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EYE ON THE MARKET | SPECIAL EDITION

Mr. Toad's Wild Ride:

The impact of underperforming 2020 and 2021 US IPOs

Mr. Toad's Wild Ride, adapted from *The Wind and the Willows*, 1949 (Disney/RKO)

For IPO investors, some of the substantial gains from the prior decade were wiped out by a flurry of poorly performing IPOs that were issued in 2020 and 2021. There are several bright spots, including the strong performance of software and internet IPOs even when including 2020/2021 vintages. In this special issue of *Eye on the Market*, we look at the wild ride of IPO performance, the SPAC disaster, IPO flipping, insider lock-up expirations, striking findings on IPO performance erosion in healthcare and some data on financial sponsors with the best performing IPOs.

By **Michael Cembalest**
Chairman of Market and Investment Strategy for J.P. Morgan Asset & Wealth Management

Mr. Toad's Wild Ride: the impact of underperforming 2020 and 2021 US IPOs on portfolio returns

Every two years, I write a piece on private equity and venture capital from the perspective of limited partner investors[1]. This year, I shifted the focus to the IPO market to assess the performance of companies brought public by financial sponsors, founders and other participants.

Now that enough time has passed, we can assess the aftermath of the IPO boom in 2020 and 2021. For IPO investors, some of the substantial gains from the prior decade were wiped out by a flurry of poorly performing IPOs that were issued in those two years, and that's without including the generally disastrous returns on Special Purpose Acquisition Companies ("SPACs"). There are several bright spots, including the strong performance of software and internet IPOs even when including 2020/2021 vintages. In this special issue Eye on the Market, we look at the wild ride of IPO performance, IPO flipping, insider lock-up expirations, striking findings on IPO performance erosion in healthcare and some data on financial sponsors with the best performing IPOs.

The irony of this wild ride: a few years ago, a lot of industry and academic research expressed grave concerns about the decline in new US listings and advocated for policies designed to increase them. Be careful what you wish for: sometimes you might just get it.

Michael Cembalest
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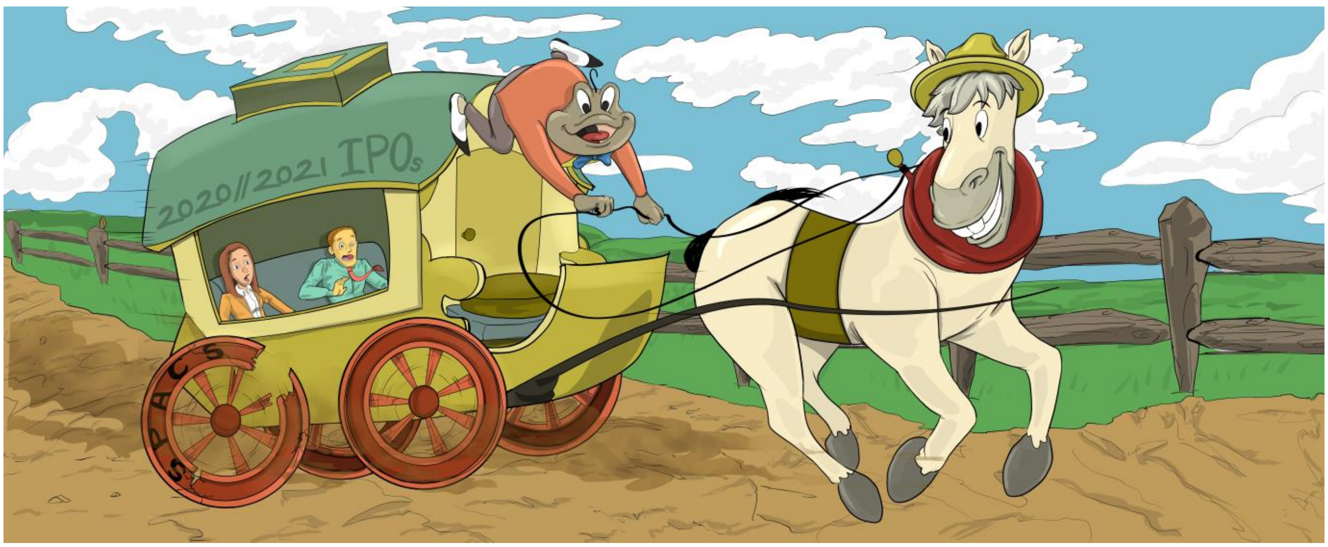


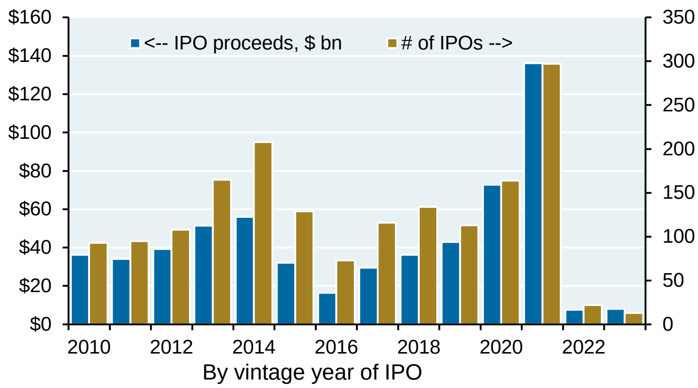
Mr. Toad's Wild Ride, adapted from "*The Wind and the Willows*", 1949 (Disney/RKO)

[1] Our most recent private equity study: "*Food Fight: An update on private equity performance vs public equity markets*", Eye on the Market, June 28, 2021. I will update this piece next year, subject to the availability of updated research from Steve Kaplan at the University of Chicago who publishes LP data by vintage year.

Executive Summary

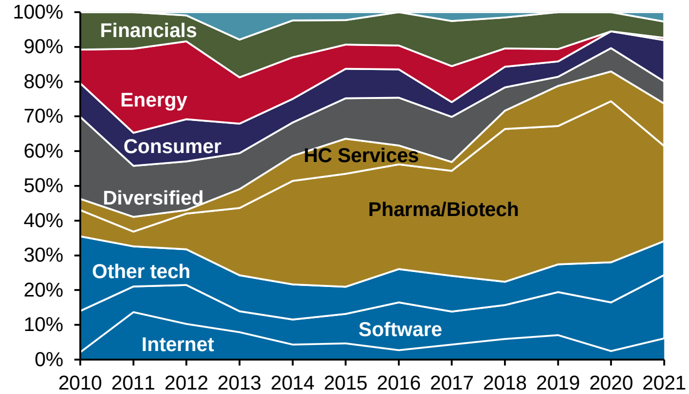
The COVID-era monetary and fiscal stimulus boom created a perfect environment for issuers and a perfect storm for investors. As shown below, 2020 and 2021 saw an avalanche of US IPOs when measured as proceeds raised and as number of listings. From a sector perspective, most of the 2020/2021 IPO surge was due to increased issuance by software, biotech and consumer discretionary companies.

IPO activity, All sectors
excl. SPACs, N=1730, >$50 mm, H=2 yr



Bloomberg, JPMAM. 07/09/2023

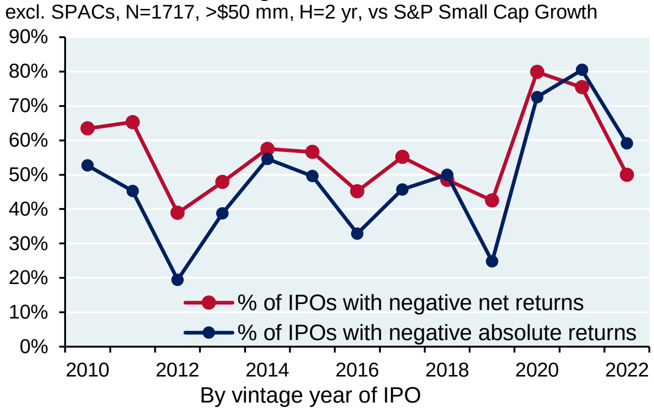
Share of IPOs on US exchanges by sector, excl. SPACs



Bloomberg, JPMAM. 07/07/2023

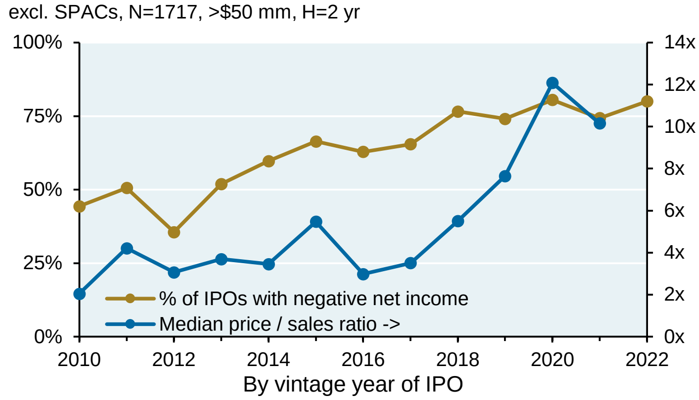
The 2020/2021 IPO vintages have been painful for investors. When measuring IPO returns, we need to assume an investment horizon; for most analyses in this piece, we use a two-year holding period. The next chart (left) shows the surge in the share of IPOs with negative returns over two years, both on an absolute basis and even more notably, relative to an equity market benchmark. We refer to the latter as "net" returns, since they're net of the benchmark (you can also think of net returns as "excess" returns). This underperformance is partly the result of eroding investor IPO underwriting standards which we have covered before[2]. The chart on the right shows two examples: increasing IPO price to sales ratios, and an increasing share of IPOs with negative profits when companies went public. Part of the rise in the price to sales measure is the by-product of a mix shift towards more software and biotech IPOs, but much of it took place within sectors as well.

Share of IPOs with negative returns: All sectors
excl. SPACs, N=1717, >$50 mm, H=2 yr, vs S&P Small Cap Growth



Bloomberg, JPMAM. 07/12/2023

Financial statistics at time of IPO, All sectors
excl. SPACs, N=1717, >$50 mm, H=2 yr

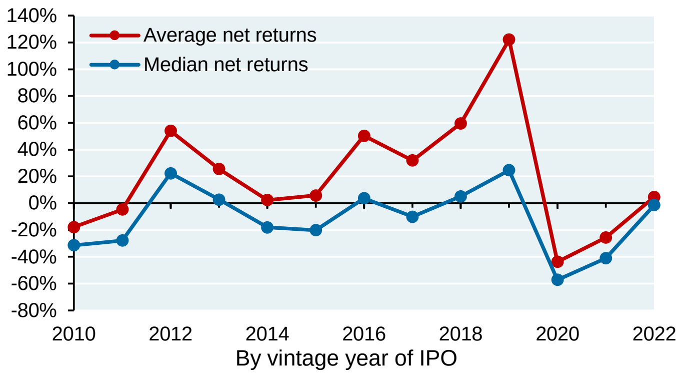


Bloomberg, JPMAM. 07/16/2023

[2] Prior Eye on the Market pieces cited research from Jay Ritter (University of Florida Warrington College of Business) on the falling share of tech companies with positive net income at time of IPO (2016 Outlook, February 2016, April 2019 and February 2021), and the rising price/sales ratio of technology IPOs (2020 Outlook).

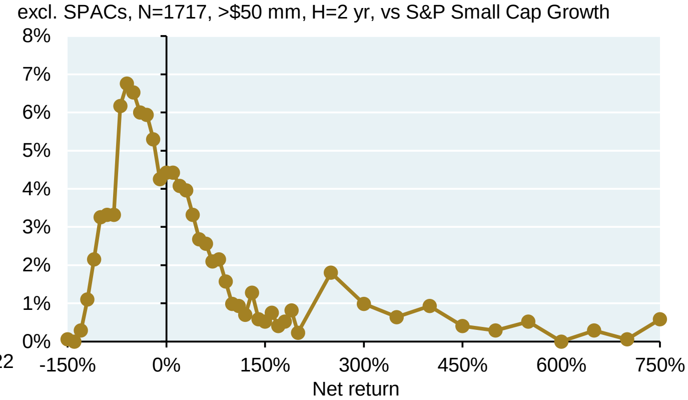
Since 40%-60% of IPOs generate negative returns even in good times, their value proposition is whether a small subset of winners offsets all the losers. A highly skewed investment universe is characterized by average returns that are much higher than median. As shown below, IPOs are an example of that; in many years, average net returns were positive while median net returns were close to zero. **But these positive average returns are *highly* skewed**: look how quickly they decline when excluding the best 3%, 5% and 7% of IPOs. Even when only excluding the top 3%, average net returns become negative and average absolute returns fall by more than half. **In other words, long-term IPO survival odds are low and skewed to a small number of mega-winners.**

Net returns by year, All sectors
excl. SPACs, N=1717, >$50 mm, H=2 yr, vs S&P Small Cap Growth



Bloomberg, JPMAM. 07/07/2023

Distribution of net returns, All sectors, H=2 yr
excl. SPACs, N=1717, >$50 mm, H=2 yr, vs S&P Small Cap Growth



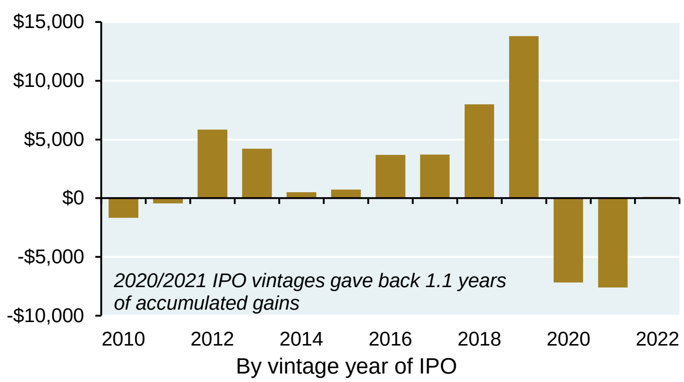
Bloomberg, JPMAM. 07/11/2023

Impact of removing top X% of IPOs on returns

remove top:	0%	3%	5%	7%
Average net	14%	-4%	-10%	-15%
Average absolute	30%	12%	6%	1%

To assess the IPO investor experience over time, we cannot simply compound returns since in 2020 and 2021 there were so many *more* IPOs issued. We need to incorporate both returns and the number of IPOs. **To do this, we use a simplified IPO portfolio framework: an investor puts $100 into every IPO, holds for two years before selling and measures performance vs the S&P Small Cap Growth Index**. The chart below shows the annual returns from such a strategy. The results: 2020/2021 IPO vintages wiped out all the gains from 2019, but the investor retained gains earned during the 2010-2018 period. The strong performance of software and internet IPOs, particularly in 2019, is a key driver of these results; other sectors do not look as good.

Annual IPO portfolio net cash flows, All sectors
excl. SPACs, N=1717, >$50 mm, H=2 yr, vs S&P Small Cap Growth



Bloomberg, JPMAM. 07/07/2023

Conclusions from our IPO analysis:

- The flurry of 2020/2021 IPOs have generally done poorly vs the equity market, wiping out 0.5 to 3.0 years of prior IPO portfolio gains depending on the sector
- Technology has been the best sector for IPO investors, even after accounting for 2020/2021 vintages
- Pharma/Biotech IPOs are biological lottery tickets since many companies are brought public before proof of concept is clear (Phase III results, FDA approval, market size, Medicare coverage, etc). Before 2020, this strategy worked well for investors, albeit with skewed reliance on a few IPOs. But the 2020/2021 vintages put a huge dent in historical performance. Furthermore, pharma/biotech IPO performance vs the market declines as the investment horizon increases due to high drug failure rates
- Consumer IPO investors did well from 2010-2019 until they were steamrolled by a large number of underperforming 2021 IPOs
- Diversified sector IPOs underperformed the market for almost the entire time period of our analysis
- The concerns I expressed about SPACs in early 2021 have materialized: their returns have been terrible, roughly twice as bad as 2020/2021 IPOs. In addition, early evidence shows much weaker revenue growth by companies brought public via SPACs
- IPO flipping strategies (i.e., selling within the first few days) have generated highly favorable risk-reward results, and were barely impacted by 2020/2021 vintages
- While IPOs are often described as being "mispriced" given positive idiosyncratic returns for flippers, this description is less accurate when using holding periods in years rather than days. For most sectors, our average long term returns are positive but highly skewed to a small subset of stocks; and median net returns were consistently negative for all sectors. This is directionally consistent with prior research showing that IPOs underperformed the equity market using a three-year holding period[3]
- Consistent with prior research, our dataset shows a decline in IPO performance around the expiration of insider lockups
- Only 15% of repeat financial sponsors consistently brought IPOs to the public which have outperformed the equity market
- Mainland China and Renewable Energy have also been very challenging categories for US IPO investors

[3] J. Ritter, IPO Data p.18 [https://site.warrington.ufl.edu/ritter/ipo-data/]. Ritter shows average net returns of -17% for IPOs from 1980-2020 using a 3-year holding period and an all-cap performance benchmark (CRSP)

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[1] Brace for impact: estimating the damage from 2020/2021 IPOs on investor portfolios

The table compares IPO returns over the 2010-2019 period with the 2010-2022 period in order to assess the impact of 2020/2021 IPOs. The poor relative performance of IPOs during these two vintage years drove down average and median net returns sharply, and across most sectors. For example: average healthcare net returns were 44% for 2010 - 2019, but after including 2020/2021 IPOs net returns fall to 14% for the 2010-2022 period.

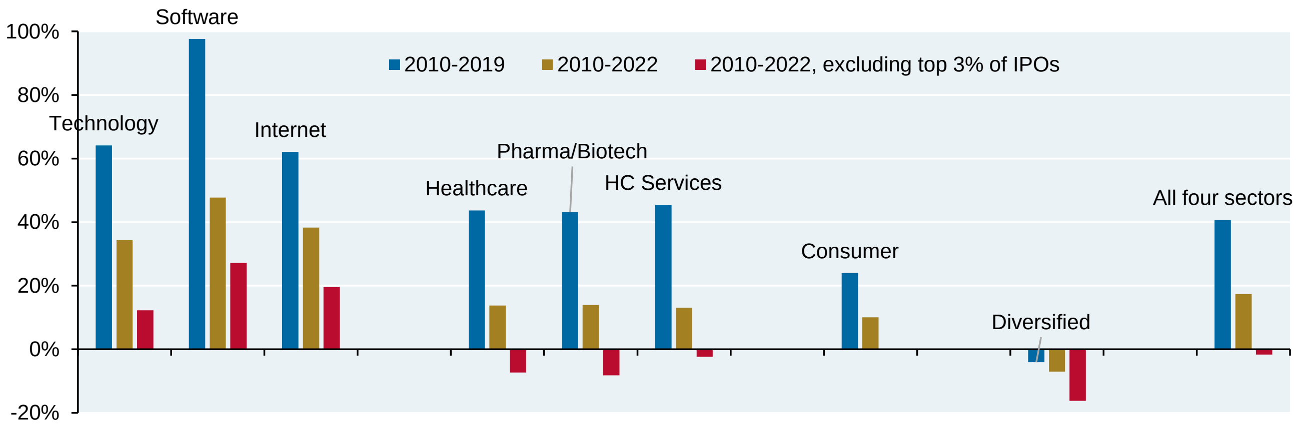
In the next few pages, we look at the four major IPO sectors before discussing other IPO topics…but we need to get the **SPAC** discussion out of the way first.

Summary statistics: the impact of 2020/2021 IPOs on sector and sub-sector returns

	Average net return		Median net return		% of net returns below zero		Years of IPO portfolio accumulated gains erased by 2020/2021 IPOs
	2010-2019	**2010-2022**	**2010-2019**	**2010-2022**	**2010-2019**	**2010-2022**	
Technology	64%	34%	22%	-11%	43%	54%	0.53
Software	98%	48%	50%	2%	31%	48%	0.51
Internet	62%	38%	13%	-10%	45%	56%	0.69
Healthcare	44%	14%	-7%	-39%	53%	63%	2.00
Pharma/Biotech	43%	14%	-11%	-39%	54%	64%	2.84
HC Services	45%	13%	5%	-31%	47%	58%	0.77
Consumer	24%	10%	11%	-2%	40%	51%	1.65
Diversified	-4%	-7%	-19%	-19%	61%	63%	NA
All four sectors	**41%**	**17%**	**-1%**	**-22%**	**50%**	**59%**	**1.12**

Two year holding period returns; net returns computed vs S&P Small Cap Growth benchmark; excluding SPACs
Financials, energy and real estate excluded due to the small number of 2020/2021IPOs
See Appendix pages 21-22 for other assumptions and methodology details

Average net return on IPOs
excl. SPACs, N=1717, >$50 mm, H=2 yr, vs S&P Small Cap Growth



Bloomberg, JPMAM. 07/18/2023

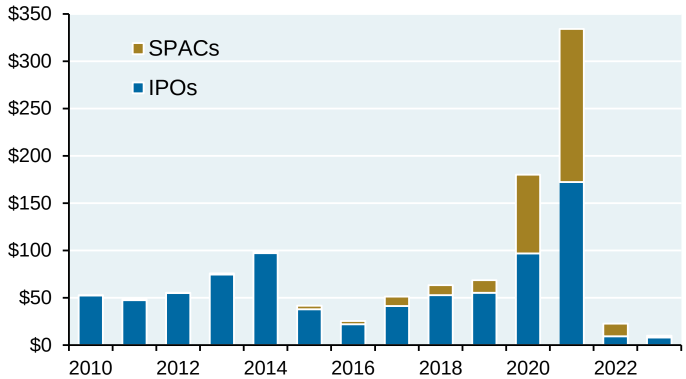
[2] SPAC performance: the wheels come off the cart

SPACs have been an unmitigated mess for investors. Don't say I didn't warn you: during the peak of the SPAC boom in 2021, I wrote a critical piece on SPACS ("*Hydraulic Spacking*", Feb 8 2021) and followed up with another broadside later ("*Spaccine Hesitancy*", Aug 19 2021). My conclusion that SPACs were an adverse selection of companies brought public has been corroborated by their performance. **The remarkable part: SPACs grew from practically nothing to equal the entire size of the traditional IPO market by 2020 and 2021**. Even more than crypto, the metaverse and unprofitable hydrogen/EV companies, SPACs may be the best example of the corrosive effects of too much stimulus on markets, investments and risk appetite.

The three performance charts below focus only on 431 SPACs that executed a merger and exclude active SPACs that are still searching (most of which still trade around issue price), and exclude SPACs that were liquidated because they didn't execute a merger. We compute returns from the time of the SPAC IPO to its current or final price as a merged company, depending on the time horizon used.

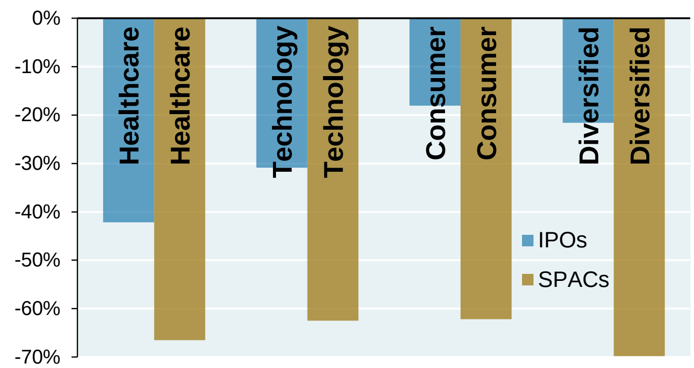
The charts speak for themselves: ~90% of offerings with negative net returns, 50%-70% underperformance vs the equity market in 2020/2021 and *much* worse performance than traditional IPOs we analyzed[4]. Using a three-year holding period results in an IPO vs SPAC performance gap that's even wider since a lot of SPACs imploded in year three.

US public listing proceeds by type, $ billions



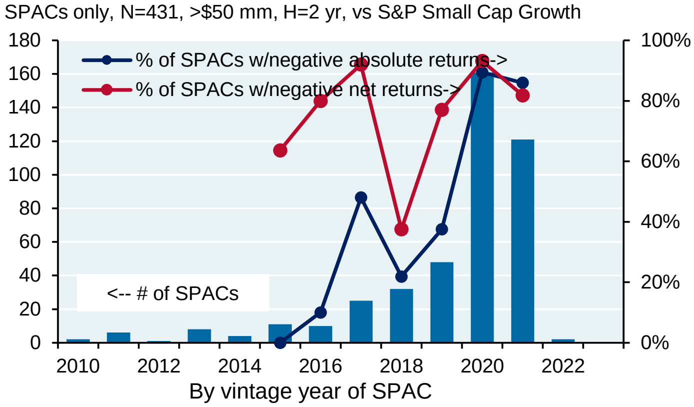
Bloomberg, JPMAM. 07/07/2023

Average IPO/SPAC net returns by sector for vintage years 2020 and 2021, H=2 yr, Percent



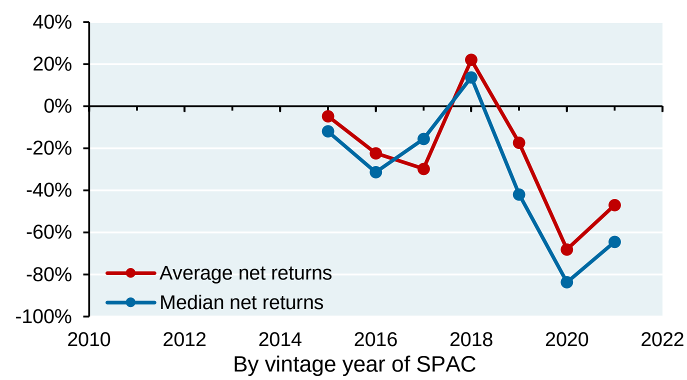
Bloomberg, JPMAM. 07/12/2023

SPAC activity and negative returns, All sectors
SPACs only, N=431, >$50 mm, H=2 yr, vs S&P Small Cap Growth



Bloomberg, JPMAM. 07/12/2023

Net SPAC returns by year, All sectors
SPACs only, N=431, >$50 mm, H=2 yr, vs S&P Small Cap Growth



Bloomberg, JPMAM. 07/12/2023

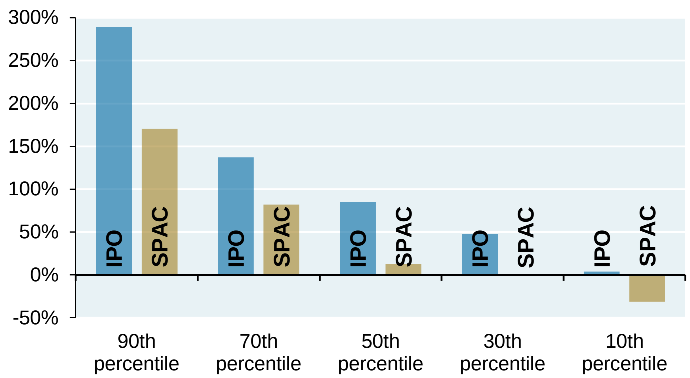
[4] Given the dismal absolute performance of most SPACs, we did not include the impact of warrants which were present in many SPAC listings and which only have value if SPAC prices rise. Our prior SPAC papers did include them, and still found dismal returns.

And to pile on here: for some investors, SPAC investment results were even worse than those shown above. The reason: many investors bought SPAC companies at the time they were merged rather than at the time that the "blank check" SPAC company went public. The average return on SPAC IPOs from issue date to merger date was 5%-15%; as a result, many investors bought merged SPAC companies at even higher prices, which would result in even lower investment returns than those shown above.

I explained my concerns about SPACs in the 2021 Eye on the Market notes cited above: perverse sponsor incentives in many cases to execute a merger since they would still make money if the merged company stock fell by 50% or more; the ability for management to make projections, which they cannot do in traditional IPOs; and the easier/faster SPAC pathway vs IPOs which constrains the entire due diligence process.

Now that enough time has passed, we can also look at whether companies brought public via SPACs generated worse business results than IPO counterparts. The answer: they sure did, at least in the tech sector. The chart below shows the revenue growth of technology companies brought public by SPACs vs those brought public via IPO in 2020 and 2021. SPAC company revenue growth was much lower, indicating a weaker group of companies going public. Since most IPO/SPAC companies go public without any profits, they need rapid revenue growth to become profitable and grow into their projections. The much lower SPAC revenue growth shown below may partly explain their poor performance.

Revenue growth comparison of 2020/2021 technology SPACs and IPOs, Q1 2020-Q2 2023, Percent



Bloomberg, JPMAM. Q2 2023

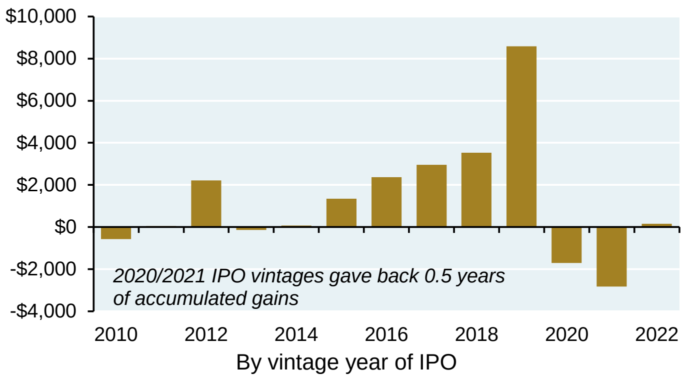
Note: SPAC companies also generated lower revenue growth than IPOs across almost every percentile category in Consumer, Healthcare and Diversified sectors as well. The technology sector showed the largest and most consistent revenue growth differences

[3] Technology sector: the IPO bright spot

For tech IPO investors, 2020 and 2021 were tough years; 80% of these IPOs have negative net returns, their average net returns were -30%, and they dominate the list of the worst tech IPOs since 2010 (see pages 23-24). Even so, tech IPO investors only gave back half of the gains earned in 2019 using our portfolio framework. Standout IPOs of 2019 include Bill, Cloudflare, Crowdstrike, Datadog, Dynatrace, Pinterest and Zoom, all of which generated net returns of 200%+ using a two-year holding period. Simply put, there were a lot of poorly performing tech IPOs in 2020/2021 which were more than offset by a smaller number of *very* profitable tech IPOs in 2019. The longer term track record of tech IPOs is still quite positive, as shown in the first chart.

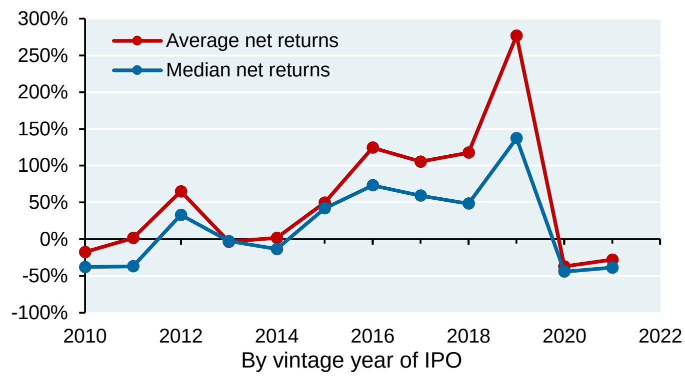
Issuance metrics: price to sales ratios of US tech IPOs began to soar after 2016, and 75% of tech IPOs have had no profits since 2015. And in good times, 20%-50% of tech IPOs still generated negative net returns. **Even so, this is the sector where IPO investors have generally done very well using our parameters.** One example: after removing the top 7% of tech IPOs, average net returns are still positive (unlike every other sector analyzed).

Annual IPO portfolio net cash flows, Technology
excl. SPACs, N=467, >$50 mm, H=2 yr, vs S&P Small Cap Growth



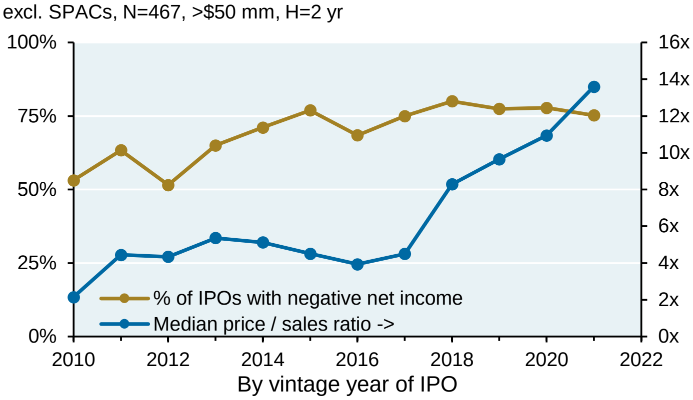
Bloomberg, JPMAM. 07/06/2023

Net returns by year, Technology
excl. SPACs, N=467, >$50 mm, H=2 yr, vs S&P Small Cap Growth



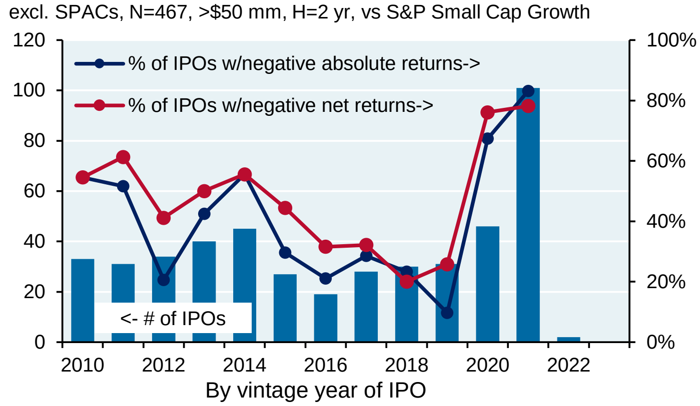
Bloomberg, JPMAM. 07/06/2023

Financial statistics at time of IPO, Technology
excl. SPACs, N=467, >$50 mm, H=2 yr



Bloomberg, JPMAM. 07/16/2023

IPO activity and negative return shares, Technology
excl. SPACs, N=467, >$50 mm, H=2 yr, vs S&P Small Cap Growth



Bloomberg, JPMAM. 07/06/2023

Distribution of IPO net returns, Technology
excl. SPACs, N=467, >$50 mm, H=2 yr, vs S&P Small Cap Growth

	<0%	0-50%	50-100%	100-200%	+200%
No. of deals	251	85	52	32	47
% of total deals	54%	18%	11%	7%	10%
Net returns	**25th**	**50th**	**75th**	**Average**	**Stdev**
Percentiles	-56%	-11%	63%	34%	171%

Bloomberg, JPMAM. 07/12/2023

Impact of removing top X% of IPOs on returns

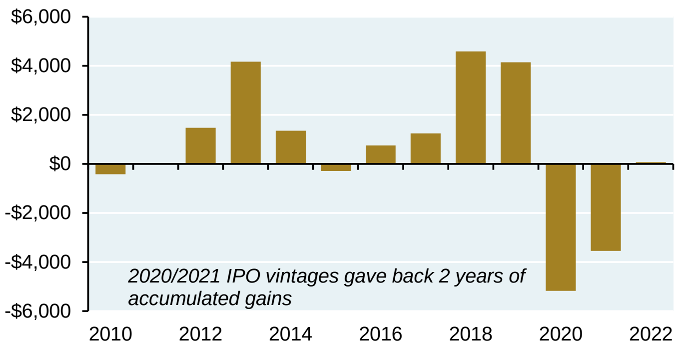
remove top:	0%	3%	5%	7%
Average net	34%	12%	5%	0%
Average absolute	50%	27%	20%	14%

[4] Healthcare: greater damage from 2020 and 2021 vintages and declining performance over time

Many pharma and biotech IPOs are biological lottery tickets issued before proof of concept is clear. To get a sense for this: 96% had no *profits* at the time of IPO, and a remarkable 50% didn't even have any *revenues* at the time of IPO. That's what we mean by saying "proof of concept to be determined".

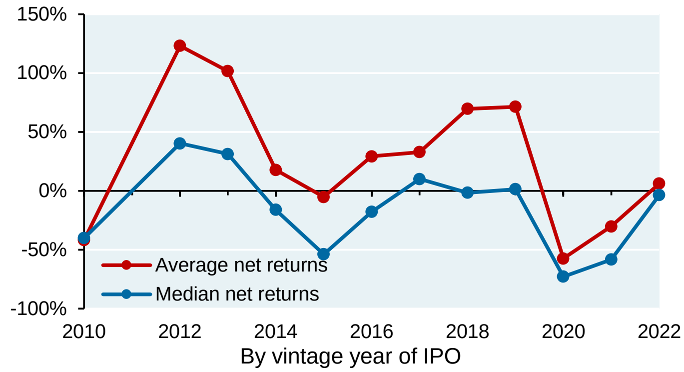
As a result, we focus more on average healthcare returns than median since our expectation is that the typical deal underperforms; the big question is whether the winners deliver enough to offset them. Before 2019, they did; but then a lot of poorly performing 2020/2021 IPOs changed that narrative, at least temporarily. While tech IPO investors only gave up half a year's accumulated gains by owning 2020/2021 IPO vintages, healthcare IPO investors gave up the last two years. In healthcare, the performance skew is very large: net returns become negative when excluding just the top 3% of IPOs.

Annual IPO portfolio net cash flows, Healthcare
excl. SPACs, N=608, >$50 mm, H=2 yr, vs S&P Small Cap Growth



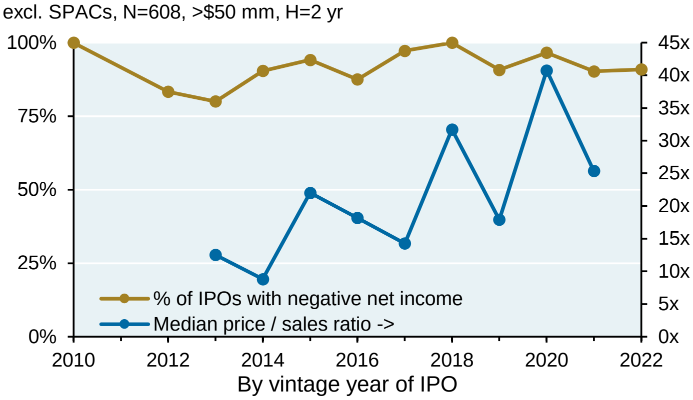
Bloomberg, JPMAM. 07/16/2023

Net IPO returns by year, Healthcare
excl. SPACs, N=608, >$50 mm, H=2 yr, vs S&P Small Cap Growth



Bloomberg, JPMAM. 07/16/2023

Financial statistics at time of IPO, Healthcare
excl. SPACs, N=608, >$50 mm, H=2 yr



Bloomberg, JPMAM. 07/16/2023

IPO activity and negative returns, Healthcare
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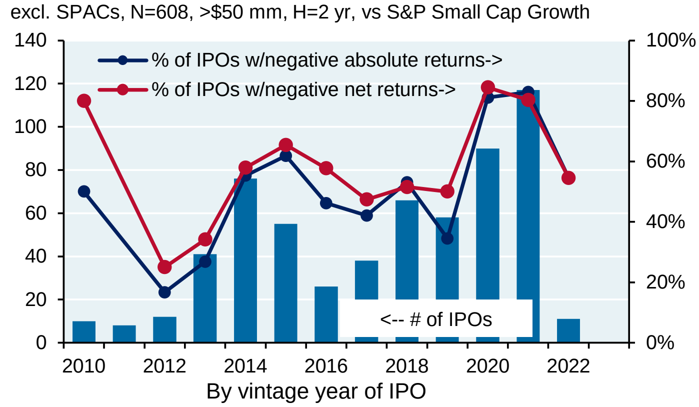


Bloomberg, JPMAM. 07/16/2023

Distribution of IPO net returns, Healthcare
excl. SPACs, N=608, >$50 mm, H=2 yr, vs S&P Small Cap Growth

	<0%	0-50%	50-100%	100-200%	+200%
No. of deals	383	78	49	49	49
% of total deals	63%	13%	8%	8%	8%
Net returns	**25th**	**50th**	**75th**	**Average**	**Stdev**
Percentiles	-74%	-39%	47%	14%	162%

Bloomberg, JPMAM. 07/12/2023

Impact of removing top X% of IPOs on returns

remove top:	0%	3%	5%	7%
Average net	14%	-7%	-15%	-21%
Average absolute	27%	6%	-2%	-8%

Something striking happens as we lengthen IPO holding periods from 1 to 3 years: pharma/biotech average net returns *decline* from year 2 to year 3 in contrast with tech whose average net returns *rise*. Furthermore, pharma/biotech median net returns collapse from years 1 to 3. This suggests that as a general rule, holding onto those pharma/biotech IPOs was a losing proposition.

Average net returns by sector and horizon

excl. SPACs, N=1717, >$50 mm, vs S&P Small Cap Growth

	1 yr	2 yr	3 yr
Technology	21%	34%	41%
Software	28%	48%	56%
Internet	13%	38%	36%
Healthcare	**11%**	**14%**	**7%**
Pharma/Biotech	**11%**	**14%**	**5%**
HC Services	**10%**	**13%**	**14%**
Consumer	20%	10%	1%
Diversified	3%	-7%	-7%

Bloomberg, JPMAM. 07/16/2023

Median net returns by sector and horizon

excl. SPACs, N=1717, >$50 mm, vs S&P Small Cap Growth

	1 yr	2 yr	3 yr
Technology	-3%	-11%	-9%
Software	0%	2%	-2%
Internet	-5%	-10%	-26%
Healthcare	**-13%**	**-39%**	**-57%**
Pharma/Biotech	**-15%**	**-39%**	**-60%**
HC Services	**-5%**	**-31%**	**-39%**
Consumer	7%	-2%	-28%
Diversified	-1%	-19%	-23%

Bloomberg, JPMAM. 07/16/2023

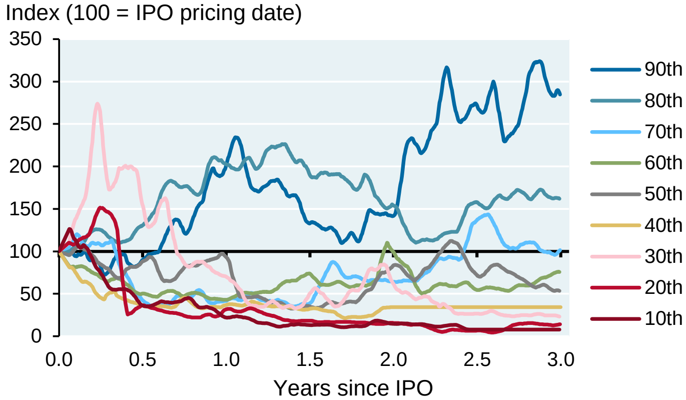
Why is this happening? One answer: a lot of biotech stocks tend to crash and burn within two years. In the chart below, we plot the absolute returns (not net of benchmark) for our biotech stocks according to the deciles shown (100th percentile = highest return). Three years after IPO, even the 60th percentile stock's return was not positive. You had to invest in the IPO whose return was above the 70th percentile in order to make money; and the return percentiles below 70th suffered sharp declines in performance between one and two years after IPO.

I spoke with Steve Squinto and Gaurav Gupta from JP Morgan Asset Management's Life Sciences Private Capital Team about this. Many pharma/biotech IPOs occur before "proof of concept" to allow public market investors to benefit from confirmation of a drug's efficacy, FDA approval, adoption by healthcare systems and coverage by entitlement programs. As a result, many IPOs take place while Phase I or Phase II trials are still underway, or maybe even before Phase I trials have begun. During bullish biotech IPO cycles, investors have more appetite for earlier stage drug development. **And as we mentioned earlier, ~50% of all pharma/biotech IPOs have no *revenues* at the time of the IPO, a scenario which simply does not exist in any other sector.**

That's why pharma/biotech business models are so volatile, and why the sector is more suited to active management than any other with the possible exception of semiconductors.

Pharma/biotech absolute returns by percentile since IPO

Index (100 = IPO pricing date)



Source: Bloomberg, JPMAM. July 5, 2023. 15 day smoothing.

Standard deviation of net returns by industry group, H=2 yr

	Stdev		Stdev
Semiconductors	457%	Pipelines	83%
Pharma/Biotech	**169%**	Diversified Finan Serv	81%
Software	159%	Telecommunications	81%
Internet	155%	Commercial Services	77%
HC Services	132%	Oil&Gas Services	68%
Energy-Alternate Sourc	127%	Transportation	67%
Insurance	125%	Auto Parts&Equipment	65%
Computers	119%	Chemicals	47%
Food	99%	Banks	35%
Retail	90%	Real Estate	6%

Bloomberg, JPMAM. 07/16/2023

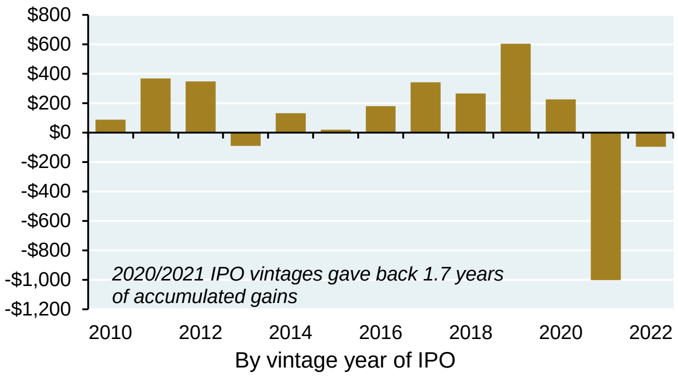
[5] Consumer: IPO investors steamrolled by 2021 vintages

Buoyed by strong performance from prior IPOs (Restoration Hardware, Danone, Annie's, Five Below), consumer IPO investors were doing fine until they were steamrolled by the surge in poorly performing IPOs in 2021. Net returns below 50% on 2021 IPOs include Allbirds shoes, Warby Parker, Honest Company, Oatly dairy products, Latham pools, Olaplex hair care, LuLu's Fashion Lounge, Traeger grills, Torrid clothing, Zevia beverages, Brilliant Earth jewelry, Solo Brands outdoor products and Real Good Foods.

Some consumer IPOs tend to not age very well; of the top 5 consumer IPOs since 2010 when performance is measured over two years, three of them eventually delivered negative net returns after that horizon (Beyond Meat, Capri Holdings and Canada Goose). Note: in the charts, the lack of dots for any specific year indicates the lack of a sufficient number of IPOs for computing that metric.

Annual IPO portfolio net cash flows, Consumer

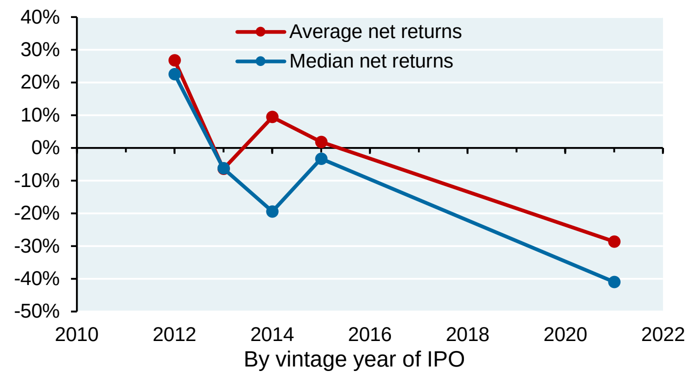
excl. SPACs, N=138, >$50 mm, H=2 yr, vs S&P Small Cap Growth



Bloomberg, JPMAM. 07/06/2023

Net returns by year, Consumer

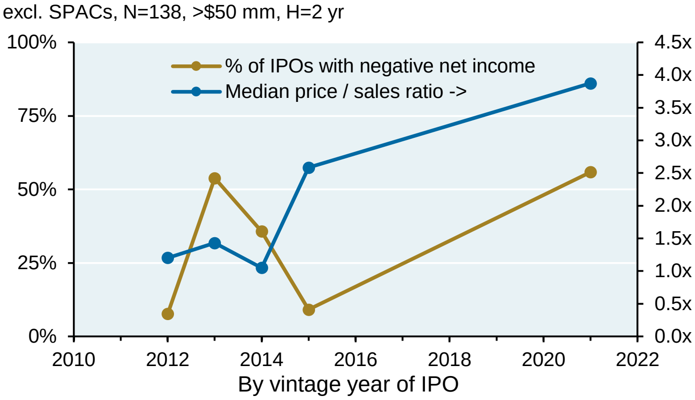
excl. SPACs, N=138, >$50 mm, H=2 yr, vs S&P Small Cap Growth



Bloomberg, JPMAM. 07/06/2023

Financial statistics at time of IPO, Consumer

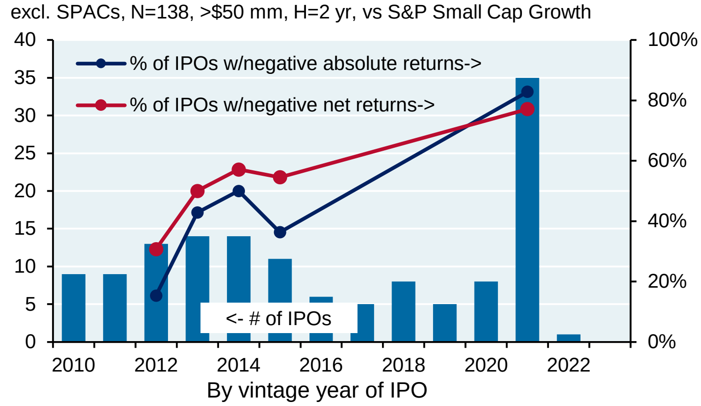
excl. SPACs, N=138, >$50 mm, H=2 yr



Bloomberg, JPMAM. 07/20/2023

IPO activity and negative return shares, Consumer

excl. SPACs, N=138, >$50 mm, H=2 yr, vs S&P Small Cap Growth



Bloomberg, JPMAM. 07/06/2023

Distribution of IPO net returns, Consumer

excl. SPACs, N=138, >$50 mm, H=2 yr, vs S&P Small Cap Growth

	<0%	0-50%	50-100%	100-200%	+200%
No. of deals	70	34	17	12	5
% of total deals	51%	25%	12%	9%	4%
Net returns	**25th**	**50th**	**75th**	**Average**	**Stdev**
Percentiles	-52%	-2%	48%	10%	86%

Bloomberg, JPMAM. 07/12/2023

Impact of removing top X% of IPOs on returns

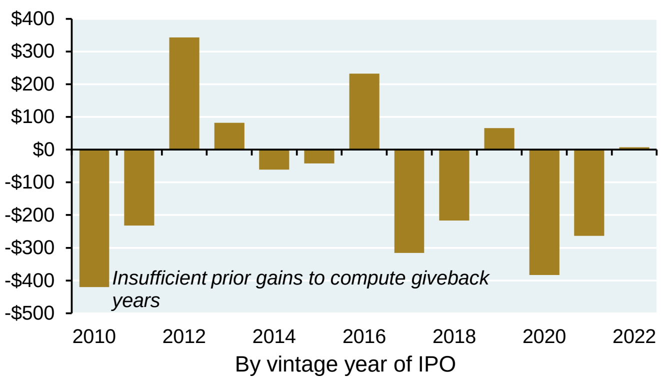
remove top:	0%	3%	5%	7%
Average net	10%	0%	-3%	-7%
Average absolute	24%	13%	10%	6%

[6] Diversified: a difficult IPO investment category during the entire time period

The diversified sector includes autos, chemicals, construction, machinery, professional services, transport, utilities and defense. While the 2020/2021 IPO vintages generated negative average and median net returns, the same was true during most of the 2010-2019 period as well, with 2012 IPOs as the only exception. We ran the results below using the S&P Small Cap Value benchmark given the nature of these IPOs, rather than the S&P Small Cap Growth Index. It didn't help; average net returns were negative for the entire time period analyzed.

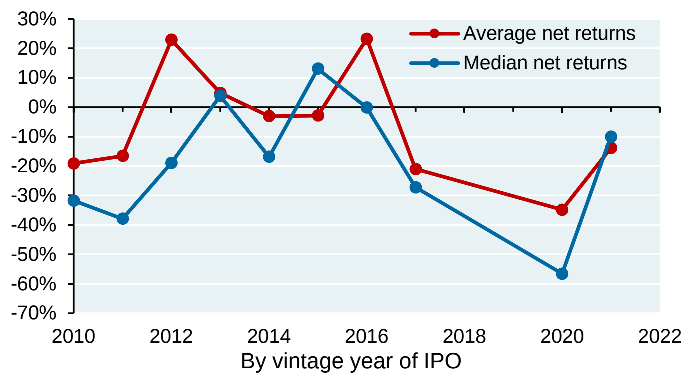
2020/2021 were tough years, with three agricultural companies at the bottom of the Diversified performance pile: Vital Farms, Hydrofarm and Agrify (cannabis). **Reefer Badness**: the cannabis investment thesis has been a failure, at least when measured via the Cannabis POTX Equity Index and its associated ETF. Of 836 thematic US equity ETFs with data as of Sept 2019, the POTX ETF return ranks 830th.

Annual IPO portfolio net cash flows, Diversified
excl. SPACs, N=171, >$50 mm, H=2 yr, vs S&P Small Cap Value



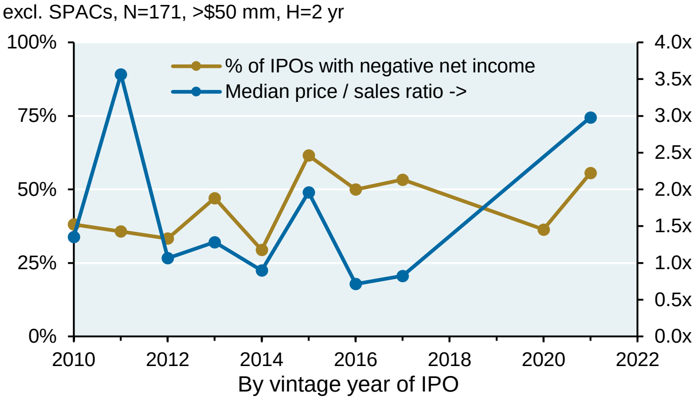
Bloomberg, JPMAM. 07/06/2023

Net returns by year, Diversified
excl. SPACs, N=171, >$50 mm, H=2 yr, vs S&P Small Cap Value



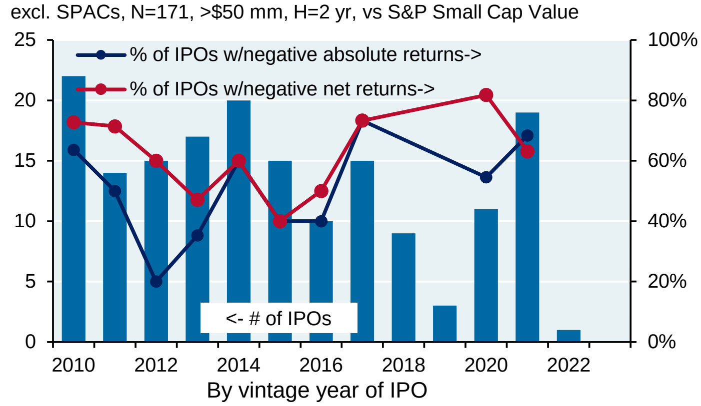
Bloomberg, JPMAM. 07/06/2023

Financial statistics at time of IPO, Diversified
excl. SPACs, N=171, >$50 mm, H=2 yr



Bloomberg, JPMAM. 07/20/2023

IPO activity and negative return shares, Diversified
excl. SPACs, N=171, >$50 mm, H=2 yr, vs S&P Small Cap Value



Bloomberg, JPMAM. 07/06/2023

Distribution of IPO net returns, Diversified
excl. SPACs, N=171, >$50 mm, H=2 yr, vs S&P Small Cap Value

	<0%	0-50%	50-100%	100-200%	+200%
No. of deals	107	37	16	8	3
% of total deals	63%	22%	9%	5%	2%
Net returns	**25th**	**50th**	**75th**	**Average**	**Stdev**
Percentiles	-50%	-19%	19%	-7%	74%

Bloomberg, JPMAM. 07/12/2023

Impact of removing top X% of IPOs on returns

remove top:	0%	3%	5%	7%
Average net	-7%	-16%	-19%	-21%
Average absolute	10%	0%	-2%	-5%

[7] IPO flipping continues to generate high positive returns and was unaffected by 2020/2021 vintages

Very short-term investors who sell ("flip") IPOs after a few days are often very keen to get allocations in IPO syndicates. **Based on the results below, I can see why**. For investors buying every non-SPAC IPO since 2010, median and average net returns based on a 7-day holding period were substantially positive for every sector and sub-sector shown. And when looking in aggregate across all sectors, median and average net returns were positive in every year. The impact of the 2020/2021 IPO vintages were negligible; the value proposition of short-term IPO investing was still positive during this time period.

These findings are directionally consistent with prior research on idiosyncratic positive returns of IPO flipping[5], which is why IPOs are often described as generally being "mispriced" in favor of investors. However, given underperformance of most IPOs when measured against the equity market using holding periods of two to three years, I don't think the "mispricing" description is accurate. And to be clear, 20%-25% of all IPOs generated negative absolute returns over 7 days; there is no *completely* free lunch.

Average net return by sector after 7 days
excl. SPACs, N=1717, >$50 mm, vs S&P Small Cap Growth

	2010-2019	2010-2022
Technology	27%	28%
Software	31%	31%
Internet	28%	29%
Healthcare	18%	23%
Pharma/Biotech	17%	23%
HC Services	21%	23%
Consumer	31%	27%
Diversified	9%	13%

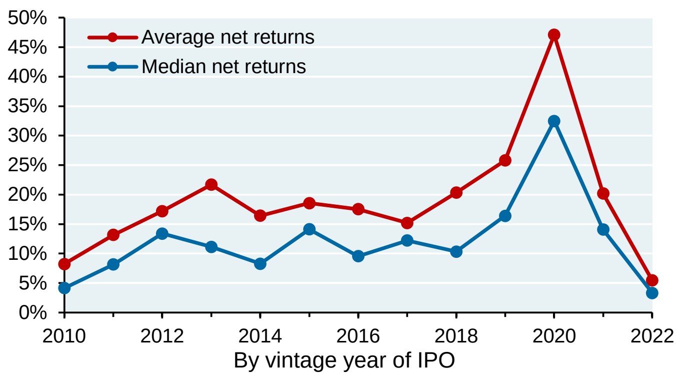
Bloomberg, JPMAM. 07/17/2023

Median net return by sector after 7 days
excl. SPACs, N=1717, >$50 mm, vs S&P Small Cap Growth

	2010-2019	2010-2022
Technology	21%	21%
Software	26%	24%
Internet	23%	25%
Healthcare	9%	11%
Pharma/Biotech	7%	9%
HC Services	17%	16%
Consumer	24%	18%
Diversified	6%	8%

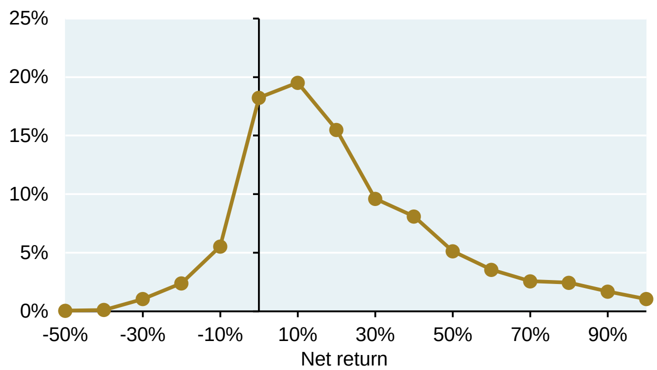
Bloomberg, JPMAM. 07/17/2023

Net returns by year, All sectors
excl. SPACs, N=1716, >$50 mm, H=7 days, vs S&P Small Cap Growth



Bloomberg, JPMAM. 07/07/2023

Distribution of net returns, All sectors, H=7 days
excl. SPACs, N=1716, >$50 mm, H=7 days, vs S&P Small Cap Growth



Bloomberg, JPMAM. 07/07/2023

5 J. Ritter IPO Data: from offer price to first day close, 7% returns in the 1980s and 19% returns since that time; page 3 [https://site.warrington.ufl.edu/ritter/ipo-data/]

[8] The lockup effect: the decline in IPO performance after the expiration of insider selling restrictions

Lockup research dates back to the 1990's when VC firms increased investments in high tech companies they brought public. At the time, several studies found negative abnormal returns following lockup expiration when measured using narrow windows of performance (from 2 days before to 3 days following lockup expiration). Our assessment is that VC firms often hold IPO positions for longer periods dependent on market conditions. As a result, we lengthened our analysis window to 3 months after most lockups expire. We found the same lockup performance trend in our data. In the tables, we show median and average net IPO returns from day 165 to day 270.

Average net returns by sector
excl. SPACs, N=1717, >$50 mm, vs S&P Small Cap Growth

	164 days	270 days
Technology	25%	20%
Software	27%	24%
Internet	19%	12%
Healthcare	19%	13%
Pharma/Biotech	20%	14%
HC Services	16%	10%
Consumer	21%	24%
Diversified	10%	7%

Bloomberg, JPMAM. 07/16/2023

Median net returns
excl. SPACs, N=1717, >$50 mm, vs S&P Small Cap Growth

	164 days	270 days
Technology	14%	4%
Software	22%	6%
Internet	3%	0%
Healthcare	5%	-8%
Pharma/Biotech	5%	-8%
HC Services	5%	-7%
Consumer	14%	10%
Diversified	7%	3%

Bloomberg, JPMAM. 07/16/2023

[9] Size effects: the largest IPOs often performed better than the smallest IPOs

Consistent with recent research, we found that that the largest IPOs (when measured by market cap at day 1 close) generated higher average net returns over two years than the smallest IPOs. This result is partially the result of biotech IPOs having smaller market caps and worse holding period performance than most other sectors. The exception in our dataset: the software sector, where smaller IPOs outperformed.

Average net returns by market cap at time of IPO
excl. SPACs, N=1717, >$50 mm, H=2 yr, vs S&P Small Cap Growth

	Top quintile of market cap at IPO	Bottom quintile of market cap at IPO
Technology	21%	38%
Software	34%	45%
Internet	27%	-3%
Healthcare	21%	-4%
Pharma/Biotech	14%	-5%
HC Services	3%	-27%
Consumer	14%	-7%
Diversified	3%	-42%
All four sectors	**26%**	**5%**

Bloomberg, JPMAM. 07/16/2023

A 2022 study from the University of Haifa (Siev and Qadan, in *Risk and Financial Management*) found that the largest IPOs outperformed the smallest ones. Several of the assumptions were different than ours (deal size, benchmark, holding period, vintage years, etc) but the general conclusions were the same

[10] Financial sponsors whose IPOs generated the highest average and median returns after issuance

I wanted to analyze whether certain financial sponsors tend to bring deals to market that perform well (or not) for IPO investors. I reached out to our contacts at Pitchbook and sent them ~2,100 of our non-SPAC IPO listings in US markets since 2010. They were able to match practically all of them in their system, and provided us with a list of all pre-IPO owners that either sold shares into each IPO, or held at that time. To be clear, we did not have data on the *amount* of shares owned or sold, or who the lead sponsors were; we were only able to identify which firms were involved at any level, according to Pitchbook. With that caveat, here are the results:

- Around 80% of the IPOs we sent to Pitchbook came back as being associated with a sponsor of some kind, and there were hundreds of different unique sponsors that showed up in the data
- For our purposes, we included private equity, hedge fund and venture capital sponsors and excluded banks, corporates, sovereign wealth funds, family offices, registered investment advisors and traditional asset managers when they acted as sponsors
- That left us with a list of 83 sponsors with more than 20 non-SPAC IPOs from 2010 to 2022, which comprised our list of "active repeat sponsors"

The table on the next page shows the 13 sponsors whose IPOs generated positive average returns AND positive median returns, sorted by average return. The other 69 sponsors did not make the cut; 52 had positive average returns but negative median returns and the remainder had both negative average and median returns. The closer the median return is to the average, the more "reliable" the outcome from an IPO investor's perspective. To reiterate, these are all "net" returns, net of equity market performance.

One last thing: it's not really the job of a private equity/VC sponsor to generate great post-IPO returns; they are judged by their limited partners based on the returns they deliver to them, which is the subject of our bi-annual private equity paper. If anything, a sponsor whose IPOs always perform extremely well two years after issuance could be seen as having priced IPOs too cheaply to the detriment of LPs and the issuing company. Since some sponsors hold beyond the 180-day lockup, one could argue that sponsors would aim for IPOs that don't skyrocket after issuance, but don't collapse either. In any case, in our roles as money managers, we're very interested in the track record of financial sponsors that consistent bring value to IPO investors, or not.

Financial sponsors whose IPOs generated positive average and median net returns after issuance
excl. SPACs, N=1717, >$50 mm, H=2 yr, vs S&P Small Cap Growth

	Firm	Average net return	Median net return	Stdev net return	Skew avg return	Deal count
	Skew = share of avg net return from top 5% of IPOs					
1	**ICONIQ Growth**	**111%**	**23%**	**247%**	**50%**	**26**
	Top 5: BILL Holdings 1017%; Crowdstrike Holdings 531%; Alteryx 469%; Datadog 385%; DocuSign 280%					
	Bottom 5: Netshoes Cayman -110%; Zymergen -75%; GreenSky -68%; Marqeta -68%; Warby Parker -65%					
2	**HBM Healthcare Investments**	**80%**	**5%**	**221%**	**45%**	**57**
	Top 5: Intercept Pharmaceuticals 1229%; Principia Biopharma 503%; Esperion Therapeutics 452%; BeiGene 417%; AveXis 394%					
	Bottom 5: Galera Therapeutics -140%; Zosano Pharma -113%; Galecto -111%; Alimera Sciences -97%; Instil Bio -78%					
3	**Bessemer Venture Partners**	**80%**	**25%**	**183%**	**39%**	**39**
	Top 5: Fiverr International 830%; Yelp 480%; Shopify 407%; LinkedIn 282%; DocuSign 280%					
	Bottom 5: Blue Apron Holdings -113%; Millennial Media -88%; Bright Health Group -82%; TScan Therapeutics -76%; Allena Pharmaceuticals -73%					
4	**Alta Partners**	**77%**	**11%**	**161%**	**39%**	**25**
	Top 5: Esperion Therapeutics 452%; ZS Pharma 394%; Allakos 364%; Ellie Mae 298%; Clovis Oncology 237%					
	Bottom 5: Sienna Biopharmaceuticals -111%; aTyr Pharma -99%; Bioventus -74%; ChemoCentryx -73%; SCYNEXIS -69%					
5	**Aisling Capital**	**71%**	**11%**	**251%**	**78%**	**30**
	Top 5: Intercept Pharmaceuticals 1229%; Esperion Therapeutics 452%; Clovis Oncology 237%; Biohaven Pharmaceutical Holdin 214%; Bridgebio Pharma 208%					
	Bottom 5: Sorrento Tech -111%; Poseida Therapeutics -111%; Spruce Biosciences -102%; Atreca -95%; Zeltiq Aesthetics -90%					
6	**Industry Ventures**	**59%**	**18%**	**154%**	**46%**	**46**
	Top 5: Cardlytics 602%; MongoDB 378%; Allakos 364%; Ellie Mae 298%; Castle Biosciences 288%					
	Bottom 5: Envivio -112%; CafePress -110%; On Deck Capital -105%; ON24 -76%; Neuronetics -73%					
7	**Insight Partners**	**59%**	**20%**	**150%**	**53%**	**26**
	Top 5: Alteryx 469%; Shopify 407%; DocuSign 280%; Smartsheet 257%; Shutterstock 253%					
	Bottom 5: Tintri -117%; JFrog -75%; Despegar.com -72%; 1stdibs.com -66%; WalkMe -57%					
8	**Sapphire Ventures**	**59%**	**5%**	**164%**	**53%**	**26**
	Top 5: Alteryx 469%; Livongo Health 400%; Block 361%; LinkedIn 282%; DocuSign 280%					
	Bottom 5: Telaria -108%; On Deck Capital -105%; Marin Software -98%; Fitbit -91%; Sumo Logic -84%					
9	**TCV**	**49%**	**2%**	**121%**	**44%**	**27**
	Top 5: Avalara 357%; LinkedIn 282%; Splunk 242%; Twilio 220%; Zillow Group 205%					
	Bottom 5: Groupon -101%; Rent the Runway -78%; Green Dot -70%; Everyday Health -65%; Elevate Credit -53%					
10	**Greenspring Associates**	**45%**	**6%**	**147%**	**74%**	**29**
	Top 5: Cloudflare 706%; DocuSign 280%; MuleSoft 148%; Imago Biosciences 137%; Nutanix 120%					
	Bottom 5: Bright Health Group -82%; WalkMe -57%; UiPath -56%; Tenaya Therapeutics -51%; TriVascular Technologies -50%					
11	**Battery Ventures**	**41%**	**5%**	**132%**	**57%**	**30**
	Top 5: Datadog 385%; Avalara 357%; Coupa Software 243%; Splunk 242%; Guidewire Software 224%					
	Bottom 5: Skullcandy -102%; Groupon -101%; MaxLinear -94%; Sumo Logic -84%; Bazaarvoice -83%					
12	**Silver Lake**	**31%**	**26%**	**135%**	**100%**	**22**
	Top 5: Tesla Energy Operations 482%; Splunk 242%; Talend SA 194%; BlackLine 116%; GoDaddy 71%					
	Bottom 5: Tintri -117%; Zynga -116%; GoodRx Holdings -105%; Groupon -101%; DiDi Global -65%					
13	**Greylock Partners**	**26%**	**3%**	**108%**	**89%**	**29**
	Top 5: Okta 389%; LinkedIn 282%; ServiceNow 191%; Workday 151%; Apptio 90%					
	Bottom 5: Groupon -101%; Blend Labs -86%; Sumo Logic -84%; Marqeta -68%; Coinbase Global -65%					

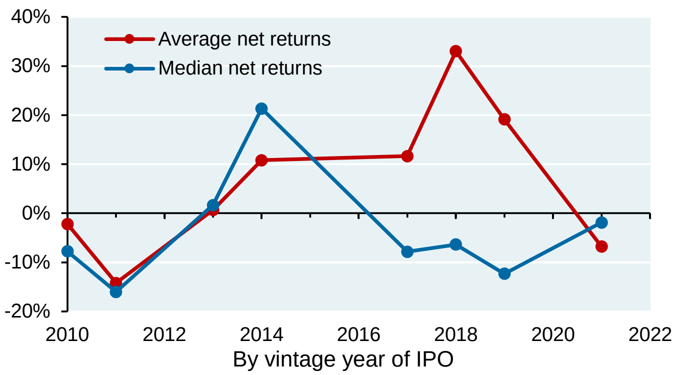
Pitchbook, Bloomberg, JPMAM. 07/14/2023

[11] Comments on financial, traditional energy and renewable energy IPOs

On **financials**, IPO average net returns from 2010-2022 were roughly zero, with better performing deals from 2015 to 2019 offsetting weaker deals earlier in the decade. It's hard to make generalizations since financial sector IPOs include regional banks, small investment banks, insurance companies, brokerage firms, money managers (investments in their firms, not in their funds), debt consolidators, electronic trading firms, leasing companies, loan originators, mortgage reinsurers, crypto/blockchain entities and various fintechs.

If there are any conclusions to draw from the data, it would be the higher average net returns from insurance IPOs compared to banks and diversified financial services, although with much greater return dispersion. Insurance outperformers include pre-2020 IPOs by Goosehead, Palomar, Kinsale and BRP which were offset by the crop of 2020 losers (SelectQuote, Root, GoHealth, Trean).

Net returns by year, Financials
excl. SPACs, N=151, >$50 mm, H=2 yr, vs S&P Small Cap Growth



Bloomberg, JPMAM. 07/07/2023

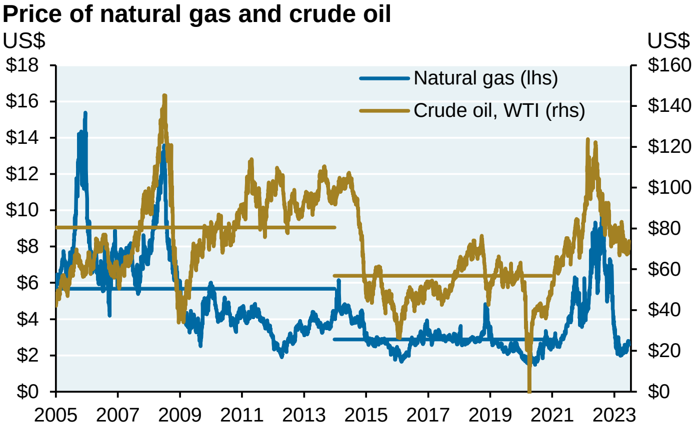
Net returns by industry group
excl. SPACs, >$50mm, H=2 yr, vs S&P Small Cap Growth

	Avg return	Med return	Std dev
Banks	7%	4%	35%
Diversified Finan Serv	4%	-18%	81%
Insurance	19%	-13%	125%

Bloomberg, JPMAM. 07/16/2023

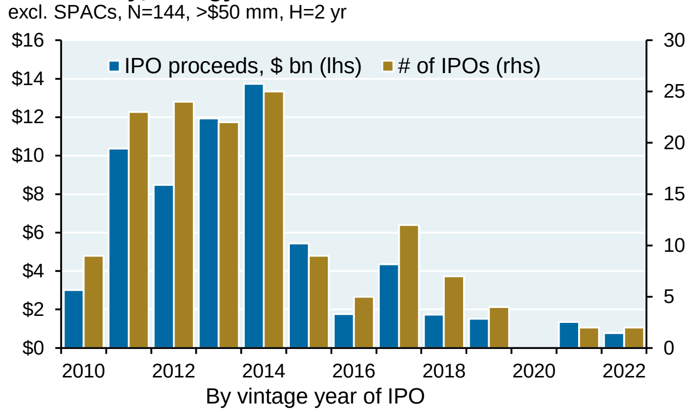
On **traditional energy**, there's not that much to analyze since energy IPO performance mostly tracks oil & gas prices. After 2014, the bottom dropped out of both oil and gas prices for the rest of the decade, leading to poor performance of the few IPOs that were issued during that time period.

Price of natural gas and crude oil



Source: Bloomberg, JPMAM. July 7, 2023.

IPO activity, Energy
excl. SPACs, N=144, >$50 mm, H=2 yr



Bloomberg, JPMAM. 07/08/2023

The more interesting question: the performance of renewable energy IPOs. First, we need to define what is meant by that designation. Consistent with our prior research, we define companies as renewable if they have ever been included in any of the following four indexes:

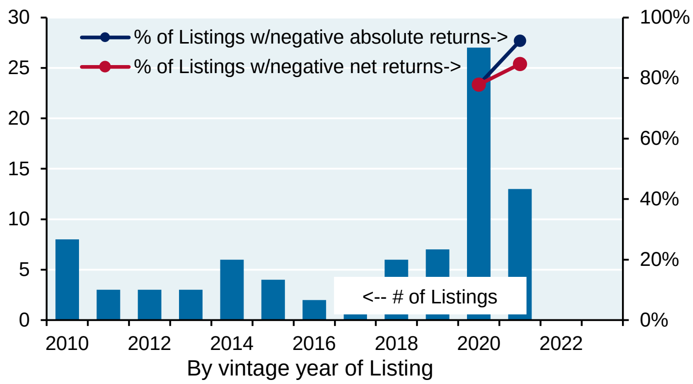
- NASDAQ Clean Edge Green Energy Index (CELS)
- Wilderhill Clean Energy Index (ECO)
- S&P Global Clean Energy Index (SPGCTED)
- Mac Global Solar Energy Index (SUNIDX)

Then, we filter these companies for any that went public on US exchanges from 2010-2022 with offer sizes of $50 mm or more, like the rest of our universe. We end up with 83 companies, split roughly 50/50 between regular IPOs and SPACs. The results: more losers than winners even before 2020, with an average net return of -8% and a median net return of -37%. Then came the crop of 2020/2021 renewable IPOs and SPACs which have done very poorly, with ~80% underperforming the benchmark. Average and median net returns for the 2010-2022 period: -24% and -51%.

The largest renewable underperformers span a variety of different industries: wind turbines, solar panel production, solar installation and financing, solar tracking software, energy storage (lithium and iron flow), clean power, electric cars and trucks, EV charging, LED lighting, "green" chemicals such as biobutanol, renewable fuels, electric aviation, hydrogen fuel cells, smart grids, energy saving software, energy efficient semiconductors and algae-based food. **In other words, despite the energy transition that is underway, there are no "sure things" for investors in renewable energy IPOs**.

Even some of the best performing IPOs over a two-year horizon ended up giving back all their gains later (NIU e-mobility, NIO EVs, TPI wind turbines, etc). **From a big picture perspective, there have been 3 huge long-term IPO winners in the renewable space: Tesla, Enphase and SolarEdge**. If we compute net returns from IPO to today (i.e., permanent hold and no 2-year sale), the average net return on the renewable basket would be 271%. Without those three stocks: -62%. Those are very difficult odds for IPO investors.

Listing activity and negative returns, All sectors, Renew.
all listings, N=83, >$50 mm, H=2 yr, vs S&P Small Cap Growth



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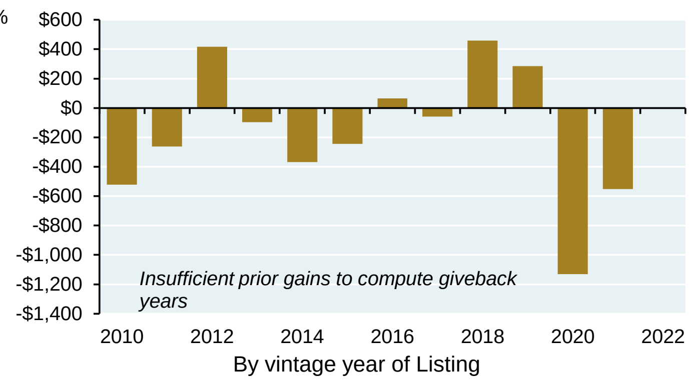
Annual Listing portfolio net cash flows, All sectors,
all listings, N=83, >$50 mm, H=2 yr, vs S&P Small Cap Growth



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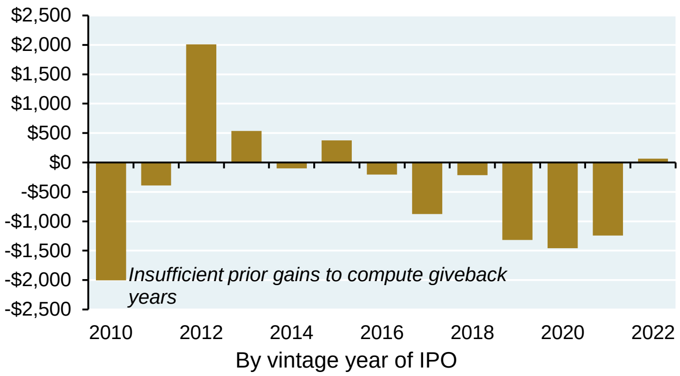
[12] Mainland China companies listing in the US: IPO investors wish they hadn't

In the sector performance analyses that appeared earlier, we excluded 240 US listings by companies domiciled outside the OECD. Of these 240 IPOs, 158 were companies domiciled in mainland China. Around 60% of these mainland Chinese IPOs were technology companies, with the rest divided among the other sectors. Their performance is shown below. Best to have avoided them; **pretty dismal returns in all years (ignore 2012 when there was only 1 deal to analyze).**

Annual IPO portfolio net cash flows, All sectors
excl. SPACs, China, N=158, >$50 mm, H=2 yr, vs S&P Small Cap Growth



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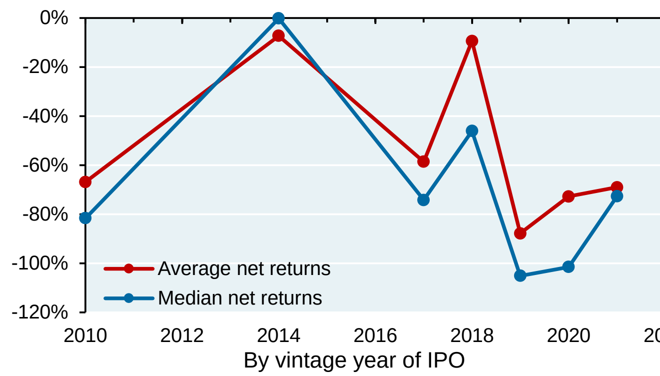
Net returns by year, All sectors
excl. SPACs, China, N=158, >$50 mm, H=2 yr, vs S&P Small Cap Growth



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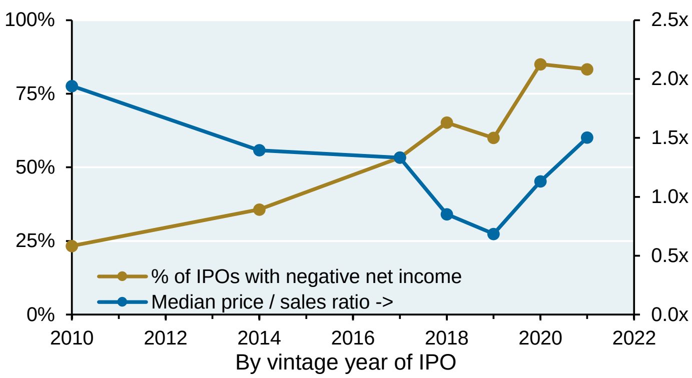
Financial statistics at time of IPO, All sectors
excl. SPACs, China, N=158, >$50 mm, H=2 yr



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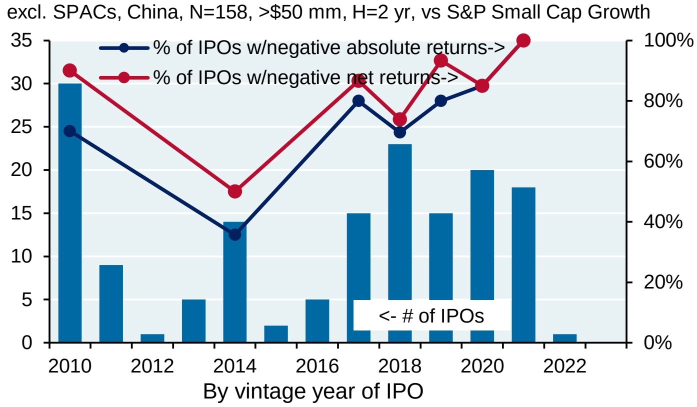
IPO activity and negative returns, All sectors
excl. SPACs, China, N=158, >$50 mm, H=2 yr, vs S&P Small Cap Growth



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Distribution of IPO net returns, All sectors
excl. SPACs, China, N=158, >$50 mm, H=2 yr, vs S&P Small Cap Growth

	<0%	0-50%	50-100%	100-200%	+200%
No. of deals	126	13	6	8	5
% of total deals	80%	8%	4%	5%	3%
Net returns	**25th**	**50th**	**75th**	**Average**	**Stdev**
Percentiles	-91%	-68%	-14%	-31%	180%

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Impact of removing top X% of IPOs on returns

remove top:	0%	3%	5%	7%
Average net	-31%	-51%	-55%	-60%
Average absolute	-15%	-36%	-40%	-45%

Appendix A: Our IPO dataset and return methodology

Composition. Our dataset is composed of 3,403 IPOs over $50 mm that were listed on US exchanges from 2010 to 2023. The size threshold includes greenshoe allocations exercised by underwriters. Bloomberg defines an IPO as an initial US listing even if the company had listed on some other country beforehand; so do we.

Country and SPAC status. The table below categorizes our US IPOs by region of company domicile. For SPACs, the table shows a breakdown of whether they executed a merger, if they're still active or if they were liquidated. We only include merged SPACs in our return analysis. We include the 12 direct listings in the table as traditional IPOs, and use the open price rather than the reference price for purposes of computing investor returns

OECD domicile. In our sector performance analyses, we only include US IPOs of companies that are domiciled in the OECD (91% of which are domiciled in the US). We take a separate look at mainland China IPOs which represent 50% of all emerging market companies listing on US exchanges

Investment vehicles excluded. We excluded IPOs of closed end funds, investment companies, BDCs and other entities from the analysis since they are actively managed portfolios composed of fixed income securities, equity securities or commodities and not investments in direct operating companies

Seasoning. We exclude all IPOs from our return analysis if they have not been trading for at least 6 months

Data history. If an IPO company is acquired or delisted before the end of the performance horizon we use, the return is computed based on the last available price

Universe materiality. When computing price to sales ratios and the share of companies with negative absolute or net returns, we only show results for years when the number of applicable IPOs exceeds 10

Financial materiality. When computing price to sales ratios, we exclude companies with less than $2 mm in sales in order to exclude companies with either infinite or preposterously high P/S ratios

Data quality. For price to sales and net income statistics at IPO date, we were able to obtain the necessary data for 80% and 95% of the IPOs in our dataset. For the numerator in the price to sales calculation, we use market cap on first day close rather than market cap at offer on that day. The reason: Bloomberg does not properly account for all share classes when computing market cap at offer

SPACggravation. Bloomberg does a good job when stock splits and reverse splits occur, rebasing historical stock prices and split-adjusting the original issue price. But Bloomberg does not do this for SPACs, since reverse splits occur with the merged ticker and do not affect the issue price of the original SPAC. So, we made the SPAC original issue price split adjustments manually.

Dataset of US listings, 2010-2023	
IPOs domiciled in the US	1,805
of which direct listings	12
IPO companies domiciled elsewhere in the OECD	206
IPO companies domiciled outside the OECD	236
of which China	161
Total number of IPOs on US exchanges	2,247

SPACs, all domiciles	1,156
Merged	497
Active or liquidated	659
Total US listings	3,403

Bloomberg, JPMAM. 07/03/2023

Direct listings on US exchanges

Pricing date	Ticker	Name	Day 1 market cap ($ bn)
4/3/2018	SPOT US	Spotify Technology	$26.5
3/28/2019	WTRE US	Watford Holdings	$0.1
6/20/2019	WORK US	Slack	$19.5
9/30/2020	ASAN US	Asana	$4.5
9/30/2020	PLTR US	Palantir Technologies	$15.7
10/1/2020	THRY US	Thryv Holdings	$0.3
3/10/2021	RBLX US	Roblox	$38.3
4/14/2021	COIN US	Coinbase Global	$65.4
5/19/2021	SQSP US	SquareSpace	$5.9
5/26/2021	ZIP US	ZipRecuiter	$2.2
9/28/2021	AMPL US	Amplitude	$5.6
9/29/2021	WRBY US	Warby Parker	$6.1
5/17/2022	BGXX US	Bright Green	$4.0

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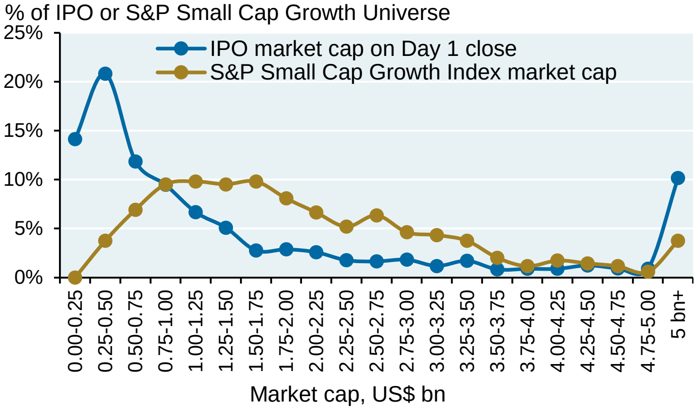
Appendix B: Benchmark selection and holding period returns

If we only looked at absolute IPO returns, we would flatter IPO performance during rising markets and penalize them during falling markets. As a result, we need a benchmark to assess the opportunity cost of investing in an IPO and holding for two years vs investing in something else. Readers of our private equity paper will recall that benchmark decisions are contentious; for example, should the S&P 500 be used for private equity performance assessment if typical LBO deals have more leverage and are smaller in size than S&P 500 companies?

In any case, here's where we came out on a benchmark for our IPO project:

- We looked for an index with a growth tilt (given the heavy weight of tech and biotech in US IPOs), and whose constituents have market capitalizations that are similar to those of US IPOs at the time they go public
- As shown below on the left, the S&P Small Cap Growth index is a reasonably good fit for our IPO universe. A Mid Cap index would be comprised of companies that are way too large compared to most IPOs
- IPO net returns were very similar to those computed using the S&P 500 or Russell 3000 Index instead. IPO net returns would have been higher had we used the Russell 2000 Growth Index, and they would have been lower had we used the Russell 3000 Growth Index or the Russell 1000 Growth Index
- We also computed median and average net returns for tech and healthcare IPOs using their respective S&P Small Cap sector indexes. The two-year rolling performance of these sub-sectors can deviate sharply from the performance of the Small Cap Growth Index, as shown in the chart on the right. However, the impact on median and average net IPO returns for these two sectors were modest when using sector-specific indexes, as shown in the table. In other words, **IPO security selection is the dominant factor here**
- We use a two-year holding period to be able to assess performance of 2020 and 2021 IPOs. For comparison, the Renaissance IPO Index uses a three-year holding period and the IPOX 100 US IPO Index uses an average holding period of four years. On page 11 we analyze the impact of using longer holding periods

IPO market cap vs S&P Small Cap Growth Index
% of IPO or S&P Small Cap Growth Universe



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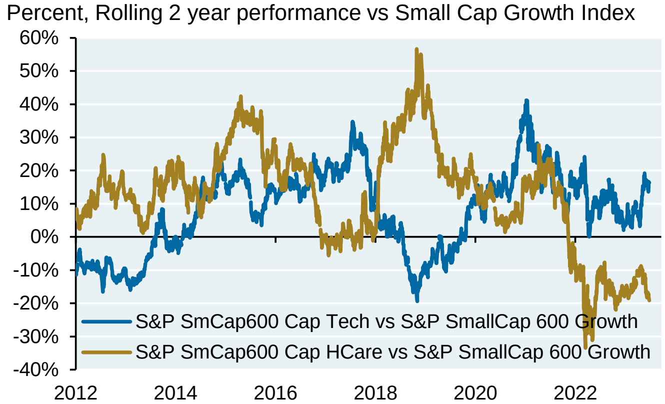
S&P Small Cap sub-sector relative performance
Percent, Rolling 2 year performance vs Small Cap Growth Index



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Benchmark net return analysis for tech and healthcare sectors

	Med. ret	Avg. ret	Index		Med. ret	Avg. ret	Index
Technology	-11%	34%	S&P 600 Small Cap Growth	Technology	-21%	25%	S&P 600 Small Cap Growth - Tech
Healthcare	-39%	14%	S&P 600 Small Cap Growth	Healthcare	-36%	9%	S&P 600 Small Cap Growth - Healthcare

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Appendix C: The best and worst IPOs by sector since 2010

Top 25 IPO net returns by sector, IPOs > $50 mm, 2 year holding period, excluding SPACs and non-OECD domiciled issuers

	Technology			Healthcare			Diversified			Consumer		
	Company	Year	Return	Company	Year	Return	Company	Year	Return	Company	Year	Return
1	SiTime	2019	2058%	BioNTech SE	2019	1494%	Caesarstone	2012	396%	Beyond Meat	2019	385%
2	BILL Holdings	2019	1017%	Intercept Pharmaceutical	2012	1229%	Proto Labs	2012	354%	OneWater Marine	2020	285%
3	Fiverr International	2019	830%	Receptos	2013	965%	TFI International	2020	196%	Canada Goose Holdings	2017	282%
4	Zoom Video Communicat	2019	771%	Bluebird Bio	2013	864%	Trinseo SA	2014	144%	Capri Holdings	2011	253%
5	Cloudflare	2019	706%	Auspex Pharmaceuticals	2014	726%	Graham Packaging Co	2010	129%	Academy Sports & Outdo	2020	211%
6	Trade Desk Inc/The	2016	640%	Inmode	2019	681%	Virgin America	2014	127%	RH	2012	186%
7	Roku	2017	603%	Karuna Therapeutics	2019	645%	Spirit Airlines	2011	126%	Burlington Stores	2013	186%
8	Cardlytics	2018	602%	Argenx SE	2017	638%	FleetCor Technologies	2010	105%	YETI Holdings	2018	174%
9	Crowdstrike Holdings	2019	531%	Moderna	2018	537%	Aptiv PLC	2011	104%	Peloton Interactive	2019	171%
10	Tabula Rasa HealthCare	2016	528%	Forty Seven	2018	524%	Installed Building Produc	2014	91%	Ollie's Bargain Outlet Hol	2015	153%
11	Yelp	2012	480%	Prometheus Biosciences	2021	521%	Cadre Holdings	2021	88%	Zoe's Kitchen	2014	148%
12	Alteryx	2017	469%	Kodiak Sciences	2018	516%	Ferrari NV	2015	87%	Fresh Market Inc/The	2010	147%
13	Sprout Social	2019	412%	Principia Biopharma	2018	503%	Bright Horizons Family S	2013	85%	GNC Holdings	2011	126%
14	Shopify	2015	407%	Synthorx	2018	503%	Avantor	2019	81%	BJ's Wholesale Club Hold	2018	124%
15	Livongo Health	2019	400%	Agios Pharmaceuticals	2013	503%	TransUnion	2015	81%	Dave & Buster's Entertain	2014	120%
16	Okta	2017	389%	Guardant Health	2018	477%	Kornit Digital	2015	73%	Terminix Global Holdings	2014	116%
17	Datadog	2019	385%	Esperion Therapeutics	2013	452%	Core & Main	2021	65%	Floor & Decor Holdings	2017	110%
18	MongoDB	2017	378%	Twist Bioscience	2018	447%	Cboe Bats LLC	2016	63%	Dunkin' Brands Group	2011	97%
19	Everbridge	2016	365%	Shockwave Medical	2019	437%	HD Supply Holdings	2013	60%	Vita Coco Co Inc/The	2021	92%
20	Block	2015	361%	Tetraphase Pharmaceutic	2013	420%	Construction Partners	2018	59%	Turning Point Brands	2016	82%
21	Avalara	2018	357%	BeiGene	2016	417%	Boise Cascade Co	2013	59%	Lovesac Co/The	2018	80%
22	Carvana Co	2017	345%	AveXis	2016	394%	Advanced Drainage Syste	2014	54%	Sovos Brands	2021	79%
23	PDD Holdings	2018	328%	ZS Pharma	2014	394%	Ingersoll Rand	2017	52%	At Home Group	2016	77%
24	Demandware LLC	2012	316%	Nevro	2014	385%	Tesla	2010	48%	AdvancePierre Foods Ho	2016	76%
25	Ellie Mae	2011	298%	Advanced Accelerator Ap	2015	379%	Houghton Mifflin Harcourt	2013	46%	Danone US	2012	72%

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As a reminder, net returns can be worse than 100% since we measure results vs an equity market benchmark that may be rising while the IPO's price is falling.

Bottom 50 IPO net returns by sector, IPOs > $50 mm, 2 year holding period, excluding SPACs and non-OECD domiciled issuers

	Technology			Healthcare			Diversified			Consumer		
	Company	Year	Return	Company	Year	Return	Company	Year	Return	Company	Year	Return
1	SMART Technologies	2010	-126%	Enliven Therapeutics	2020	-171%	Ceres	2012	-134%	Primo Water Operations	2010	-113%
2	Selectquote	2020	-126%	Galera Therapeutics	2019	-140%	GSE Holding	2012	-133%	LiveStyle	2013	-113%
3	Root Inc/OH	2020	-124%	SNDL	2019	-139%	Amyris	2010	-112%	Laird Superfood	2020	-112%
4	Vroom	2020	-122%	ORIC Pharmaceuticals	2020	-139%	Pro Farm Group	2013	-109%	GAN	2020	-106%
5	NantHealth	2016	-121%	Humanigen	2013	-130%	Forterra	2016	-108%	Skullcandy	2011	-102%
6	Voltari	2010	-121%	Ayala Pharmaceuticals	2020	-129%	Arcadia Biosciences	2015	-108%	Fairway Group Holdings	2013	-97%
7	GoHealth	2020	-121%	Stealth BioTherapeutics	2019	-127%	Fenix Parts	2015	-107%	Bright Green	2022	-96%
8	CPI Card Group	2015	-120%	Axcella Health	2019	-126%	Gevo	2011	-105%	TCP International Holding	2014	-95%
9	Tintri	2017	-117%	Passage Bio	2020	-125%	Baltic Trading	2010	-105%	Vince Holding	2013	-93%
10	Greenlane Holdings	2019	-116%	ReShape Lifesciences	2016	-124%	On Deck Capital	2014	-105%	DavidsTea	2015	-86%
11	Zynga	2011	-116%	Novan	2016	-124%	Venator Materials PLC	2017	-101%	Oatly Group AB	2021	-74%
12	Blue Apron Holdings	2017	-113%	Genfit SA	2019	-123%	Foresight Energy LP	2014	-98%	Allbirds	2021	-73%
13	MaxPoint Interactive	2015	-113%	Freeline Therapeutics Ho	2020	-122%	KiOR	2011	-97%	Torrid Holdings	2021	-73%
14	Envivio	2012	-112%	SmileDirectClub	2019	-121%	Westmoreland Resource	2010	-95%	Honest Co Inc/The	2021	-73%
15	CafePress	2012	-110%	Trevi Therapeutics	2019	-121%	CHC Group	2014	-94%	Casper Sleep	2020	-71%
16	VIA Optronics AG	2020	-109%	Biodesix	2020	-120%	Agrify	2021	-93%	Latham Group	2021	-71%
17	Meru Networks	2010	-108%	Acutus Medical	2020	-119%	Hydrofarm Holdings Grou	2020	-89%	Olaplex Holdings	2021	-70%
18	Connecture	2014	-108%	Kineta	2016	-119%	Bazaarvoice	2012	-83%	Tilly's	2012	-69%
19	Telaria	2013	-108%	Aprea Therapeutics	2019	-119%	Sono Group NV	2021	-79%	elf Beauty	2016	-67%
20	GoodRx Holdings	2020	-105%	Biora Therapeutics	2020	-118%	REV Group	2017	-78%	Warby Parker	2021	-65%
21	DynaVox	2010	-104%	Fusion Pharmaceuticals	2020	-118%	Vital Farms	2020	-78%	Lulu's Fashion Lounge Ho	2021	-65%
22	Intermolecular	2011	-104%	Lyra Therapeutics	2020	-117%	Gatos Silver	2020	-77%	Arlo Technologies	2018	-64%
23	Sequans Communication	2011	-102%	Pacific Biosciences of Ca	2010	-117%	Euronav MI II	2015	-73%	Nuvei	2021	-64%
24	Groupon	2011	-101%	Kadmon Holdings	2016	-117%	Charah Solutions	2018	-72%	J Jill	2017	-64%
25	Intralinks Holdings	2010	-100%	Metacrine	2020	-117%	Tower International	2010	-71%	Amplify Snack Brands	2015	-64%
26	American Well	2020	-99%	Bellerophon Therapeutics	2015	-115%	Ramaco Resources	2017	-71%	Traeger	2021	-63%
27	Marin Software	2013	-98%	Valeritas Holdings	2017	-113%	Ply Gem Holdings	2013	-71%	JOANN	2021	-61%
28	Violin Memory Federal S	2013	-97%	Zosano Pharma	2015	-113%	Leaf Group	2011	-71%	GoPro	2014	-60%
29	NuPathe	2010	-97%	ADC Therapeutics SA	2020	-113%	Green Dot	2010	-70%	TerraVia Holdings	2011	-59%
30	Rocket Fuel	2013	-96%	CalciMedica	2020	-113%	Aspen Aerogels	2014	-69%	Zevia PBC	2021	-58%
31	Rackspace Technology	2020	-94%	Aileron Therapeutics	2017	-112%	Gain Capital Holdings	2010	-67%	Noodles & Co	2013	-56%
32	MaxLinear	2010	-94%	Sorrento Tech	2014	-111%	Mesa Air Group	2018	-66%	Roundy's	2012	-55%
33	ContextLogic	2020	-94%	Poseida Therapeutics	2020	-111%	Cypress Environmental P	2014	-66%	Brilliant Earth Group	2021	-53%
34	pSemi	2012	-93%	Sienna Biopharmaceutica	2017	-111%	ADT	2018	-66%	Soho House & Co	2021	-52%
35	LendingClub	2014	-92%	Taysha Gene Therapies	2020	-111%	Metals USA Holdings	2010	-62%	Freshpet	2014	-52%
36	Motorsport Games	2021	-92%	Galecto	2020	-111%	Rhino Resource Partners	2010	-59%	Solo Brands	2021	-52%
37	Corp Mitel Networks	2010	-91%	Satsuma Pharmaceutica	2019	-111%	Dorian LPG	2014	-58%	Container Store Group In	2013	-50%
38	Fitbit	2015	-91%	Sierra Oncology LLC	2015	-111%	OCI Partners LP	2013	-57%	Real Good Food Co Inc/T	2021	-50%
39	Covisint	2013	-91%	Akouos	2020	-110%	Rivian Automotive	2021	-56%	Hudson	2018	-50%
40	Cyan	2013	-90%	Onconova Therapeutics	2013	-110%	Euronav NV	2015	-54%	Fogo De Chao	2015	-46%
41	Millennial Media	2012	-88%	Ovid therapeutics	2017	-109%	Elevate Credit	2017	-53%	Figs	2021	-45%
42	Telos	2020	-87%	Chiasma	2015	-109%	Foundation Building Mate	2017	-53%	Body Central	2010	-42%
43	Blend Labs	2021	-86%	Eledon Pharmaceuticals	2014	-107%	Zipcar	2011	-53%	PlayAGS	2018	-41%
44	Sumo Logic	2020	-84%	Oncorus	2020	-107%	Pactiv Evergreen	2020	-52%	Vizio Holding	2021	-41%
45	Velti PLC	2011	-84%	Inozyme Pharma	2020	-106%	US Xpress Enterprises	2018	-51%	Habit Restaurants Inc/Th	2014	-40%
46	aka Brands Holding	2021	-84%	Black Diamond Therapeu	2020	-106%	Valvoline	2016	-49%	Leslie's	2020	-39%
47	Stronghold Digital Mining	2021	-83%	Milestone Pharmaceutica	2019	-106%	AZEK Co Inc/The	2020	-47%	R1 RCM Holdco	2010	-35%
48	Accolade	2020	-82%	Astria Therapeutics	2015	-106%	Camping World Holdings	2016	-47%	Cricut	2021	-35%
49	Casa Systems	2017	-82%	Generation Bio Co	2020	-105%	General Motors Co	2010	-44%	Sweetgreen	2021	-35%
50	Lanyon Solutions	2011	-81%	Codiak Biosciences	2020	-105%	Renewable Energy Group	2012	-44%	Petco Health & Wellness	2021	-34%

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