy-and-hold Return | | |
|---|---|---|---|---|---|
| VC-backed or not | Number of IPOs | First-day Return | IPOs | Market-adjusted | Style-adjusted |
| VC-backed | 949 | 22.5% | 78.4% | 42.8% | 42.5% |
| NonVC-backed | 2,847 | 10.0% | 44.3% | 5.6% | 11.2% |
| All | 3,796 | 13.1% | 52.8% | 14.9% | 19.0% |

## Table 6

## Technology and Life Science Company IPOs, 1980-2022

There are 3,311 tech and 987 life science (Life Sci) IPOs from 1980-2022, including both those with and without a financial sponsor, after excluding those with an offer price below $5.00 per share, unit offers, ADRs, closed-end funds, partnerships, acquisition companies, REITs, bank and S&L IPOs, and firms not listed on CRSP.

The caption to table 2 describes the definition of tech stocks. Life science is defined as SIC=2830, 2834, 2835, 2836, and 8731. Life science includes biotech and pharmaceutical firms. We are not including 2833 (medical chemicals and botanical products) since in recent years it has been mainly cannabis-related companies.

Sales are the last twelve months (LTM) revenues as reported in the prospectus. The median sales, in millions, are expressed in dollars of 2022 purchasing power using the CPI. Pro forma numbers are usually used if there have been recent mergers or mergers that coincide with the IPO. The percentage of IPOs that are profitable measures profitability using trailing LTM earnings (usually using after extraordinary items earnings, and usually using pro forma numbers that are computed assuming that any recent or concurrent mergers have already occurred, and the conversion of convertible preferred stock into common stock). In some cases, last fiscal year earnings are used when LTM earnings are unavailable.

(table on the next page)

| | Number of IPOs | | | % Profitable | | | Median sales ($2022, mm) | | |
|---|---|---|---|---|---|---|---|---|---|
| Year | Tech | Life Sci | Other | Tech | Life Sci | Other | Tech | Life Sci | Other |
| 1980 | 22 | 3 | 46 | 91% | 67% | 70% | 58.6 | 20.5 | 77.3 |
| 1981 | 72 | 10 | 110 | 88% | 30% | 85% | 41.8 | 4.9 | 43.3 |
| 1982 | 42 | 2 | 33 | 83% | 50% | 79% | 31.4 | 4.0 | 29.9 |
| 1983 | 173 | 21 | 257 | 71% | 42% | 86% | 24.8 | 7.4 | 88.8 |
| 1984 | 50 | 2 | 119 | 80% | 100% | 85% | 27.0 | 136.3 | 69.5 |
| 1985 | 37 | 5 | 144 | 84% | 40% | 87% | 35.7 | 12.5 | 106.3 |
| 1986 | 77 | 23 | 293 | 74% | 35% | 84% | 33.4 | 10.8 | 95.2 |
| 1987 | 59 | 10 | 216 | 86% | 20% | 85% | 45.0 | 7.8 | 110.9 |
| 1988 | 28 | 2 | 75 | 79% | 0% | 85% | 58.3 | 9.9 | 229.7 |
| 1989 | 35 | 4 | 77 | 77% | 0% | 82% | 73.2 | 2.7 | 122.2 |
| 1990 | 32 | 4 | 74 | 94% | 0% | 87% | 63.0 | 4.5 | 129.0 |
| 1991 | 71 | 32 | 183 | 75% | 16% | 88% | 72.3 | 7.0 | 154.8 |
| 1992 | 115 | 33 | 264 | 65% | 18% | 80% | 45.6 | 2.6 | 142.0 |
| 1993 | 127 | 27 | 356 | 74% | 22% | 75% | 53.2 | 3.0 | 120.2 |
| 1994 | 115 | 20 | 267 | 70% | 20% | 80% | 40.4 | 3.2 | 107.1 |
| 1995 | 205 | 21 | 236 | 71% | 14% | 75% | 40.0 | 5.8 | 118.8 |
| 1996 | 276 | 44 | 357 | 47% | 14% | 73% | 30.3 | 4.1 | 99.4 |
| 1997 | 174 | 22 | 278 | 50% | 14% | 77% | 37.4 | 9.9 | 111.7 |
| 1998 | 113 | 10 | 160 | 36% | 30% | 69% | 38.5 | 13.4 | 123.8 |
| 1999 | 370 | 10 | 96 | 14% | 20% | 63% | 20.7 | 10.1 | 194.1 |
| 2000 | 261 | 50 | 69 | 14% | 12% | 50% | 20.2 | 6.6 | 153.2 |
| 2001 | 24 | 5 | 51 | 30% | 0% | 66% | 38.1 | 0.3 | 571.2 |
| 2002 | 20 | 5 | 41 | 40% | 40% | 63% | 151.2 | 228.0 | 684.8 |
| 2003 | 18 | 8 | 37 | 39% | 0% | 76% | 160.4 | 0.1 | 623.8 |
| 2004 | 61 | 30 | 82 | 44% | 7% | 70% | 84.3 | 5.3 | 300.6 |
| 2005 | 45 | 16 | 98 | 36% | 13% | 70% | 100.3 | 18.2 | 320.0 |
| 2006 | 48 | 24 | 85 | 50% | 8% | 80% | 81.7 | 4.8 | 472.6 |
| 2007 | 76 | 19 | 64 | 30% | 5% | 73% | 95.9 | 1.9 | 323.0 |
| 2008 | 6 | 1 | 14 | 67% | 0% | 57% | 208.7 | 0.4 | 268.7 |
| 2009 | 14 | 3 | 24 | 71% | 67% | 71% | 232.1 | 50.1 | 598.8 |
| 2010 | 33 | 11 | 47 | 64% | 0% | 70% | 155.1 | 0.0 | 419.0 |
| 2011 | 36 | 8 | 37 | 36% | 0% | 59% | 180.4 | 4.0 | 412.6 |
| 2012 | 40 | 10 | 43 | 43% | 0% | 77% | 140.7 | 0.5 | 424.6 |
| 2013 | 45 | 40 | 73 | 27% | 7% | 58% | 129.2 | 11.9 | 507.1 |
| 2014 | 53 | 71 | 82 | 17% | 7% | 57% | 108.8 | 0.0 | 286.2 |
| 2015 | 38 | 42 | 38 | 26% | 0% | 66% | 157.4 | 0.0 | 205.8 |
| 2016 | 21 | 25 | 29 | 29% | 8% | 59% | 130.1 | 1.1 | 775.6 |
| 2017 | 30 | 32 | 44 | 17% | 0% | 42% | 218.2 | 0.0 | 516.2 |
| 2018 | 39 | 59 | 36 | 15% | 0% | 51% | 203.3 | 0.0 | 536.2 |
| 2019 | 37 | 42 | 27 | 30% | 0% | 50% | 219.7 | 0.0 | 121.5 |
| 2020 | 46 | 76 | 43 | 22% | 5% | 47% | 220.0 | 0.0 | 311.5 |
| 2021 | 121 | 89 | 101 | 22% | 2% | 49% | 202.4 | 0.0 | 325.4 |
| 2022 | 6 | 16 | 16 | 33% | 0% | 38% | 92.7 | 0.0 | 7.2 |
| 2001-22 | 857 | 632 | 1,119 | 32% | 4% | 63% | 135.2 | 0.0 | 380.6 |
| **1980-22** | **3,311** | **987** | **4,829** | **47%** | **10%** | **75%** | **47.0** | **1.6** | **135.4** |

## Table 7

### Long-run Returns on VC-backed and other IPOs Segmented by Industry

9,089 IPOs from 1980-2021 are used, with returns calculated through December 30, 2022. IPOs with an offer price below $5.00 per share, unit offers, SPACs, ADRs, REITs, closed end funds, natural resource partnerships, banks and S&Ls, small best efforts offers, and IPOs not listed on CRSP within six months of the offer date are excluded. Buy-and-hold returns are calculated from the first closing market price until the earlier of the three-year anniversary or the delisting date (Dec. 30 of 2022 for IPOs from 2020 and 2021). The captions to Tables 2 and 6 provide industry classification details. Market-adjusted returns use the CRSP value-weighted index. Style adjustments use firms matched by market cap and book-to-market ratio with at least five years of CRSP listing and no follow-on equity issues in the prior five years. The market-adjusted and style-adjusted returns are the average buy-and-hold return on the IPOs minus the average compounded return on the benchmark. Market capitalization (size) is calculated using the first closing market price after the IPO and the post-issue number of shares outstanding.

**Panel A: Long-run Returns on VC-backed IPOs, by Industry, 1980-2021**

| Sector | Number of IPOs | Average First-day Return | Average 3-year Buy-and-hold Return | | |
|---|---|---|---|---|---|
| | | | IPOs | Market-adjusted | Style-adjusted |
| Tech | 1,991 | 37.3% | 25.8% | -4.0% | 5.7% |
| Life science | 776 | 15.7% | 9.2% | -20.2% | -18.4% |
| Other | 892 | 14.3% | 23.1% | -20.7% | -8.3% |
| All | 3,659 | 27.0% | 21.6% | -11.5% | -2.8% |

**Panel B: Long-run Returns on nonVC-backed IPOs, by Industry, 1980-2021**

| Sector | Number of IPOs | Average First-day Return | Average 3-year Buy-and-hold Return | | |
|---|---|---|---|---|---|
| | | | IPOs | Market-adjusted | Style-adjusted |
| Tech | 1,314 | 22.2% | 14.9% | -22.9% | -9.1% |
| Life science | 195 | 17.0% | 37.4% | 5.0% | 28.2% |
| Other | 3,921 | 10.2% | 18.4% | -25.2% | -14.6% |
| All | 5,430 | 13.4% | 18.2% | -23.5% | -11.7% |

Note: The high life science 3-year buy-and-hold return for the 195 nonVC-backed IPOs in Panel B is partly driven by the 2,444.8% return on the June 1980 IPO of Enzo Biochem and the 1,606.1% return on the August 2003 IPO of New River Pharmaceutical, which used a WR Hambrecht + Co auction to go public. Of the 971 life science IPOs during 1980-2021, these are two of the three top long-run performers, with the VC-backed July 1998 IPO of Abgenix being the third, with a 2,071.1% return. Moderna, a December 2018 VC-backed IPO, produced the fifth-highest return.

## Table 8

### Long-run Returns on VC-backed and other IPOs Segmented by Industry, 1999-2021

3,426 IPOs from 1999-2021 are used, with returns calculated through December 30, 2022. See the captions to Tables 2 and 6 for a description of the sample and industry definitions.

### Panel A: Long-run Returns on VC-backed IPOs, by Industry, 1999-2021

| Sector | Number of IPOs | Average First-day Return | Average 3-year Buy-and-hold Return | | |
|---|---|---|---|---|---|
| | | | IPOs | Market-adjusted | Style-adjusted |
| Tech | 1,029 | 54.4% | -15.0% | -18.2% | -28.2% |
| Life science | 567 | 18.0% | 2.2% | -17.4% | -24.2% |
| Other | 284 | 22.3% | 0.1% | -17.3% | -31.5% |
| All | 1,880 | 38.6% | -7.5% | -17.8% | -27.5% |

### Panel B: Long-run Returns on nonVC-backed IPOs, by Industry, 1999-2021

| Sector | Number of IPOs | Average First-day Return | Average 3-year Buy-and-hold Return | | |
|---|---|---|---|---|---|
| | | | IPOs | Market-adjusted | Style-adjusted |
| Tech | 453 | 33.1% | -22.4% | -21.7% | -34.9% |
| Life science | 109 | 20.8% | 5.2% | -8.9% | -8.3% |
| Other | 892 | 13.4% | 12.2% | -3.3% | -9.3% |
| All | 1,546 | 19.7% | 1.6% | -9.1% | -16.7% |

## Table 9

### Long-run Returns on IPOs Categorized by VC-backing or Buyout Fund-backing

All Last Twelve Months (LTM) sales figures for the firms going public have been converted into dollars of January 2022 purchasing power using the Consumer Price Index. IPOs from 1980-2021 are used, with returns calculated through the end of December 2022. In Panel A, the sample size is 9,089 firms. Growth capital-backed IPOs are included in the VC-backed category. IPOs with an offer price below $5.00 per share, unit offers, small best efforts offerings, ADRs, REITs, closed-end funds, natural resource limited partnerships, banks and S&Ls, and IPOs not listed on CRSP within six months of the offer date are excluded. Financial sponsored IPOs are those with either VC-backing or buyout-backing. In Panel B, one additional screen is implemented, reducing the sample size. This additional screen is that the last twelve months (LTM) sales of the issuing firm is at least $50 million (2022 purchasing power). Buy-and-hold returns are calculated from the first close until the earlier of the three-year anniversary or the delisting date (Dec. 30 of 2022 for IPOs from 2020 and 2021). Market-adjusted returns use the CRSP value-weighted index. Style adjustments use firms matched by market cap and book-to-market ratio with at least five years of CRSP listing and no follow-on equity issues in the prior five years. All returns include dividends and capital gains, including the index returns.

**Panel A: IPOs from 1980-2021 categorized by venture capital backing**

| VC-backed or not | Number of IPOs | Average First-day Return | Average 3-year Buy-and-hold Return | | |
|---|---|---|---|---|---|
| | | | IPOs | Market-adjusted | Style-adjusted |
| VC-backed | 3,659 | 27.0% | 21.6% | -11.5% | -2.8% |
| NonVC-backed | 5,430 | 13.4% | 18.2% | -23.5% | -11.7% |
| Financial Sponsored | 4,889 | 22.6% | 23.5% | -8.6% | -2.1% |
| NonFinancial Sponsored | 4,200 | 14.5% | 15.1% | -30.5% | -15.1% |
| 1980-2021 | 9,089 | 18.9% | 19.6% | -18.7% | -8.1% |

Note: The nonVC- and nonBuyout-backed IPOs do not include a minimum sales screen, unlike in Panel B.

**Panel B: IPOs with at least $50 million in LTM sales (2022 purchasing power) from 1980-2021 categorized by private equity (buyout fund) backing**

| Buyout-backed or not | Number of IPOs | Average First-day Return | Average 3-year Buy-and-hold Return | | |
|---|---|---|---|---|---|
| | | | IPOs | Market-adjusted | Style-adjusted |
| Buyout-backed | 1,174 | 9.5% | 29.9% | 0.9% | 3.1% |
| NonBuyout-backed | 4,018 | 16.1% | 36.4% | -5.8% | 1.5% |
| All | 5,192 | 14.6% | 34.9% | -4.3% | 1.9% |

## Table 10

## Special Purpose Acquisition Company (SPAC) IPOs, 1990-2022

IR is the initial return, measured from the offer price to the first close. Proceeds are in billions and do not include overallotment shares. For 1990-1997 and 2004-2007, 50 of the initial returns are missing for SPAC OTC issues. For SPACs from before 2010, data has been provided by Tim Jenkinson, Andrew Karolyi, and Milos Vulanovic. SPAC Research, Gritstone Asset Management, and Dealogic have been used as data sources for SPACs in 2015-2022. For 1990-2022, Refinitiv (SDC) misclassifies over 140 SPAC IPOs, usually as closed-end funds (SIC 6726).

| | Operating Company IPOs | | SPAC IPOs | | | SPAC IPOs | |
|---|---|---|---|---|---|---|---|
| Year | Number | Mean IR | Non-unit | Unit | Total | Proceeds, $b | Mean IR |
| 1990 | 110 | 10.8% | 0 | 1 | 1 | $0.003 | |
| 1991 | 286 | 11.9% | 0 | 1 | 1 | $0.015 | |
| 1992 | 412 | 10.3% | 0 | 2 | 2 | $0.030 | |
| 1993 | 510 | 12.7% | 0 | 8 | 8 | $0.086 | |
| 1994 | 402 | 9.6% | 0 | 7 | 7 | $0.086 | |
| 1995 | 462 | 21.4% | 0 | 2 | 2 | $0.018 | |
| 1996 | 677 | 17.2% | 0 | 4 | 4 | $0.032 | |
| 1997 | 474 | 14.0% | 0 | 1 | 1 | $0.018 | |
| 1998 | 283 | 21.9% | 0 | 0 | 0 | | |
| 1999 | 476 | 71.2% | 0 | 0 | 0 | | |
| 2000 | 380 | 56.3% | 0 | 0 | 0 | | |
| 2001 | 80 | 14.0% | 0 | 0 | 0 | | |
| 2002 | 66 | 9.1% | 0 | 0 | 0 | | |
| 2003 | 63 | 11.7% | 0 | 1 | 1 | $0.024 | 0.9% |
| 2004 | 173 | 12.3% | 0 | 12 | 12 | $0.425 | 0.8% |
| 2005 | 159 | 10.3% | 4 | 24 | 28 | $1.846 | 1.9% |
| 2006 | 157 | 12.1% | 0 | 35 | 35 | $3.013 | 3.2% |
| 2007 | 159 | 14.0% | 0 | 65 | 65 | $10.985 | 0.7% |
| 2008 | 21 | 5.7% | 0 | 17 | 17 | $3.627 | 0.2% |
| 2009 | 41 | 9.8% | 0 | 0 | 0 | 0 | |
| 2010 | 91 | 9.4% | 0 | 7 | 7 | $0.513 | -1.5% |
| 2011 | 81 | 13.9% | 0 | 16 | 16 | $1.049 | 0.4% |
| 2012 | 93 | 17.7% | 1 | 8 | 9 | $0.475 | 0.0% |
| 2013 | 158 | 20.9% | 3 | 7 | 10 | $1.325 | 0.2% |
| 2014 | 206 | 15.5% | 0 | 11 | 11 | $1.555 | -0.1% |
| 2015 | 118 | 19.2% | 1 | 19 | 20 | $3.620 | 0.4% |
| 2016 | 75 | 14.5% | 0 | 13 | 13 | $3.224 | 0.3% |
| 2017 | 106 | 12.9% | 0 | 34 | 34 | $8.996 | 0.7% |
| 2018 | 134 | 18.6% | 0 | 46 | 46 | $9.935 | 0.4% |
| 2019 | 113 | 23.5% | 0 | 59 | 59 | $12.115 | 0.6% |
| 2020 | 165 | 41.6% | 11 | 237 | 248 | $75.337 | 1.6% |
| 2021 | 311 | 32.1% | 33 | 580 | 613 | $144.530 | 1.9% |
| 2022 | 38 | 48.9% | 0 | 86 | 86 | $12.000 | 0.1% |
| **Total** | **7,080** | **22.4%** | **53** | **1,302** | **1,356** | **$294.86** | **1.4%** |

| SPAC IPOs by Quarter | | | | | |
|---|---|---|---|---|---|
| 1Q 21 | 298 | 3.7% | 1Q22 | 54 | 0.0% |
| 2Q 21 | 60 | 0.3% | 2Q22 | 16 | 0.2% |
| 3Q 21 | 89 | -0.2% | 3Q22 | 8 | 0.0% |
| 4Q 21 | 166 | 0.5% | 4Q22 | 8 | 0.5% |

## Table 11

### Redemption rates on deSPACs, by quarter, 2017-2022

The redemption rates are equally weighted averages at the time of the merger between a SPAC and an operating company. Source: SPAC Research. The sample includes 3 deSPACs in 2019, 1 in 2020, and 1 in 2021 that were listed OTC, and thus not included in Tables 12-13, which examine deSPAC returns for Nasdaq- and NYSE-listed companies. Furthermore, 1 deSPAC in 2022 listed on the last trading day of the year, and there is thus no post-listing return to include in Tables 12-13.

| | All deSPACs | | VC-backed | | Non-VC-backed | |
|---|---|---|---|---|---|---|
| Quarter | Number of deSPACs | Average redemption rate | Number of deSPACs | Average redemption rate | Number of deSPACs | Average redemption rate |
| 2017, first | 3 | 38.4% | 1 | 8.7% | 2 | 53.3% |
| 2017, second | 2 | 36.2% | 0 | 0.0% | 2 | 36.2% |
| 2017, third | 4 | 60.2% | 1 | 78.2% | 3 | 54.2% |
| 2017, fourth | 4 | 57.8% | 1 | 91.8% | 3 | 46.5% |
| 2018, first | 6 | 64.9% | 0 | 0.0% | 6 | 64.9% |
| 2018, second | 1 | 8.4% | 0 | 0.0% | 1 | 8.4% |
| 2018, third | 5 | 41.8% | 2 | 14.1% | 3 | 60.3% |
| 2018, fourth | 11 | 72.1% | 3 | 86.4% | 8 | 66.8% |
| 2019, first | 6 | 73.0% | 1 | 99.3% | 5 | 67.8% |
| 2019, second | 6 | 72.5% | 2 | 88.6% | 4 | 62.2% |
| 2019, third | 5 | 74.2% | 1 | 96.7% | 4 | 68.6% |
| 2019, fourth | 11 | 53.1% | 2 | 7.1% | 9 | 63.3% |
| 2020, first | 10 | 52.2% | 3 | 64.9% | 7 | 46.7% |
| 2020, second | 8 | 54.1% | 4 | 32.7% | 4 | 75.6% |
| 2020, third | 8 | 56.3% | 3 | 37.5% | 5 | 67.5% |
| 2020, fourth | 38 | 27.4% | 24 | 27.7% | 14 | 26.7% |
| 2021, first | 24 | 11.3% | 16 | 7.0% | 8 | 19.8% |
| 2021, second | 40 | 24.2% | 30 | 25.1% | 10 | 21.6% |
| 2021, third | 82 | 54.5% | 62 | 52.2% | 20 | 61.3% |
| 2021. fourth | 53 | 62.0% | 34 | 61.5% | 19 | 63.0% |
| 2022, first | 29 | 85.6% | 23 | 85.5% | 6 | 86.1% |
| 2022, second | 20 | 81.4% | 9 | 84.0% | 11 | 79.2% |
| 2022, third | 26 | 82.2% | 9 | 80.6% | 17 | 83.0% |
| 2022, fourth | 27 | 88.1% | 14 | 90.9% | 13 | 85.0% |
| **Total** | **429** | **55.4%** | **245** | **58.1%** | **184** | **57.0%** |

**Table 12**
**Post-merger Returns on deSPACs, 2012-2022**

This table is an updated version of Table 4 in "SPACs" by Minmo Gahng, Jay R. Ritter, and Donghang Zhang, published in the 2023 *Review of Financial Studies*. The table reports average equally weighted deSPAC period common share percentage returns based on a buy-and-hold strategy in which an investor purchases common shares of a merged company at the close of the first day of trading as a new entity (the deSPAC) and holds them for 1 or 3 years. The year column represents the year of the merger. The sample consists of 451 business combinations consummated between January 2010 and December 2022, after excluding a few deSPACs that were listed OTC rather than on Nasdaq or the NYSE. Returns include dividend yields and capital gains. When the full 1- or 3-year data are not available, we calculate the returns based on available data. For example, if a merged company started to trade in March 2020 and delisted in August 2020, we report the buy-and-hold returns from March 2020 to August 2020 for both one-year and three-year returns (not annualized). Returns end on December 30, 2022, a Friday. The CRSP return is the total return on the CRSP value-weighted market index, matched to each investment period.

For 2022, the returns are for less than 1 year. For 2020-2022, the 3-year returns are for less than 3 years. In 2021, GNRS is not included because this deSPAC was traded OTC. For 2022, MLEC is not included because the deSPAC occurred on the last trading day of the year. It should be noted that if there is a high redemption rate, the public float after the deSPAC can be quite low until shares that were locked up become available for trading.

**Panel A: deSPAC Returns Categorized by Cohort Year**

| | | Average 1-year Return | | | Average 3-year Buy-and-hold Return | | |
|---|---|---|---|---|---|---|---|
| Year | Number | deSPACs | Market | Market-adjusted | deSPACs | Market | Market-adjusted |
| 2012 | 1 | -53.2% | 20.4% | -73.6% | -98.1% | 37.2% | -135.3% |
| 2013 | 5 | -30.1% | 17.9% | -48.0% | -41.1% | 28.0% | -69.1% |
| 2014 | 4 | -51.6% | 5.7% | -57.3% | -89.6% | 26.7% | -116.2% |
| 2015 | 9 | -19.5% | 0.7% | -20.2% | 87.7% | 33.1% | 54.6% |
| 2016 | 9 | -5.2% | 19.0% | -24.2% | -35.1% | 40.3% | -75.3% |
| 2017 | 13 | -11.0% | 11.7% | -22.6% | -44.5% | 30.3% | -74.7% |
| 2018 | 23 | -35.0% | 8.8% | -43.8% | -8.1% | 51.7% | -59.8% |
| 2019 | 25 | 2.0% | 8.8% | -6.8% | -25.0% | 10.1% | -35.1% |
| 2020 | 63 | -3.0% | 32.6% | -35.6% | -54.6% | 13.0% | -67.6% |
| 2021 | 198 | -64.2% | -10.3% | -53.9% | -74.2% | -13.8% | -60.4% |
| 2022 | 101 | -58.9% | -5.9% | -53.0% | -58.9% | -5.9% | -53.0% |
| 2012-2022 | 451 | -45.4% | 0.6% | -46.0% | -57.3% | 0.1% | -57.4% |

**Panel B: deSPAC Returns Categorized by VC-backing**

| | | Average 1-year Return | | | Average 3-year Buy-and-hold Return | | |
|---|---|---|---|---|---|---|---|
| Year | Number of IPOs | deSPACs | Market | Market-adjusted | deSPACs | Market | Market-adjusted |
| VC-backed | 242 | -59.0% | -2.5% | -56.4% | -74.7% | -5.6% | -69.0% |
| Others | 181 | -30.3% | 3.7% | -34.0% | -40.9% | 9.3% | -50.2% |
| 2017-2022 | 423 | -46.7% | 0.2% | -46.8% | -60.2% | 0.8% | -61.0% |

## Table 13

## Returns on deSPACs and IPOs, VC vs. NonVC Backed, 2017-2022

Panel A of this table reports average equally weighted deSPAC period common share percentage returns based on a buy-and-hold strategy in which an investor purchases common shares of a merged company at the close on the first day of trading as a new entity (the deSPAC) and holds them for 1 or 3 years, for both VC-backed and non-VC backed companies before the deSPAC merger. The year column represents the year of the merger. The sample consists of 423 business combinations consummated between January 2017 and December 29, 2022, after excluding a few deSPACs that were listed OTC rather than on Nasdaq or the NYSE. When the full 1- or 3-year data are not available, the returns are based on available data. For example, if a merged company started to trade in March 2020 and delisted in August 2020, we report the buy-and-hold returns from March 2020 to August 2020 for both 1-year and 3-year returns (not annualized). Returns end on Friday, December 30, 2022. The market return is the total return on the CRSP value-weighted market index, matched to each investment period. Panel B reports the same numbers for operating company IPOs, after excluding IPOs with an offer price below $5 per share, unit offers, REITs, closed-end funds, ADRs, small best effort offers, banks and S&Ls, and natural resource LPs. IPO returns are calculated from the closing market price on the first day of trading.

### Panel A: deSPACs

| | VC-backed | | | | NonVC-backed | | | |
|---|---|---|---|---|---|---|---|---|
| | | Avg 3-yr Buy-and-hold Return, % | | | | Avg 3-yr Buy-and-hold Return, % | | |
| Year | No. of deSPACs | deSPACs | Market | Market-adjusted | No. of deSPACs | deSPACs | Market | Market-adjusted |
| 2017 | 3 | -74.8% | 31.8% | -106.6% | 10 | -35.5% | 35.0% | -70.5% |
| 2018 | 5 | -32.8% | 76.3% | -109.1% | 18 | -1.1% | 63.5% | -64.6% |
| 2019 | 5 | -45.1% | 31.2% | -76.3% | 20 | -20.0% | 35.5% | -55.5% |
| 2020 | 34 | -63.5% | 11.0% | -74.5% | 29 | -44.1% | 15.4% | -59.5% |
| 2021 | 141 | -80.7% | -13.8% | -66.9% | 57 | -58.1% | -13.9% | -44.2% |
| 2022 | 54 | -72.5% | -7.8% | -64.7% | 47 | -43.3% | -3.8% | -39.5% |
| 2017-2022 | 242 | -74.7% | -5.6% | -69.0% | 181 | -40.9% | 9.3% | -50.2% |

### Panel B: IPOs

| | VC-backed | | | | NonVC-backed | | | |
|---|---|---|---|---|---|---|---|---|
| | | Avg 3-yr Buy-and-hold Return, % | | | | Avg 3-yr Buy-and-hold Return, % | | |
| Year | Number of IPOs | IPOs | Market | Market-adjusted | Number of IPOs | IPOs | Market | Market-adjusted |
| 2017 | 64 | 73.8% | 29.7% | 44.1% | 42 | 20.8% | 31.1% | -10.3% |
| 2018 | 91 | 88.6% | 54.9% | 33.7% | 43 | 59.2% | 57.6% | 1.5% |
| 2019 | 77 | 6.9% | 36.7% | -29.8% | 36 | 24.4% | 39.7% | -15.3% |
| 2020 | 113 | -53.9% | 17.2% | -71.1% | 52 | -33.7% | 14.3% | -48.0% |
| 2021 | 175 | -63.2% | -12.5% | -50.7% | 136 | -47.6% | -11.5% | -36.1% |
| 2022 | 14 | -14.7% | -8.3% | -6.4% | 24 | -36.6% | -7.4% | -29.2% |
| 2017-2022 | 534 | -7.6% | 17.5% | -25.1% | 333 | -14.4% | 12.7% | -27.1% |