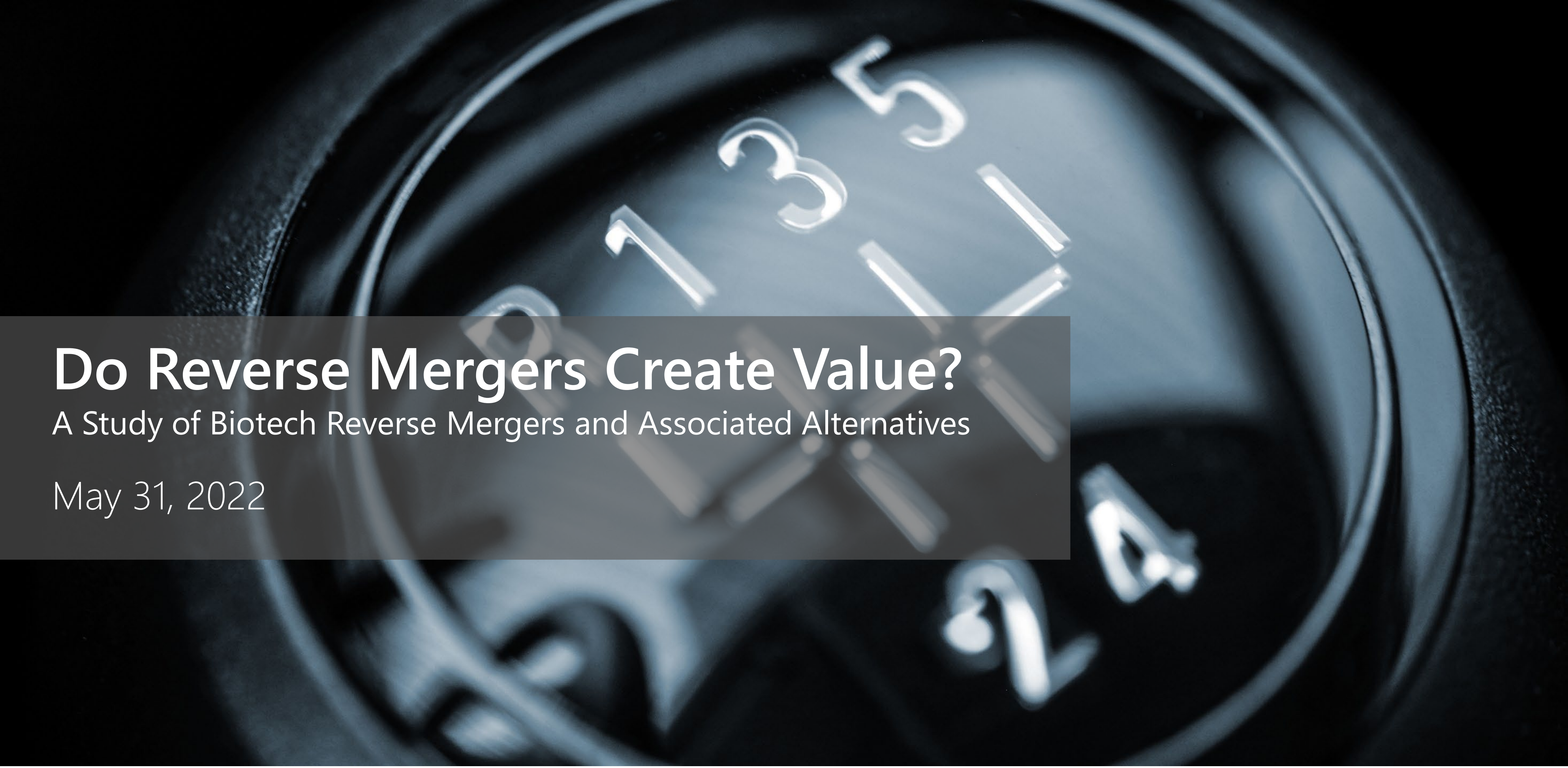


Do Reverse Mergers Create Value?

A Study of Biotech Reverse Mergers and Associated Alternatives

May 31, 2022

TORREYA

Executive Summary

- As of this writing we find ourselves in an extraordinary moment in biotech history.
- More than 190 biotech companies are trading with a market cap below their level of net cash (negative EV).
- The market is sending a message to the management and boards of these companies that their current programs are likely NPV negative.
- Boards have been responsive to these messages as an unprecedented number of biotech companies have publicly indicated that they are exploring strategic options.
- Historically, many companies have chosen a reverse merger as the conclusion of a strategic review.
- A reverse merger involves a public company issuing new shares to acquire a private company, whose shareholders typically take control of the public company, gaining the listing and cash to pursue a business plan that has better prospects than those of the public company on its own.
- The idea is beguiling. A board appears to discharge its fiduciary duties getting out of a business that the market does not value. Further, there are many promising private companies that are open to participating, particularly in difficult markets. Importantly, reverse merger transactions also involve an element of finality. Employees can be terminated. A shareholder vote takes place, and the current company is handed over to new management. Board members can move on.
- This is typically capped by a fairness opinion from a financial advisor indicating that such transaction is value positive.
- Even though almost all reverse mergers are accompanied by fairness opinions that argue that such transactions are value positive (or, at worst, value neutral), there is little *ex post* evidence that such transactions systematically create value.
- Dasilas, Grose and Talias (2017) find that reverse mergers are associated with long-term poor share price performance. A number of other research papers have confirmed this finding.*

* See Dasilas, Apostolos, Chris Grose, and Michael A. Talias. "Investigating the valuation effects of reverse takeovers: evidence from Europe." *Review of Quantitative Finance and Accounting* 49.4 (2017): 973-1004; Lee, Charles MC, Kevin K. Li, and Ran Zhang. "Shell games: The long-term performance of Chinese reverse-merger firms." *The Accounting Review* 90.4 (2015): 1547-1589 and Adjei, F, Cyree, KB, Walker, MM, "The Determinants and Survival of Reverse Mergers vs. IPOs," Journal of Economics and Finance, 32, 176–194 (2008).

Executive Summary – Reverse Mergers Underperform

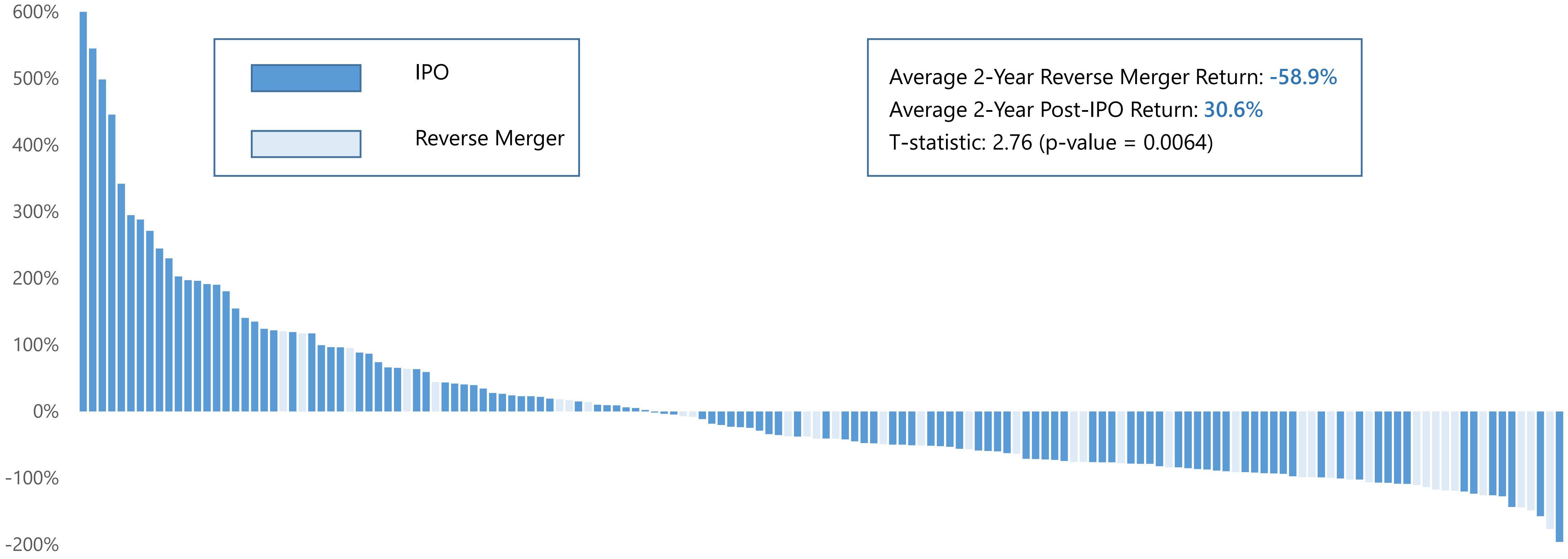
- To better understand the effectiveness of reverse mergers in generating value in the biotech context, we collected a comprehensive sample of U.S. listed reverse mergers announced in the January 2017 to May 2020 period. We stopped in May 2020 to give enough time to measure returns to shareholders of the reversing company for two years post-announcement.
- In total we identified 36 reverse merger transactions.
- For comparison, we also collected a comprehensive sample of IPO's taking place on a major U.S. exchange in the same time period. We required IPOs to be for $50mm or more.
- Consistent with the prior literature we have found that reverse mergers underperform the market and their IPO comparators.
- In our study, we found that the average two-year market-adjusted return following a reverse merger was -58.9%.**
- In contrast, the IPO cohort outperformed the market. The average IPO outperformed its peer group (the XBI ETF) by 30.6% over two years.
- Very few reverse merger companies beat the market. We find that 81% of reverse mergers underperform the market by 24 months post-announcement.
- There are obvious potential problems with reverse mergers versus IPOs including adverse selection (companies that can't IPO choose reverse mergers), lack of research sponsorship, selling pressure from the original public companies' shareholders, lack of adequate finance and lack of price discovery.
- We have heard some companies argue that reverse merger shells with more cash or investor support via concurrent PIPEs perform better.
- To better gain insight into why reverse mergers are involved with poor post-transaction returns we stratified our sample into subgroups that involved a PIPE of at least $20mm.

** The reverse merger company's market-adjusted return was defined as its percentage change in share price over a specified time horizon less the percentage return in the same time period in the ARCA XBI Biotech ETF.

Two-Year Returns After Reverse Mergers and IPOs

Reverse Mergers Dramatically Underperform their IPO Counterparts

Two Year Market Adjusted Returns Associated with IPOs and Reverse Mergers in the Period from Jan 2017 to May 2020



Average 2-Year Reverse Merger Return: -58.9%

Average 2-Year Post-IPO Return: 30.6%

T-statistic: 2.76 (p-value = 0.0064)

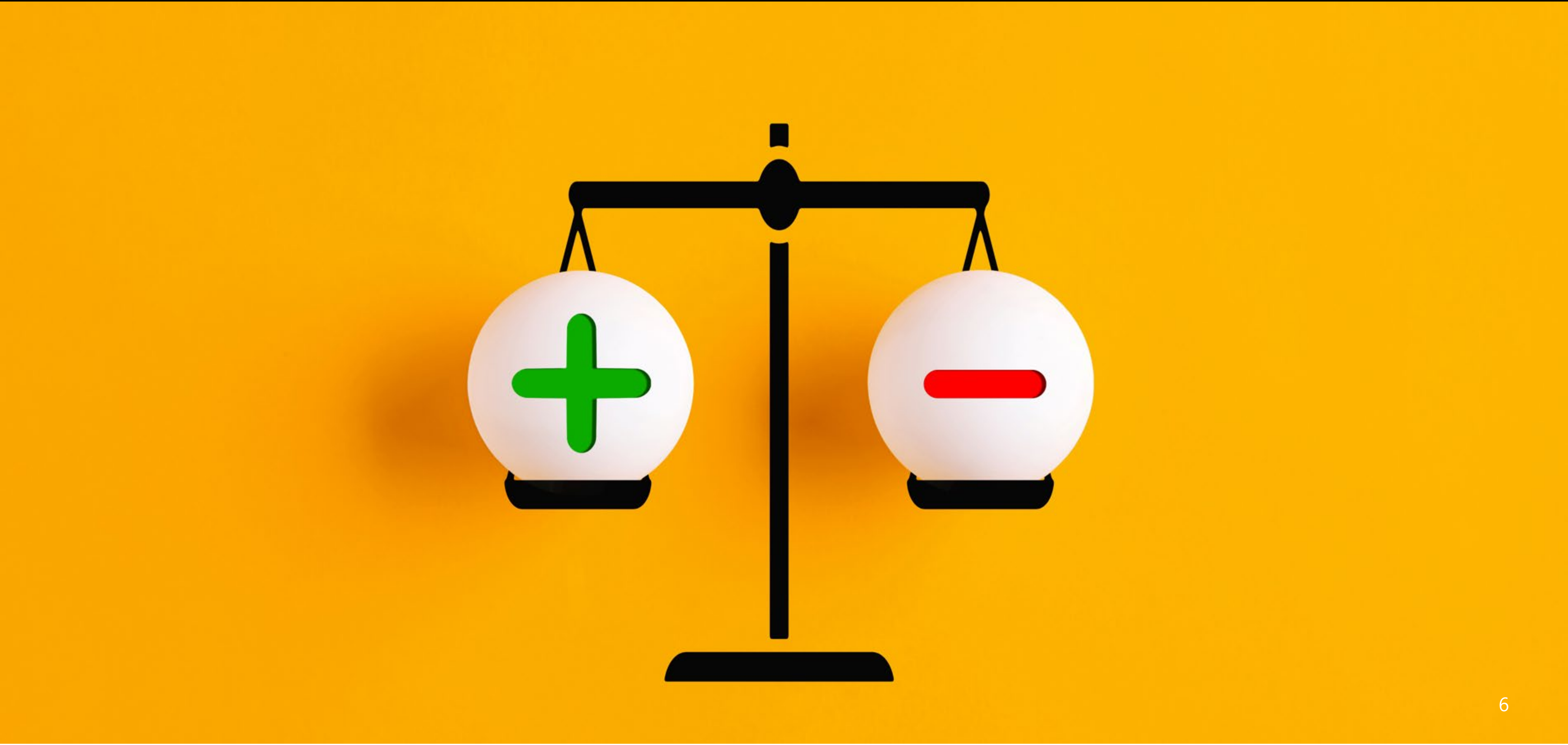
Notes: Sourced from Capital IQ and Torreya research. Returns are calculated as split-adjusted share price return over two years from IPO pricing or merger announcement. Market adjustment is carried out by subtracting the XBI return over the same two-year time period.

Executive Summary – Good Alternatives to Reverse Mergers Often Exist

- We also stratified the sample by whether a public reverse merging company had $30mm in net cash at the time of a transaction announcement.
- The companies that reversed with a concurrent PIPE transaction performed *worse* in our sample. The companies that carried out a concurrent PIPE had an average two-year market-adjusted return of -63% versus -54% for those that did not.
- As for amount of cash in the shell, there was a difference in performance. Those that had more than $30mm in cash did better – only underperforming the market by 21%. Obviously, this would still be highly disappointing to the companies involved.
- In today's environment where so many companies have significant cash balances and negative enterprise value, it's worth contemplating what alternatives might exist to the reverse merger.

- In a May 2022 article, for example, Peter Kolchinsky of RA Capital has argued that cash rich shell companies will have a very difficult time completing reverse mergers given the scale of valuation discounts to cash and the dissolution value of many biotech companies.
- The point is well taken. If a company is trading at a third of its cash value, the bar to beat some type of dissolution or return of capital is very high.
- We review six alternatives that boards can consider when contemplating a reverse merger.
- One important alternative in today's context of negative EV biotechs is a full or partial return of capital.
- While there are some administrative complexities involved, total professional fees are likely to be lower with this approach.
- And, importantly, a return of capital lets shareholders decide how to deploy capital rather than the board of public company.

A Study of Reverse Mergers versus IPOs



Comparison of Biotech Reverse Mergers to Biotech IPOs in the 2017 to 2020 Period

- Torreya collected information on all reverse mergers involving two biotech companies where one was listed on a major U.S. exchange between January 2017 and May 2020.
- We tracked the share price of the public company from the day before announcement of a reverse merger for up to two years after.
- The reverse merger candidate public company return was defined as its percentage change in share price over a certain period of time
- The reverse merger candidate public company abnormal return was defined as its percentage change in share price over a certain period of time over the percentage return in the same time period in the ARCA XBI Biotech ETF.
- In total, we identified 36 transactions where a biotech company went public via a reverse merger in the 2017 to 2020 period.
- To provide a point of comparison, Torreya also collected all NASDAQ, NYSEAM and NYSE biotech IPOs that took place in the January 2017 to May 2020 period.
- In total we identified 121 biotech companies that went public through an IPO of $50mm or more on a major U.S. exchange in the January 2017 to May 2020 time period.

Announce Date	Public Company	Private Company Target
1/5/17	OncoGenex Pharma	Achieve Life Sciences, Inc.
1/7/17	Mast Therapeutics	Savara
1/19/17	PharmAthene	Altimmune, Inc.
3/17/17	Threshold Pharma	Molecular Templates, Inc.
3/20/2017	Cerulean	Dare Bioscience
4/18/17	Nivalis Therapeutics	Alpine Immune Sciences, Inc.
5/16/17	Mirna Therapeutics	Synlogic, Inc.
7/3/17	Opexa Therapeutics	Acer Therapeutics
8/8/17	Galena	Sellas
9/27/2017	Alcobra	Arcturus
10/17/2017	Neothetics	Evofem Biosciences
10/30/2017	Aviragen	Vaxart
12/17/17	Inotek	Rocket Pharma
6/4/2018	Versartis	Aravive
7/30/2018	Seelos Therapeutics	Apricus Biosciences, Inc.
8/9/2018	Ovascience	Millendo
10/12/18	Alliqua	Adnyxx
11/19/2018	Bioblast Pharma	Enlivex
11/26/2018	Edge Therapeutics	PDS Biotechnology
11/27/2018	Arsanis	X4
1/3/2019	OHR Pharma	NeuBase Therapeutics
1/4/2019	Vital Therapies	Immunic
1/4/2019	Flex Pharma	Salarius Pharma
3/7/2019	GTx, Inc.	Oncternal Therapeutics
4/8/2019	Histogenics	Ocugen
6/3/2019	Vical Incorporated	Brickell Biotech
6/3/2019	Proteon Therapeutics	ArTara Therapeutics
7/26/19	Gemphire Therapeutics Inc.	NeuroBo
9/30/2019	NewLink Genetics Corporation	Lumos Pharma
12/18/2019	Zafgen	Chondrial Therapeutics
1/21/20	Ritter Pharmaceuticals, Inc.	Qualigen Therapeutics
1/28/2020	Conatus	Histogen
1/28/20	BioPharmX Corporation	Timber Pharmaceuticals
2/20/2020	Tocagen	Forte Biosciences
4/29/2020	RestorBio	Adicet
5/18/2020	Neurotrope	Metuchen Pharma

IPO Study Population

In total we identified 121 biotech companies that went public through an IPO of $50mm or more on a major U.S. exchange in the January 2017 to May 2020 time period.

These companies were sourced from Capital IQ.

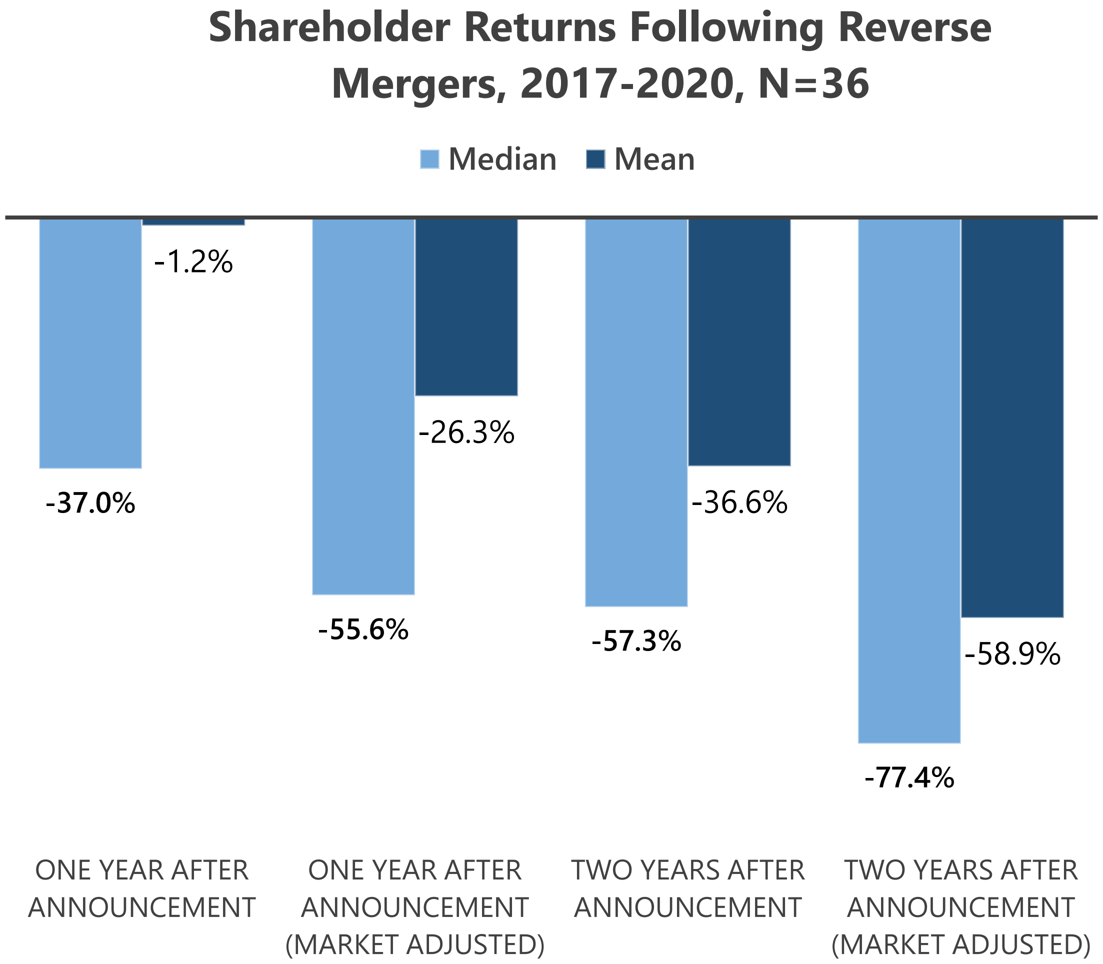
Pricing Date	Company	Pricing Date	Company	Pricing Date	Company	Pricing Date	Company
03/09/2017	Tocagen	01/09/2018	Evolus	09/14/2018	Allogene	08/16/2019	Satsuma Pharma
03/27/2017	Akcea Therapeutics	02/12/2018	BioXcel Therapeutics	09/17/2018	Equillium	08/19/2019	IGM Biosciences
03/31/2017	Zymeworks	02/16/2018	Arcus Bio	09/25/2018	LogicBio	09/03/2019	Vir Bio
04/07/2017	Biohaven Pharma	03/02/2018	Homology Med	09/28/2018	NGM Bio	09/06/2019	Frequency Tx
04/07/2017	UroGen Pharma	03/02/2018	Unum Therapeutics	10/02/2018	Twist Bioscience	09/09/2019	BioNTech
04/10/2017	Ovid Therapeutics	04/05/2018	Unity Bio	10/04/2018	Orchard Tx	09/27/2019	Beam Therapeutics
04/13/2017	G1 Therapeutics	04/13/2018	Evelo Bio	11/09/2018	Moderna	09/30/2019	Phathom Pharma
05/12/2017	Athenex	04/27/2018	Scholar Rock	12/21/2018	Gossamer Bio	09/30/2019	Cabaletta
06/01/2017	Mersana Tx	04/27/2018	Kiniksa Pharma	12/27/2018	Harpoon Tx	10/04/2019	Oyster Point Pharma
06/02/2017	Dova Pharma	05/01/2018	Iterum Tx	12/28/2018	TCR2 Tx	10/11/2019	89bio
06/02/2017	Aileron Therapeutics	05/07/2018	Autolus Tx	12/28/2018	Stealth Bio	10/11/2019	Galera Therapeutics
06/23/2017	Calyxt	05/09/2018	Provention Bio	01/07/2019	Alector	10/29/2019	I-Mab
06/23/2017	Kala Pharma	05/14/2018	MeiraGTx	03/01/2019	Precision Bio	01/03/2020	Black Diamond Tx
06/29/2017	Clementia Pharma	05/22/2018	Verrica Pharma	03/21/2019	Turning Point Tx	01/06/2020	Arcutis
08/15/2017	Zai Lab	05/24/2018	Magenta Tx	03/22/2019	HOOKIPA Pharma	01/17/2020	Revolution Med
08/29/2017	Sol-Gel	05/24/2018	Kezar Life	04/05/2019	Trevi Tx	02/03/2020	Passage Bio
08/31/2017	Nightstar Tx	05/24/2018	Xeris Bio	04/12/2019	Cortexyme	02/14/2020	IMARA
09/01/2017	Deciphera Pharma	05/25/2018	AVROBIO	04/12/2019	NextCure	02/28/2020	ORIC Pharma
09/01/2017	NuCana	06/04/2018	Tricida	04/12/2019	Milestone Pharma	03/06/2020	Zentalis
09/05/2017	Rhythm Pharma	06/22/2018	Allakos	04/12/2019	Axcella Health	03/06/2020	Lyra Therapeutics
09/18/2017	OptiNose	06/22/2018	Replimune	04/26/2019	Bicycle Tx	03/06/2020	Ayala Pharma
09/21/2017	Cue Biopharma	06/22/2018	Crinetics	05/23/2019	Stoke Tx	03/16/2020	Keros Therapeutics
10/06/2017	Spero Tx	06/22/2018	Rubius Tx	05/24/2019	BridgeBio	04/24/2020	ADC Therapeutics
10/06/2017	Allena Pharma	06/27/2018	Aquestive Tx	05/24/2019	Akero Tx	05/08/2020	Pliant Tx
10/13/2017	Apellis	08/17/2018	Entasis Tx	05/24/2019	Atreca	05/13/2020	Legend Biotech
10/23/2017	scPharmaceuticals	08/23/2018	Gritstone bio	05/30/2019	Morphic	05/18/2020	Applied Molecular Tr
11/13/2017	Denali Tx	08/24/2018	Y-mAbs Tx	05/31/2019	Karuna	05/22/2020	Vaxcyte
12/28/2017	Menlo Tx	08/29/2018	Sutro Bio	06/21/2019	Mirum Pharma	05/22/2020	Avidity Bio
12/29/2017	ARMO BioSciences	08/30/2018	Arvinas	06/21/2019	Fulcrum Tx	05/22/2020	Generation Bio
12/29/2017	resTORbio	09/07/2018	Kodiak Sciences	08/16/2019	SpringWorks Tx	05/22/2020	Burning Rock
12/29/2017	Solid Bio						

Shareholders Rarely Benefit from Reverse Mergers

- A year after reverse merger announcement, ~80% of companies had a negative market-adjusted return.
- Two years after announcement, 74% have a negative return.
- The average market-adjusted return one year after reverse merger announcement is -26.3%.
- The average market-adjusted return two years after reverse merger announcement is -58.9%.
- Median returns are even lower than average returns.

	One Year Share Return from Announcement	One Year Market Adjusted Return	Two Year Share Return from Announcement	Two Year Market Adjusted Return
Q1	-85.4%	-100.4%	-90.7%	-108.6%
Median	-37.0%	-55.6%	-57.3%	-77.4%
Average	-1.2%	-26.3%	-36.6%	-58.9%
Q3	20.0%	4.5%	-11.0%	-29.9%
Fraction Positive	33%	28%	25%	18%

There are, of course, some examples of reverse mergers that outperform the market. We are surprised, however, by how few of these cases are to be found.*

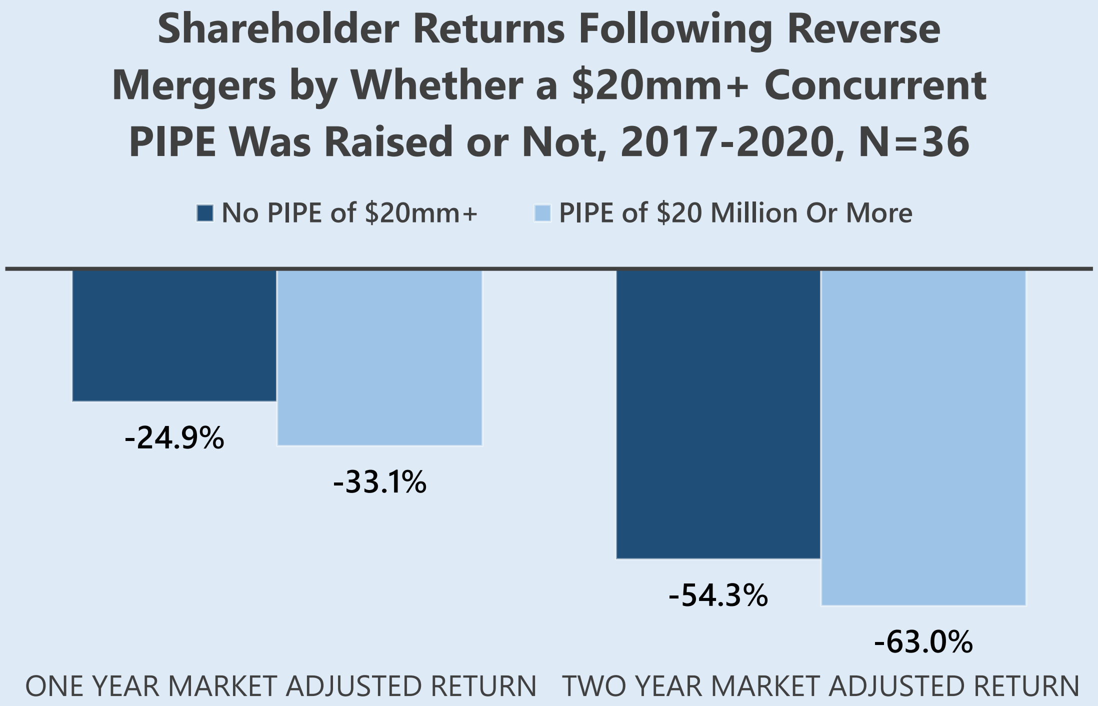


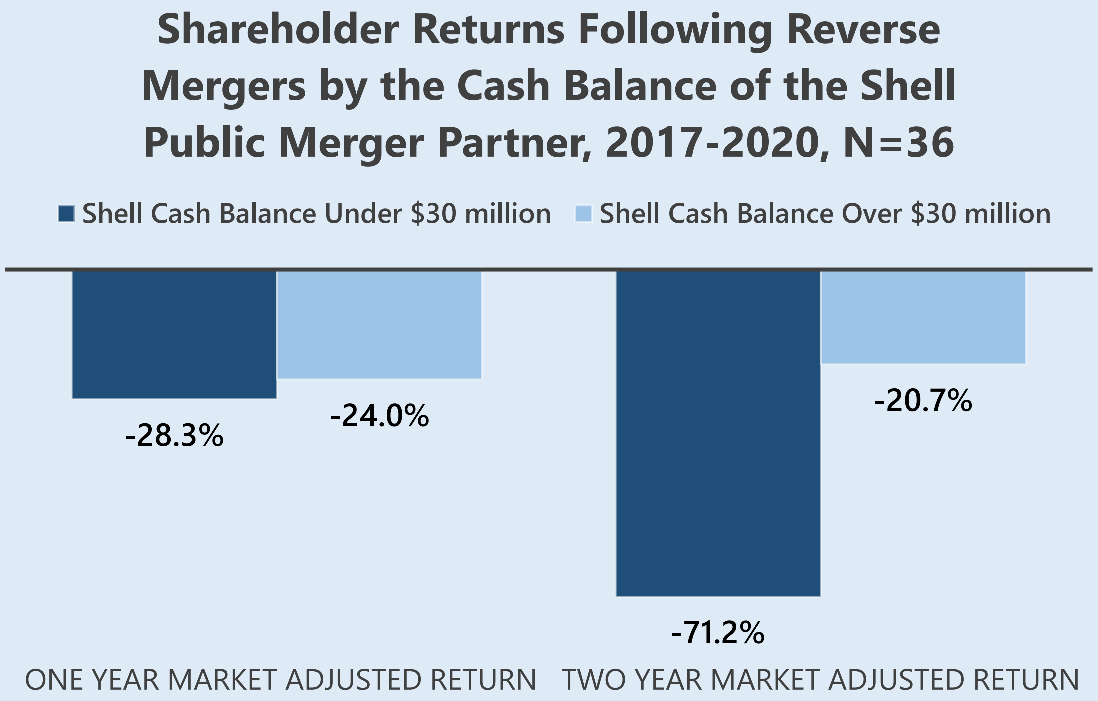
* See, for example: https://www.evaluate.com/vantage/articles/news/deals/forte-fails-who-might-yet-improve-image-reverse-mergers

Source: Capital IQ and Torreya research

Relevance of Concurrent PIPEs and Cash Balances of the Public Merger Candidate

There were 10 concurrent PIPEs of $20mm or more in our sample of 36 reverse mergers. Average returns in mergers accompanied by concurrent PIPEs were lower rather than higher. Eleven of the 36 reverse mergers featured public partner shell companies with $30mm or more in cash at announcement. The average returns for this subset were not as poor in year 2 (although differed little in year 1). Importantly, regardless of whether a PIPE was carried out or whether a merger partner was cash rich or not, shareholder returns were negative, on average, in the years following transaction announcement.*





* In the past two years, a handful of reverse mergers have taken place that involved >$100M PIPE investments by well-known public biotech investors, who also took board seats after the transaction was complete. While not included in our dataset due to insufficient history, their median excess performance to date is better than the median excess performance in our dataset (although still negative). Several cases such as Aerpio / Aadi have generated positive returns. This suggests that reverse mergers with meaningful support (PIPE + board seat) from credible investors may be more likely to outperform.

Source: Capital IQ and Torreya research

The Public Company's Shareholders Bear the Brunt of Reverse Merger Costs

In our sample, the public partner, on average, retained 26% of the ownership of the successor company.

Pay the filing costs for the deal.
Legal time and SEC costs $500,000 to $1mm

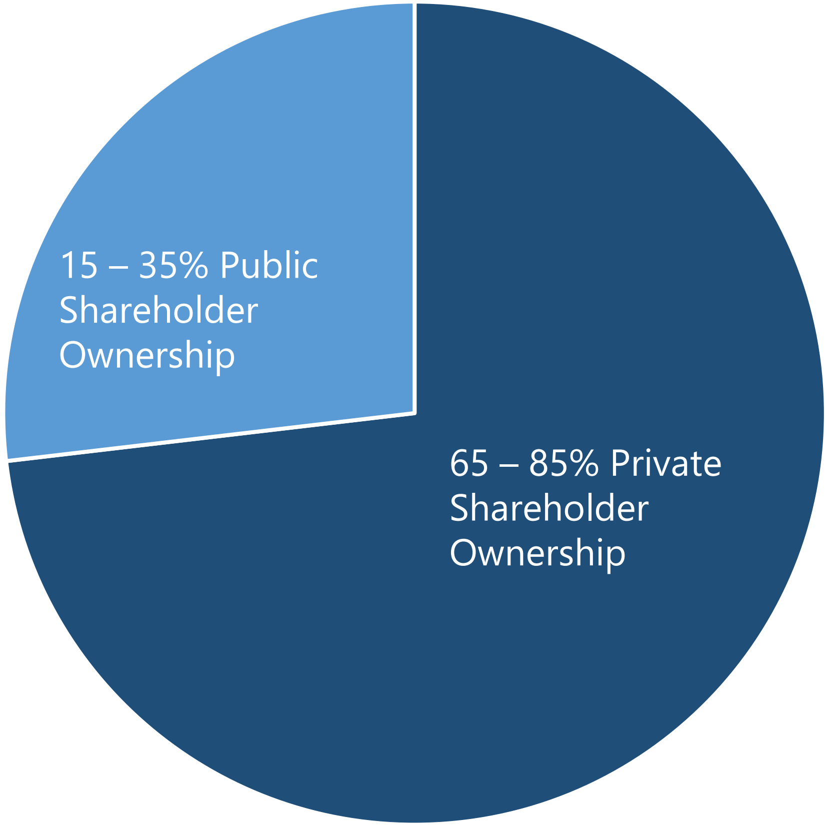
Pay banker costs.
We took a sampling and found that the average public company banker transaction fee was $1.3mm on a reverse merger.

Pay for fairness opinion costs.
These average $400,000. This is on top of the banker fee.

Typical fees for a reverse merger.
Range from $2.7 to $3.2mm

While the shell company's shareholders get 15% to 35% of the successor company, they typically bear the brunt of the transaction costs associated with a deal.

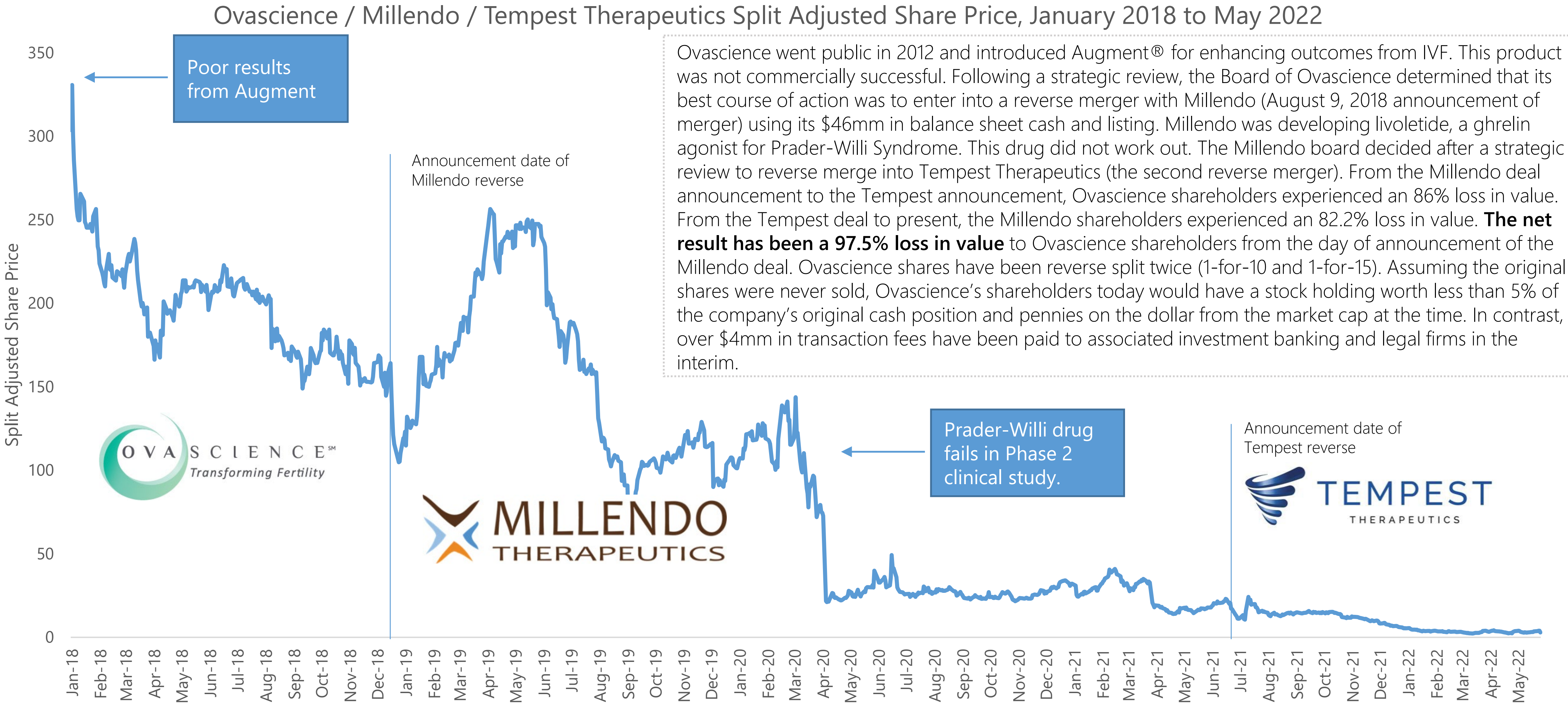
Share Ownership of Merged Company



Source: Torreya Research and Analysis of SEC disclosures.

Alternatives to Reverse Mergers

Doubling Down: Example of Two Sequential Reverse Mergers



Ovascience went public in 2012 and introduced Augment® for enhancing outcomes from IVF. This product was not commercially successful. Following a strategic review, the Board of Ovascience determined that its best course of action was to enter into a reverse merger with Millendo (August 9, 2018 announcement of merger) using its $46mm in balance sheet cash and listing. Millendo was developing livoletide, a ghrelin agonist for Prader-Willi Syndrome. This drug did not work out. The Millendo board decided after a strategic review to reverse merge into Tempest Therapeutics (the second reverse merger). From the Millendo deal announcement to the Tempest announcement, Ovascience shareholders experienced an 86% loss in value. From the Tempest deal to present, the Millendo shareholders experienced an 82.2% loss in value. **The net result has been a 97.5% loss in value** to Ovascience shareholders from the day of announcement of the Millendo deal. Ovascience shares have been reverse split twice (1-for-10 and 1-for-15). Assuming the original shares were never sold, Ovascience's shareholders today would have a stock holding worth less than 5% of the company's original cash position and pennies on the dollar from the market cap at the time. In contrast, over $4mm in transaction fees have been paid to associated investment banking and legal firms in the interim.

Source: Torreya Research and Capital IQ

What Alternatives did the Ovascience Board Consider?

It's easy to throw stones after decisions don't work out. But it's also important to study past decision-making processes to see if better decisions might be possible in future similar situations. That is, we do not mean in any way to criticize decisions made by the Ovascience board after the fact. Rather, we wish to use this example to illustrate issues that boards face when facing clinical failure and the need to reorganize a company's affairs.

So, what alternatives might the board of Ovascience have considered? At the time of the Millendo deal, they had $46.4mm in balance sheet cash, a challenging business plan and no debt.

The advisors around the table for Ovascience's board were highly competent and professional. The board members themselves had distinguished histories, impressive credentials and strong reputations in the industry.

According to its SEC filed proxy statement*:

> "The [Ovascience] strategic review included the evaluation of all reasonable options to maximize value for OvaScience shareholders, including the viability of advancing the OvaPrime program to a Phase 1b/2a clinical trial, the potential sale of OvaScience's EggPC cell technology platform, possible business combinations with other cell therapy or fertility related companies, liquidating OvaScience and distributing any remaining cash to shareholders, and a merger with a privately-held life sciences company, with OvaScience's stock being the consideration in the transaction. The attractiveness of the latter potential option was supported by the lack of value that the marketplace seemed to assign to OvaScience's remaining non-cash assets and the value that OvaScience's public listing and cash might have to a high-quality merger candidate seeking to advance its own clinical programs. Further, a reverse merger transaction of this kind could provide OvaScience shareholders with a meaningful stake in a combined organization possessing both promising clinical prospects and the means to pursue them, establishing the opportunity for long-term value creation for OvaScience shareholders…"

* See https://www.sec.gov/Archives/edgar/data/1544227/000104746918007059/a2237055zdefm14a.htm

Strategic Options Considered by Ovascience Board

- Go alone with an additional fundraise
- Reverse merger transaction with a high-quality private company
- Liquidation of the company

It's important to note that the Board of Ovascience carefully considered its alternatives and appear to have genuinely believed that a reverse merger with Millendo would have delivered the best option for its shareholders.

Other Potential Options Not Named in Ovascience Proxy

Augment current plan with additional assets, including a company pivot

Special dividend or partial recapitalization in which shareholders would be given the option to stay or leave

Go dark transaction where the company would cease reporting and pay out a special dividend

We don't know if the Ovascience board considered the above alternatives, but we do wish to note that transactions in which companies pivot to new assets have been associated with much higher returns, on average, than reverse mergers (and lower professional fees).

Partial recapitalizations are quite rare but can be a highly effective way to return capital. They have the important benefit of giving shareholders a choice of whether to continue with a management team. Going dark and ceasing reporting is often preferable to a standard Delaware liquidation process.

The Option to Partially Return Capital

Partial Return of Capital

- In a partial return of capital, shareholders are offered the chance to cash in their shares at a set value or within a value range.
- The company undertaking the return of capital transaction gives shareholders the option of sticking with a specific business plan or taking their stock back.
- Examples of companies that have effectively used partial return of capital to allow orderly shareholder exit while others stay in, include Adimab, Corcept, DaVita, Royalty Pharma and Xbiotech.
- The benefit of a partial recap versus letting shareholders sell on the open market is much less negative pressure on the share price.

Comparison to Reverse Merger

- Previous shareholders are likely to sell shares after a merger as the business plan that they bought into is no longer pursued.
- They are not given a mechanism to exit other than selling shares into the open market.
- Simultaneously, shareholders of private company enter into an IPO-like transaction with no restrictions on selling stock. They, too, often sell shares after consummation of a merger.
- There can be huge downward pressure on the share price.
- The normal IPO process which involves a careful selection process by underwriters, research support, and price discovery process with new investors, is absent.

Illustration of a Partial Return of Capital

XBiotech is an Austin, Texas headquartered biotech focused on the development of therapeutic antibodies using its proprietary True Human™ technology. On December 7, 2019, XBiotech announced that Janssen had acquired the rights to its Phase 2 anti-inflammation antibody, Bermekimab for a price of $750mm plus additional potential milestones.

XBiotech found itself with far more cash than it needed to pursue development of its remaining pipeline. Rather than burn the money on additional R&D, XBiotech made the decision to undertake a partial recapitalization. This worked through a so-called Dutch Auction Self-Tender ("DAST"). Each shareholder of XBiotech was offered the opportunity to name a price (within a range) for which they were willing to sell back shares to the company. Shareholders had the choice to sell back all shares, some or none.

Xbiotech offered a price range that was well above the trading value at the time and so the DAST was oversubscribed and shareholders ended up getting a pro-rata allocation of proceeds from the Janssen deal.

An alternative would have been to pay a special dividend to all shareholders. But, this would have forced all to accept the cash and to pay associated taxes whereas the self-tender gave shareholders the choice of whether or not to participate.

Xbiotech returned $420mm of the $750mm it received from Janssen to shareholders using a self-tender offer.

XBiotech Press Release Communications

XBiotech
Next Generation Antibody Therapy

XBiotech Commences Tender Offer to Purchase up to $420,000,000 of its Shares

January 14, 2020

AUSTIN, Texas, Jan. 14, 2020 (GLOBE NEWSWIRE) -- XBiotech Inc. (NASDAQ: XBIT) ("XBiotech") announced today that it commenced a "modified Dutch auction" tender offer to purchase up to $420,000,000 of its common shares, or such lesser number of common shares as are properly tendered and not properly withdrawn, at a price not less than $30.00 nor greater than $33.00 per common share, to the seller in cash, less any applicable withholding taxes and without interest (the "Offer"). The Offer is made upon the terms and subject to the conditions described in the offer to purchase and in the related letter of transmittal. The closing price of XBiotech's common shares on the NASDAQ Global Select Market on January 13, 2020, the last full trading day before the commencement of the Offer, was $18.62 per share. The Offer is scheduled to expire at 5:00 p.m., New York City time, on February 12, 2020, unless the Offer is extended.

XBiotech believes that the Offer represents an efficient mechanism to provide XBiotech's stockholders with the opportunity to tender all or a portion of their stock and thereby receive a return of some or all of their investment in XBiotech if they so elect. The Offer provides stockholders with an opportunity to obtain liquidity with respect to all or a portion of their stock without the potential disruption to XBiotech's stock price.

The Offer is not contingent upon obtaining any financing. However, the Offer is subject to a number of other terms and conditions, which are described in detail in the offer to purchase. Specific instructions and a complete explanation of the terms and conditions of the Offer will be contained in the offer to purchase, the letter of transmittal and the related materials, which will be mailed to stockholders of record shortly after commencement of the Offer.

None of XBiotech, the members of its Board of Directors (including the Independent Committee who authorized the Offer), the information agent or the depositary makes any recommendation as to whether any stockholder should participate or refrain from participating in the Offer or as to the price or prices at which stockholders may choose to tender their shares in the Offer.

D.F. King & Co., Inc. will serve as information agent for the Offer. Stockholders with questions, or who would like to receive additional copies of the Offer documents may call D.F. King at (212) 269-5550 (banks and brokers) or (866) 856-3065 (all others).

XBiotech
Next Generation Antibody Therapy

XBiotech Announces Final Results of Tender Offer

February 19, 2020

AUSTIN, Texas, Feb. 19, 2020 (GLOBE NEWSWIRE) -- XBiotech Inc. (NASDAQ: XBIT) ("XBiotech") today announced the final results of its "modified Dutch auction" tender offer, which expired at 5:00 p.m., New York City time, on February 12, 2020.

Based on the final count by American Stock Transfer & Trust Co., LLC, the depositary for the tender offer, a total of 40,007,286 common shares, no par value, were properly tendered and not properly withdrawn at or below the maximum purchase price of $33.00 per share. Not all shares tendered through notice of guaranteed delivery were delivered within the required settlement period.

XBiotech has accepted for purchase 14,000,000 common shares at a price of $30.00 per share, for an aggregate cost of approximately $420 million, excluding fees and expenses relating to the tender offer. These shares represent approximately 32.67 percent of the common shares outstanding. The final proration factor for shares that XBiotech has purchased pursuant to the tender offer is approximately 33.25 percent.

To assist shareholders in determining the tax consequences of the tender offer, XBiotech estimates that for purposes of the Income Tax Act (Canada), the paid-up capital per common share was approximately C$8.45 and the "specified amount" (for purposes of subsection 191(4) of the Income Tax Act (Canada)) was C$28.90 as of February 18, 2020. In addition, for purposes of the Income Tax Act (Canada) and any applicable provincial legislation pertaining to eligible dividends, XBiotech designates the entire amount of the deemed dividend arising from its purchase of shares pursuant to the tender offer as an eligible dividend.

Shareholders who have questions or would like additional information about the tender offer may contact the information agent for the tender offer, D.F. King & Co., Inc., at (212) 269-5550 (banks and brokers) or (866) 856-3065 (all others).

XBiotech could have used its excess cash to grow its pipeline or fund some type of acquisition. Instead, it chose to return cash to shareholders. Despite a very challenging biotech environment, XBiotech shareholders have had a very strong performance since the company went public. Most of the return has been realized because of the return of capital in the self-tender transaction.

Mechanics of a Self-Tender Offer

- A self-tender offers several advantages over an open-market repurchase program:
  - Allows a large share repurchase to be accomplished much more quickly
  - Eliminates the price risk of an open-market repurchase program since it is achieved at a single fixed price
  - Has a greater market impact since it is a more visible mechanism
- Self-tender offers can be done on either a fixed-price basis, where the issuer tenders for shares at a fixed price, or a Dutch auction basis
- With a Dutch Auction self-tender, the issuer sets a price range. Then shareholders are invited to tender all or a portion of their shares at any price within the range.

- The Company will repurchase shares at the lowest price in the range that results in the acceptance of the maximum number of shares that the company is seeking to repurchase.
- The mechanics of the two self-tender methods are almost identical. However, a Dutch auction offers the issuer several advantages:
  - Creates flexibility as to the price at which the repurchase is made by offering a price range.
  - Allows the issuer to find shareholders willing to sell at the lowest price.*
  - The price range reduces the risk of overpricing the repurchase while increasing the chance of success.
  - Shareholders often view the Dutch auction as being a fairer process. In effect, the market sets the tender price in a Dutch auction, whereas the issuer sets a single tender price in a fixed price process.

* See Laurie Bagwell, "Dutch Auction Share Repurchases: An Analysis of Shareholder Heterogeneity," *Journal of Finance*, 1992, pp. 71-105.

Signaling Value of Self-Tenders

A significant stock buyback sends a message that management believes their stock to be undervalued.

What gets communicated:

- Exciting growth opportunities
- Future value potential
- Shareowner orientation

Research strongly supports the idea that buybacks are an effective signaling tool.

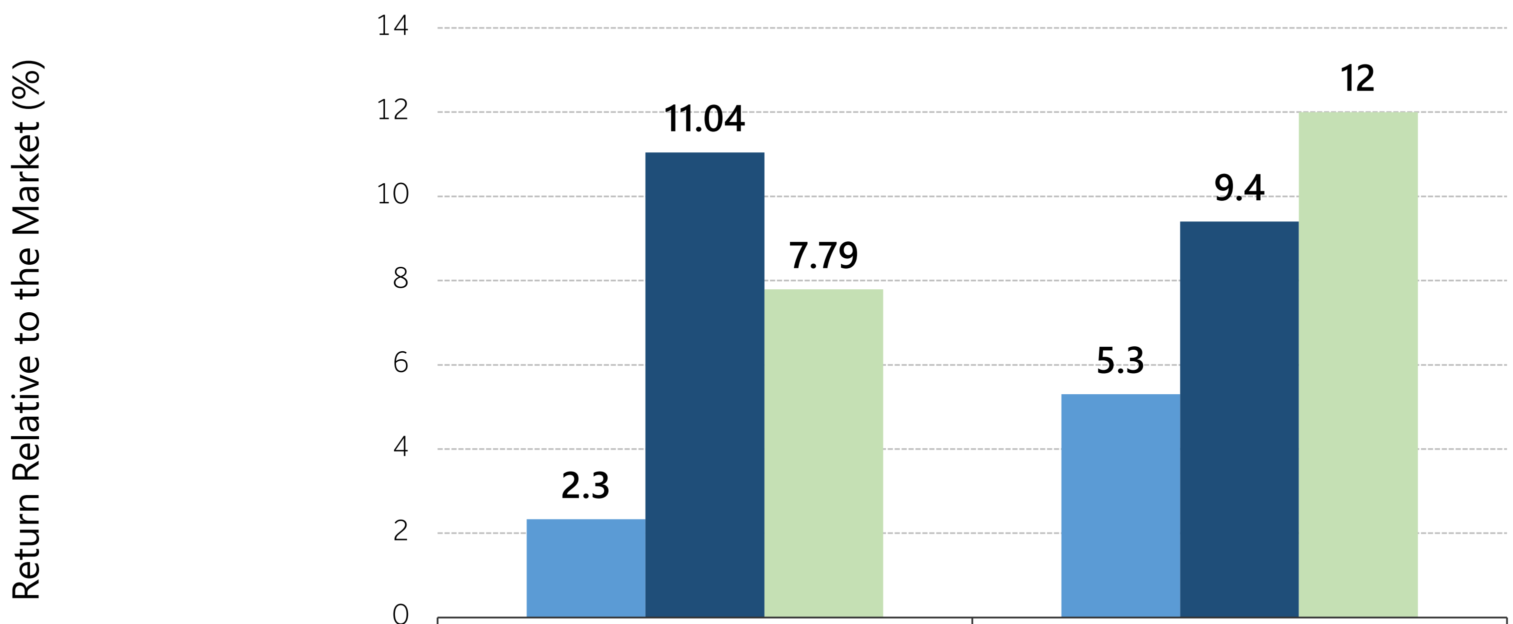
- Vermaelen (1981) finds that Dutch Auction tenders results appear to reflect market signals.
- Lie and McConnell (1998) find that earnings improve, on average, after self-tenders (both Dutch Auction and fixed). This is consistent with signaling explanations.
- D'Mello and Shroff (2000) find that undervalued companies are most likely to use Dutch Auction self-tenders.

See Erik Lie and John McConnell, "Earnings signals in fixed-price and Dutch auction self-tender offers," *Journal of Financial Economics* 49, 1998, pp. 161-186; Ranjan D'Mello and Pervin Shroff, "Equity Undervaluation and Decisions Related to Repurchase Tender Offers: An Empirical Investigation," *Journal of Finance* 55, Oct 2000, pp. 2399-2424 and Vermaelen, T. (1981). 'Common Stock Repurchases and Market Signaling: An Empirical Study', *Journal of Financial Economics*, Vol. 9, No. 2, pp. 139-183.

Corporate Actions Can Have Powerful Signaling Value to Investors

Repurchase Announcement Reaction Stratified by Type of Repurchase: Comment and Jarrell Study

Average Net of Market Return Surrounding Repurchase Announcement (Day 0)



	Percent Return (Day -1 to Day +1)	Percent Return (Day -1 to Day + 50)
Open Market Repurchases	2.33	5.3
Fixed Price Tender Offer	11.04	9.4
Dutch Auction Tender Offer	7.79	12

The market reacts positively to all types of repurchases but reacts most positively to tender offers.

The market price, on average, rises by 7.79% in the three days surrounding a Dutch Auction tender announcement. While this is somewhat less than that seen for fixed price tenders, Dutch Auctions produce the strongest average result in the long run. By business day 50 after a tender, Dutch Auction companies have a 12% return above the market where fixed price firms have a 9.4% return above the market.

Source: Robert Comment and Gregg Jarrell, 1991, The Relative Signaling Power of Dutch-Auction and Fixed-Price Self-Tender Offers and Open-Market Share Repurchases, *Journal of Finance*, 1991.

Special Dividends

An alternative to a self-tender would be to pay a special dividend to all shareholders.

This has the benefit of administrative simplicity but the cost that all shareholders receive a dividend whether they want it or not.

Special dividends are well suited to situations where there is little reason for shareholders to bet on future operations and the company simply wishes to pay out cash.

merrimack

A relevant case study of how to use special dividends involves the situation of Merrimack Pharmaceuticals. The company experienced a series of clinical failures with its pipeline and decided to liquidate all assets, terminate all employees, pay off all debt and pay out special dividends. While it could have chosen to delist, Merrimack has stayed public on the NASDAQ and still files its reports with the SEC. This allows shareholders to still achieve liquidity should they choose. After selling ONIVYDE® to Ipsen, Merrimack paid a $140mm special dividend in 2017. In 2019, Merrimack paid an additional $20mm special dividend. The company has been successful in achieving quite a few additional small asset sales and deals such that it has an increasing cash balance and no meaningful debt. The company faces $450mm in future potential payments from Ipsen.

Illustration of Hypothetical Special Dividend for Ovascience versus a Reverse Merger

As of its last financials (9/30/2018) Ovascience had $46mm in cash. But as of the time of its merger close with Millendo, it reported that it was delivering $37mm in cash. We assume this difference reflects interim burn, settling of all debts, professional fees, payment of all employee severance and bonuses, etc.

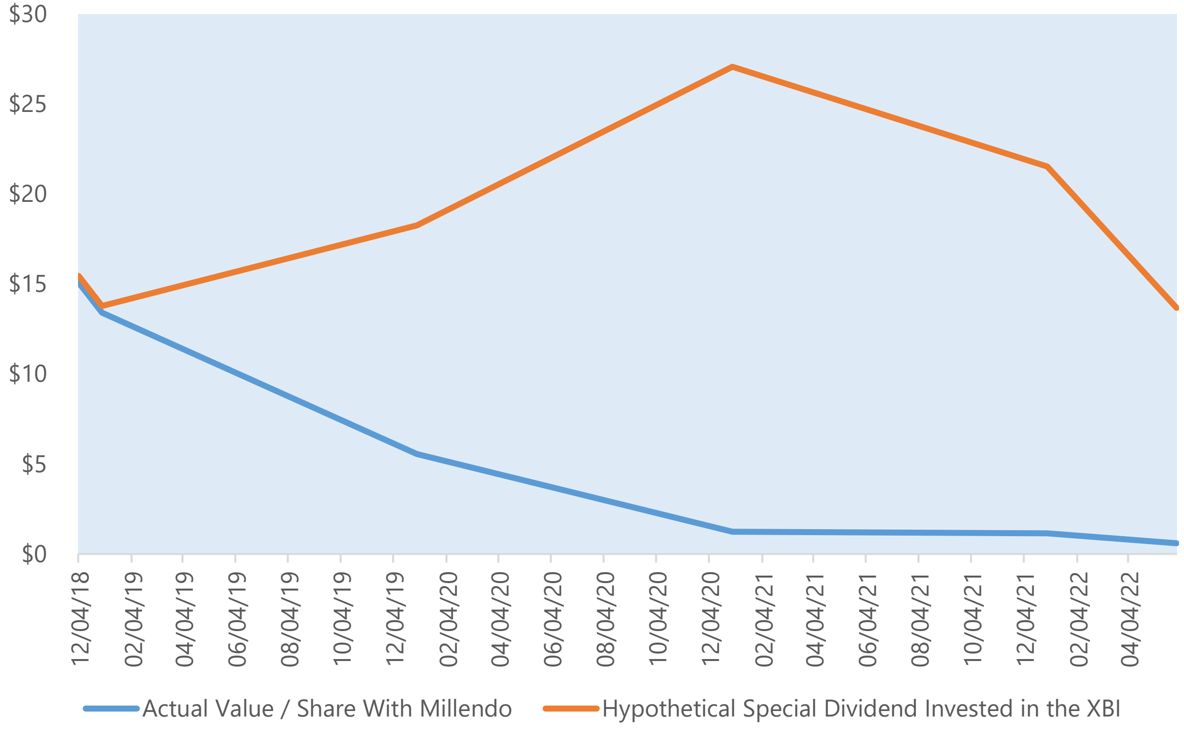
We added back $1.6mm in net professional fees (versus a special dividend) relating to banking, accounting and legal fees.*

We then assumed that Ovascience left behind $1.5mm in a dark entity and that this money would never be returned to shareholders (probably conservative).

The net cash left over would be a dividend of $37.1mm or, approximately $15.50 per share. We assume that investors put all of this in the XBI.***

We then show at right what would have happened to this versus the actual value per Ovascience share in the subsequent two mergers (assuming shareholders stayed with stock to present).** Ovascience shareholders would have made 22x more money with a special dividend, although the outcome could have been very different had Millendo's drug performed well.

Value Per Ovascience Share in Millendo Merger Scenario and with a Hypothetical Special Dividend that Was then Invested in the XBI



* $1.25mm in banker fees reported in the proxy. We then assumed that legal fees would have been $350,000 higher with a merger than special dividend.
** In fact, more than 50% of Ovascience's reporting top ten shareholders exited within six months of the merger transaction (and prior to Millendo's negative data).
*** tax effect excluded for the analysis

The Corporate Liquidation Alternative

We have highlighted several options that could have been considered by Ovascience. One would have been to pivot with the existing team to another project. Another option would have been to return capital through either a special dividend or partial recapitalization. It is also worth noting that Ovascience could have paid a special dividend (or carried out a partial liquidation) and then carried out a merger with the remaining shell. It noted in its merger proxy that counterparties valued its shell at $2 to $10mm.

There is obviously another option that was considered: corporate liquidation. Ovascience, like almost all biotech boards, opted not to liquidate but instead did a reverse merger. In its proxy statement it noted: "If the Merger is not completed, the OvaScience Board of Directors may decide to pursue a dissolution and liquidation of OvaScience. In such an event, the amount of cash available for distribution to OvaScience shareholders will depend heavily on the timing of such decision and, ultimately, such liquidation, since the amount of cash available for distribution continues to decrease as OvaScience funds its operations while pursuing the Merger. In addition, if the OvaScience Board of Directors were to approve and recommend, and the OvaScience shareholders were to approve, a dissolution and liquidation of OvaScience, OvaScience would be required under Delaware corporate law to pay its outstanding obligations, as well as to make reasonable provision for contingent and unknown obligations, prior to making any distributions in liquidation to shareholders. OvaScience's commitments and contingent liabilities may include (i) obligations under its employment and related agreements with certain employees that provide for severance and other payments following a termination of employment occurring for various reasons, including a change in control of OvaScience; (ii) litigation against OvaScience, and other various claims and legal actions arising in the ordinary course of business; and (iii) non-cancelable facility lease obligations. As a result of this requirement, a portion of OvaScience's assets would need to be reserved pending the resolution of such obligations."

Ovascience argued in its merger proxy that the alternative to the Millendo deal of liquidation would have been highly risky due to potential litigation, the need to bear severance costs and the need to reserve cash.

In reality, the Millendo merger involved significant shareholder litigation, high fees, the need to pay employee termination costs and the like.

See https://www.sec.gov/Archives/edgar/data/1544227/000110465918070695/a18-40937_2defa14a.htm

Director Liability in a Liquidation Situation

- It is not uncommon to hear a company's counsel advise a Board not to entertain a liquidation but rather to transfer all liabilities to a successor corporation through a reverse merger because of potential D&O liabilities associated with liquidating dividends.
- We have heard leading life science law firms counsel boards that intolerably high D&O insurance payments will be required if the company pursues a liquidation.
- We wish to note that this area of law is well understood and that, despite occasional conservative advice from counsel, the Delaware courts have a well-established position in this area.
- In particular, companies must have assets that exceed liabilities (a surplus) to pay out a dividend or to make a share repurchase.
- The rules for determining a surplus are well understood and were laid out in the *Chemours* decision.*
- In general, the process for carrying out a formal liquidation with associated shareholder vote is, indeed, somewhat challenging because companies must put together and execute a plan of liquidation and dissolution.
- But the notion that directors face trailing liability that is extremely costly to eliminate with D&O insurance is not consistent with Delaware case law.
- It is also possible to go through a process where all reserves against liabilities are approved by the Delaware courts, thereby eliminating any future liability.**

* See https://www.lockelord.com/newsandevents/publications/2021/12/delaware-court-provides-guidance-on-director-liabi
** https://www.delawarelitigation.com/2021/10/articles/chancery-court-updates/chancery-does-deep-dive-into-corporate-dissolution-details-and-winding-up-proces/

Alternative to a Traditional Delaware Dissolution: Going Dark

Delaware Dissolution Process

- Requires that all assets be sold off.
- Requires that reserves be kept until all liabilities are resolved and all shareholder disputes settled.
- Requires a shareholder vote to return a final liquidation dividend.
- Can be tax advantaged relative to traditional dividends.*

Going Dark

- Company does not dissolve in a formal way.
- Company sells off assets.
- Company settles its liabilities including employee severance payments.
- Company appoints a caretaker (usually an accounting firm) to maintain the books and keep the affairs.
- Company makes a dividend payment to shareholders after a period of time in which any litigation or hidden liabilities arise.
- Company ceases to be listed on an exchange and ceases SEC reporting (going dark).
- No shareholder vote required to go dark.
- Company keeps some cash to cover potential future costs of litigation and may make a final dividend payment.
- Recent examples of ceasing operations and going dark in biotech include Genocea and Kaleido.

* See, for example, https://www.thetaxadviser.com/issues/2012/sep/casestudy-sep2012.html

Case Study of Going Dark: Genocea

Genocea Announces Wind Down of Operations and Delisting From NASDAQ

CAMBRIDGE, Mass., May 24, 2022 (GLOBE NEWSWIRE) -- Genocea Biosciences, Inc. (Nasdaq: GNCA), a biopharmaceutical company developing next-generation neoantigen immunotherapies, announced that its Board of Directors voted to wind down the Company's ongoing operations and terminate the Company's remaining employees except those deemed necessary to complete an orderly wind down.

On May 23, 2022, the Company delivered formal notice to The Nasdaq Stock Market, Inc. of its intent to voluntarily delist its Common Stock from the Nasdaq Capital Market in connection with the wind down of its operations. The Company plans to file a Form 25 with the Securities and Exchange Commission on or about June 2, 2022, to effect the voluntary delisting of the Common Stock under Section 12(b) of the Securities Exchange Act of 1934, as amended.

Also, on May 23, 2022, the Company received a letter from the Nasdaq Listing Qualifications department of Nasdaq notifying the Company that it was not in compliance with the requirement of Nasdaq Marketplace Rule 5450(a)(1) for continued inclusion on The Nasdaq Capital Market as a result of the closing bid price for the Company's common stock being below $1.00 for 30 consecutive business days.

The Genocea board chose not to carry out a reverse merger. While little cash is left in the company, there is a chance for shareholders to recover some investment with the "go dark" and shut down decision.

Source: https://ir.genocea.com/news-releases/news-release-details/genocea-announces-wind-down-operations-and-delisting-nasdaq

Comparison of a Reverse Merger versus a Restart Merger Deal

Reverse Merger	Restart Merger Transaction
• Potential adverse selection has taken place insofar as a private company that could not otherwise go public via the IPO route goes public via a reverse merger. • Previous shell company shareholders may sell shares after a merger as the business plan that they bought into is no longer pursued. • Shareholders of private company enter into an IPO-like transaction with no restrictions on selling stock. They, too, often sell shares after consummation of a merger. • Previous company gets an entirely new management team with no experience of operating inherited assets and liabilities. • New management team is also often inexperienced in dealing with public markets.	• Less adverse selection. Private company is doing a merger to gain benefit of public company's management expertise, board and assets. • Previous shareholders are much less likely to sell shares after a merger as the business plan that they bought into is being pursued with some evolutionary change. • Lower employee termination costs. • Combined company gets to retain some or all management of original public company who have: (1) understanding of existing assets, (2) understanding of public markets and (3) relationships with legacy shareholders.

Illustration of a Pivot / Restart Type deal

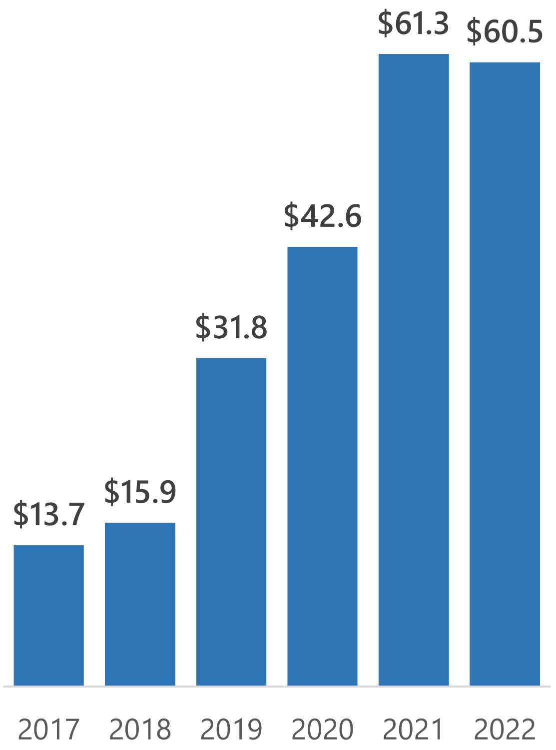
+ =

A somewhat similar company to Ovascience was the Female Health Company ("FHCO"). This company was focused on contraception for women and sold the female condom (called FC2). Its share price fell over time as product sales disappointed expectations. Further, the company's CEO O.B. Parrish was in his 80's and wanted a merger partner that would value what FHCO was but bring in a new leader and new assets to recharge the story.

In October 2016, FHCO merged with Aspen Park Pharmaceuticals, a biotech company led by Mitch Steiner and Harry Fisch. This was structured as a merger of equals transaction. Aspen Park had promising pipeline and a focus on men's health. The idea was to combine the best of both companies including management, products and business plans. Since the merger, the new team has recharged sales of FC2, introduced new commercial products and has made significant advances with its pipeline. The new company has been rebranded as Veru Healthcare.

Importantly, Veru has become a billion+ market cap company since the merger. Returns to FHCO shareholders since the merger announcement (to May 27, 2022) have been 1,110% versus 20.3% for the XBI Index. We do not wish to imply that all strategic mergers and corporate restart / pivot deals work out. However, we have noted that returns tend to be much better for these types of deals.

Veru Healthcare Revenue Since Merger in 2016 ($ in mm)



Revenues of FC2 Have Grown Rapidly Under Veru

Pivoting is Commonplace in Biotech

All of the well-known biotech companies listed below ended up with principal commercial products that *were not* part of their original business plans. Each company later introduced new products that were the basis of pivoting their business plan.

ACTELION ALEXION
Allergan Biogen
Celgene GILEAD
Incyte Shire VERTEX

Why Pivoting Can Work: The Nature of the Firm

In his famous 1937 article "The Nature of the Firm", Ronald Coase rationalized the existence of firms at all by noting that fiat within an organization with skilled employees who are accustomed to working together is far more efficient than using external contracting to produce goods and services. Subsequent contributors including Harold Demsetz, Ben Klein and Oliver Williamson have amplified this original insight by noting that firms solve a host of contracting problems including opportunism and issues associated with asymmetric information. Biotech firms operate in an environment where asymmetric information and specialization are particularly high. In this environment, putting together a team that can cooperate in the effort to develop drugs is particularly challenging. It is also valuable in and of itself. For this reason, a good team and organization, at a place like Alexion or Gilead, can often be repurposed around a new project and generate returns that might be higher than those offered by pursuing the same project in a virtual manner.

Summary: Alternatives to Reverse Mergers for Companies that Have Negative Enterprise Value or Poor Asset Prospects

Public shells:

Company has concluded their pipeline does not have a prospective return above the cost of capital (or cannot raise enough capital to fully finance). The company initiates a strategic review which includes a search for reverse mergers.

- Reverse mergers destroy value over 80% of the time according to our analysis.
- Boards should be highly skeptical of upside stories pitched with reverse mergers.
- Boards should consider taking some outside shareholders over the wall on a reverse to get their view before agreeing to a transaction.
- Other options:
  - If the company is cash poor and there is not enough left to distribute funds to shareholder after expenses, we encourage boards to consider non-traditional merger partners beyond just the traditional biotechs (e.g., a private cash-rich company with its own unique reasons of preferring going public this way).
  - If they still have a good amount of cash, the company should consider using special dividends or share repurchases as described in this presentation.

Company with negative EV and some pipeline value:

Investors are signaling that they view the pipeline as worth less than hoped by management. Investors appear to believe that management will use funds on unproductive projects. Many investors do not believe in the story.

- Reverse mergers would be particularly unattractive in this context. Poor prospective returns and good alternatives for shareholders likely exist.
- If management has strong conviction in all or some of its programs, consider a self-tender with cash that is in excess of what is needed to get to immediate inflection points.
- This allows non-believer shareholders to exit the story while believers can stay in with management.
- The company's long-term access to capital is likely to be enhanced by aggressive steps to management undervaluation.
- If the team is strong but the market isn't buying the company's story, another attractive option could be a full or partial pivot, bringing in complementary assets.
- Such a move should be consistent with wishes of shareholders and could be vetted with large holders who are willing to wall cross to view options.

Appendix: Overview of Reverse Mergers

A Reverse Merger

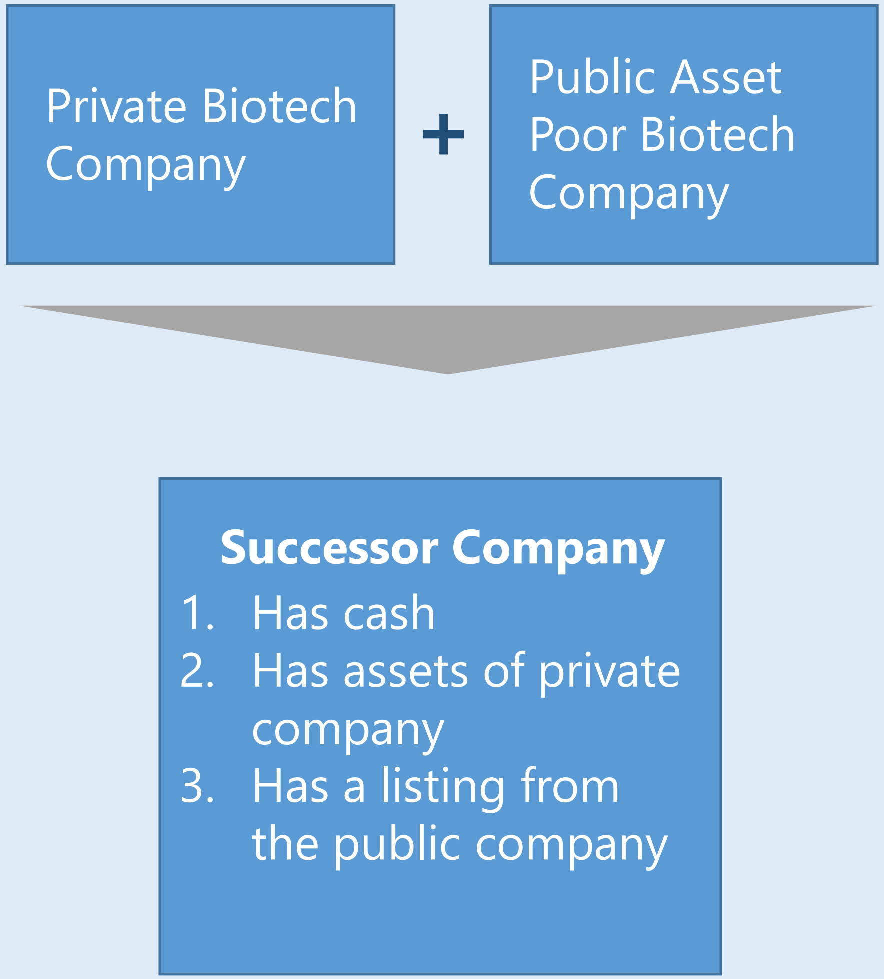
A reverse merger is an alternative to an IPO where a private company goes public by merging into a public shell company with a listing and cash.

A reverse merger is distinguished from a traditional merger insofar as the target public company typically does not bring complementary assets to the party other than cash.

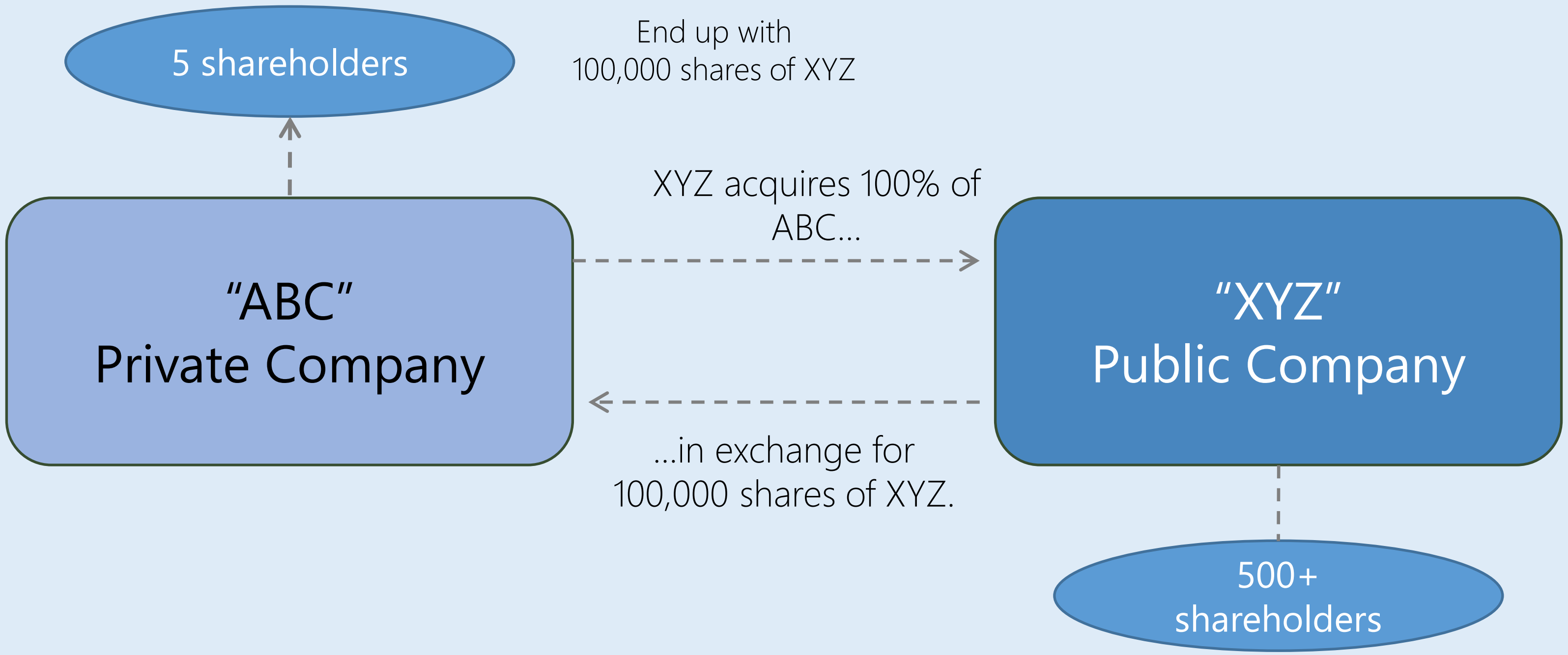
Typically, the shareholders of the public shell end up with a share of the successor company that is well under 50%. They exchange their shell and cash for a stake in a successor company built around the assets of the private company.

Reverse mergers are quite common in the biotech market because many public biotech companies have binary risk associated with a narrow pipeline. Once an asset fails in the clinic the company will often find itself in a cash rich, asset poor situation and a reverse merger could look attractive.

MECHANICS OF A REVERSE MERGER



Reverse Merger Process



In this hypothetical case, the private company ("ABC") exchanges its shares for shares in the public company ("XYZ").

We assume that XYZ, like most public companies, has a large stockholder base with more than 500 shareholders.

Technically, the public company, in this case XYZ co, is the acquirer

- XYZ distributes 100,000 shares to ABC
- New XYZ shares distributed to ABC shareholders who then become owners of XYZ alongside the previous public owners.

Reverse Merger PIPE Transactions

It is not uncommon that the public company merger does not have enough cash to fund the private company to key value inflection points.

In this case, the reverse merger transaction can be accompanied by a simultaneous fund-raising transaction – a so-called private investment into a public company (PIPE).

Despite the fundraising transaction, the execution more closely resembles an M&A process, and the SEC filings are M&A filings (e.g., Form S-3) rather than IPO filings (e.g., Form S-1)

A reverse merger plus a PIPE decouples an IPO into its three component elements:

Going Public

M&A

Raising equity capital

Perspective of the Public Company

After an asset failure public companies typically have a range of strategic options. One option would be to bring in selected assets for equity and then to manage the asset alongside other projects. Another option would be to combine equally with another entity and to attempt to maximize the joint value of the assets through synergies.
At the other end of the spectrum, the public company would merge with an asset rich private company.
This would constitute a so-called reverse merger because the public shareholders become the minority.

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