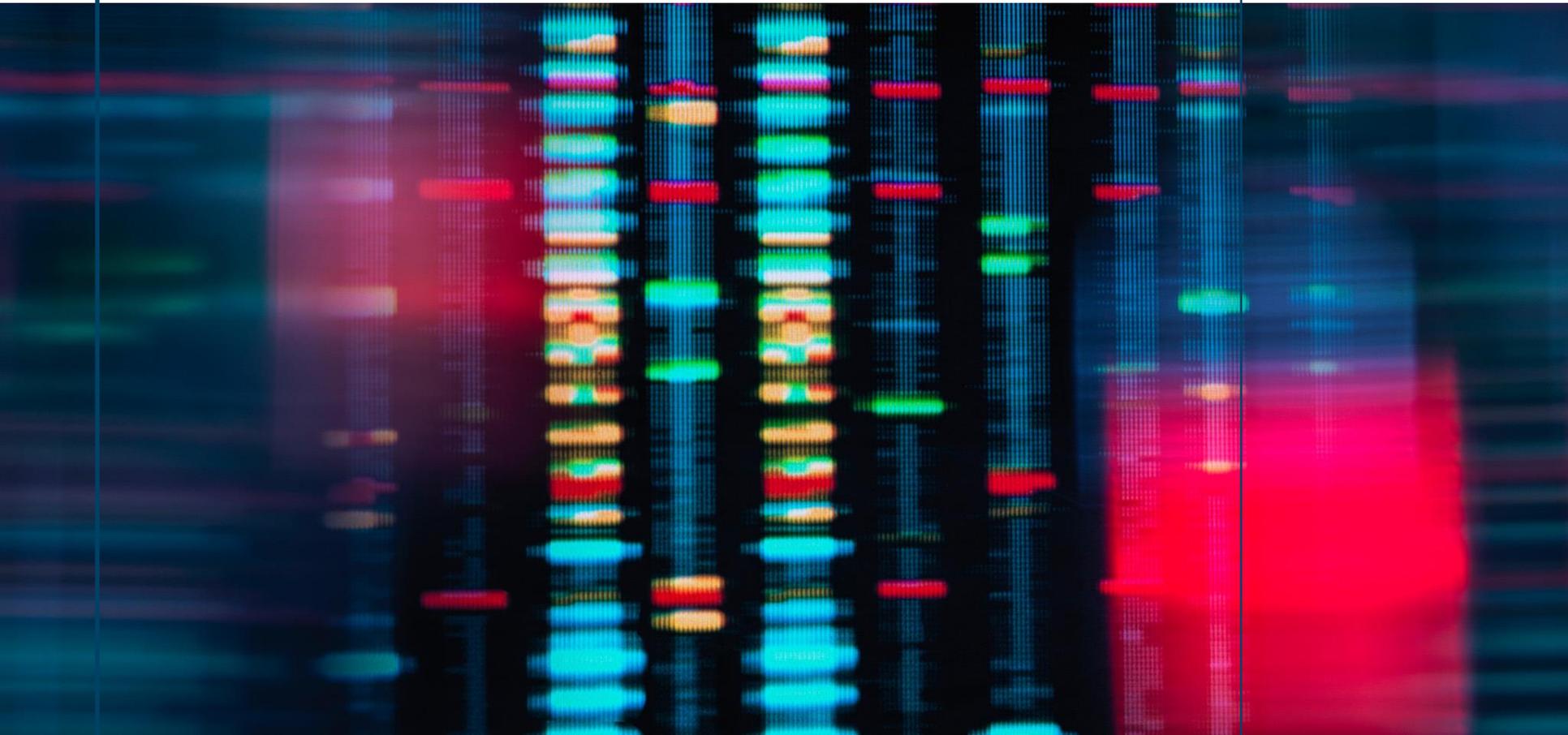


William Blair

October 2022

The Quarterly Rx: Q3 2022 U.S. Biopharma Recap



Q3 2022 Biopharma Market Summary – Key Takeaways

Biopharma sentiment has improved thanks to a steady cadence of financing and M&A activity coupled with positive news flows; however, overall macro risk continues to loom over the sector



A Dream of Spring

- **Constructive biopharma sector elevated key indices off multi-year lows** following a string of key positive data readouts and meaningful M&A (≥\$1B in transaction value), resulting in a healthy recycling of capital
- The XBI's rally in Q3 2022 has positioned the index for a "golden cross," a closely watched bullish technical indicator where the 50-day moving average climbs above the 200-day moving average



The Times They Are (IR)A-Changin'

- Investors, biotech and pharma companies **digesting the direct impact of the IRA as well as potential unintended consequences**
- Key concerns include shifting incentives to develop **biologics vs. NDA drugs**, sequencing of indication expansion (particularly relevant in oncology), and potential **disincentives to expand beyond a single orphan indication**



A Tale of Two Public Financing Markets

- **IPO market remains subdued as Third Harmonic was the sole offering to price in Q3 2022; Prime Medicine's IPO expected in early October will be another litmus test for the asset class and barometer for early-stage appetite, however year end fund performance dynamics may limit broad appeal for additional new issuances in Q4 2022**
- Robust secondary market with 50 follow-ons priced (including PIPEs/RDs), the **busiest quarter since Q1 2021**, as investors more actively deploy capital to new high-conviction positions
- In contrast to earlier in the year, investors were **rewarded for taking clinical risk, with an average 1-day return for "positive" catalysts of +17% in Q3 2022** (compared to +5% in Q2 2022)



Crossovers Over Troubled Water

- Crossover financings environment continues to remain challenging with only 10 deals announced in Q3 2022 compared to 24 in Q3 2021; Series A financings remain highly active, despite a slowdown in overall activity in 2022YTD
- Increased prevalence of insider-led private rounds as companies look to extend runway through value inflection points – **one in five financings announced in Q3 2022 was led by an existing investor**, almost double the average of the last two years
- **Backlog of likely IPO companies continues to grow**, with 41 companies that have raised a crossover round over the last 12 months that are likely IPO candidates in 2023



Where the Rubber Meets the Road

- **Pace of corporate restructuring announcements continues to remain high**, with 29 biopharma companies in Q3 2022 announcing layoffs, resulting in a median reduction in workforce of 33% and cash runway extension of 2 quarters
- **Strategic alternative processes contributing to sector consolidation** through a wide array of outcomes including traditional reverse mergers, public-public mergers, asset sales and/or return of capital to investors
- **Significant financial overhang remains in the public markets**; of the 101 companies with <1 year of cash as of March 31, 2022, over two-thirds have extended their cash runway either through capital raises, strategic partnerships or corporate restructuring



I'm Gonna Make Them an Offer They Can't Refuse

- **Continued strength in early-stage collaborations as a viable source of non-dilutive capital**, with 20 deals announced in Q3 2022 for a median upfront and milestone payments of \$50 million and \$1.3 billion, respectively
- **M&A activity remained strong in Q3 2022**, with 14 deals announced for \$13.5 billion in total deal value
- While Seagen's rumored acquisition of Merck disappointingly has not come to fruition, the steady cadence of meaningful M&A has contributed to improved investor sentiment (e.g. Forma, Global Blood, Chemocentryx)

What We Are Hearing – Investor Sentiment and Outlook

Despite recent sector tailwinds, increased risk of an imminent recession looms large for investors

Curiosity Corner: Back on the Conference Circuit?
“We’ve been attending as many as we can... it’s hard to pass up the opportunity to do in-person 1x1s” – Chicago Hedge Fund
“We’re much more selective about where to attend, but we’re definitely participating” – West Coast biopharma fund

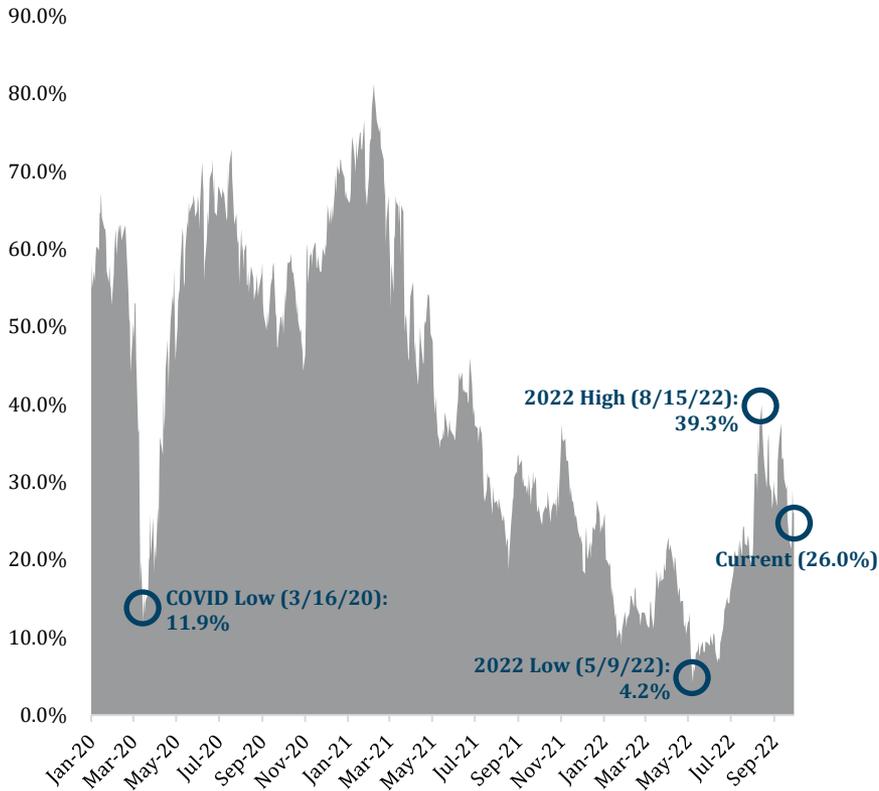
<p>Overall Market</p>		<ul style="list-style-type: none"> Overall macro themes remain consistent: rising inflation, slowing growth, and a more aggressive Federal Reserve continue to stoke recession fears The U.S. midterm elections in November will be closely watched; while Republicans are still expected to flip control of the House, a tightening race has created further uncertainty <i>“We think it’s still going to get worse before it gets better” – New York fund</i>
<p>Biopharma Market</p>		<ul style="list-style-type: none"> Amongst investors surveyed, healthcare specialists are back to looking across all market caps at opportunities with catalysts (clinical and/or strategic) while generalist and long-only investor bias remains up market cap Fund flows into biopharma remain positive; approximately \$5.5 billion of inflows in 2022YTD Some investors still digesting potential impact of the IRA, others are actively engaged in shifting priorities and revaluing assets <i>“Don’t think the IRA has a lot of teeth... pretty clear to us which drugs will be impacted and it’s mainly a big pharma issue for now” – Boston biopharma fund</i> <i>“The biopharma ecosystem must start considering the impacts of the IRA now even though the law does not go into effect until 2026” – Boston biopharma fund</i>
<p>2023 Outlook</p>		<ul style="list-style-type: none"> Majority sentiment is that market participants are overly eager to call a bottom; while we should see pockets of stability, volatility is expected to persist through 2023 Upcoming patent cliff, coupled with robust balance sheets should boost M&A activity in 2023 Cash level amongst fund managers has risen to 6.1% at the end of Q3, the highest since October 2001 and above long-term average of 4.8%, as fears of impending recession loom <i>“While there’s been more good news in the [biopharma] space, macro factors will continue to dominate” – New York hedge fund</i>
<p>Private Financings</p>		<ul style="list-style-type: none"> Investors surveyed this quarter were more receptive to private opportunities, however interest remains concentrated amongst traditional life science specialists and later-stage VC funds Increased focus from VC and PE investors on consolidating companies targeting similar indications; greater willingness to backstop financings as part of reverse merger processes Valuations remain squarely in focus; down rounds are increasingly common as well as convertible note structures with “floating” valuations pegged to a future IPO <i>“If companies are willing to meet us halfway on valuation, we continue to have appetite for privates” – West Coast biopharma fund</i>
<p>IPOs</p>		<ul style="list-style-type: none"> Appetite from new investors remains muted, especially as we approach year-end; however, phenotype for a successful biopharma IPO remains unchanged (outsized support at launch from existing investor syndicate) Investors surveyed expect a busier IPO calendar in 2023 <i>“There’s too much value to be had still in the public markets – IPOs aren’t a focus unless it’s a ‘must-own’” – Midwest long-only fund</i>
<p>Follow-Ons & PIPEs</p>		<ul style="list-style-type: none"> Increased appetite from investors to fund public opportunities that leverage data/strategic catalysts or other MNPI; some funds are liquidating lower conviction positions in order to participate in financings for core holdings Bias from investors to “overfund” companies <i>“We want to see all your best ‘fallen angel’ ideas” – European biopharma VC</i>

Weak ↔ Strong

Signs of Recovery in Biopharma

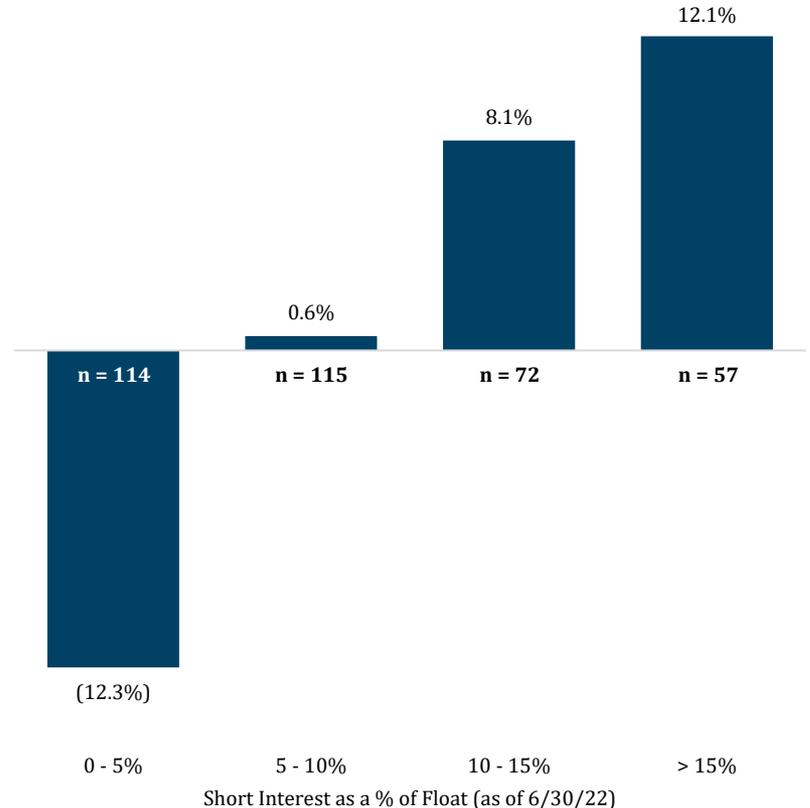
The biopharma market bounced back from Q2 2022 lows, driven by broad sector short covering, quant fund buying, and increasing prospects for M&A. However, macro headwinds have tempered the rally to close out Q3 2022

The Percentage of Companies in the NBI Currently Trading Above Their 200-Day Moving Average Recently Reached Highest Level Since June 2021



Most Heavily Shorted Companies in the NBI Have Experienced Greater Price Appreciation

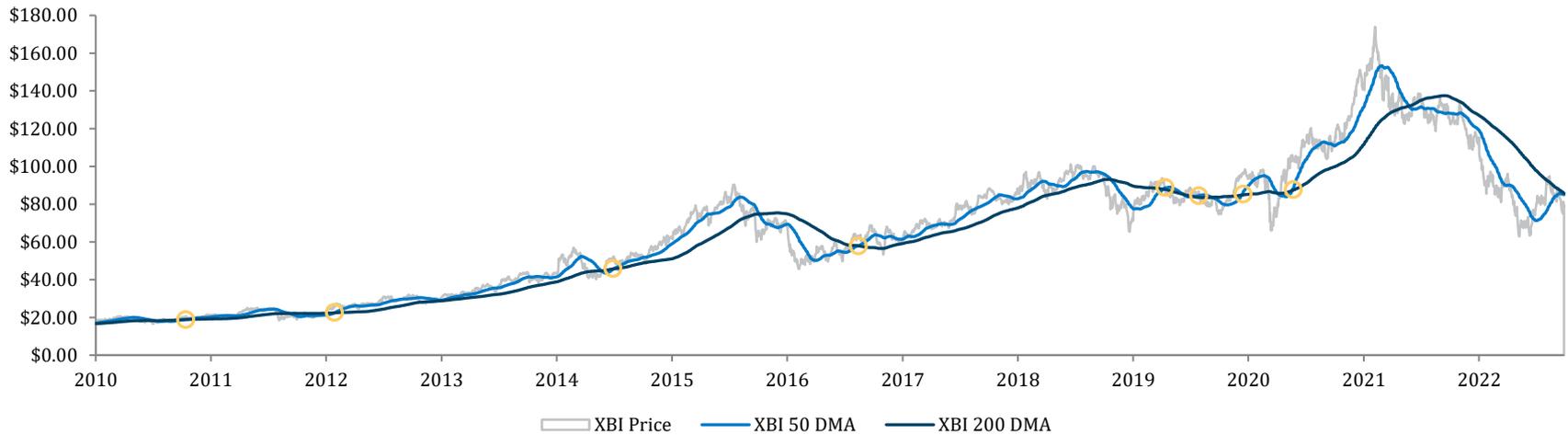
Median Q3 2022 stock price performance



“Golden Crosses” in the XBI: a Harbinger of a Broad Biopharma Rally?

Q3 2022's biopharma rally has set the stage for the XBI to experience a "golden cross," a closely watched bullish indicator that occurs when the index's 50-day moving average closes above the 200-day moving average; previous golden crosses since 2010 have seen the index climb 116% with an average duration of 297 days to peak

XBI Day Moving Average and Price Performance Since 2010



XBI 50 DMA Cross Date ⁽¹⁾	XBI Performance					
	Golden Cross to Rally Peak		Rally Peak to Death Cross ⁽²⁾		Golden Cross to Death Cross ⁽²⁾	
	% Change	Duration ⁽³⁾	% Change	Duration ⁽³⁾	% Change	Duration ⁽³⁾
10/8/2010	24.1%	287	(31.0%)	49	4.3%	336
2/1/2012	116.4%	757	(64.1%)	89	63.2%	846
7/3/2014	72.8%	379	(50.8%)	82	20.9%	461
8/17/2016	63.3%	672	(36.4%)	128	29.8%	800
4/10/2019	0.0%	0	(13.3%)	63	(12.5%)	63
7/12/2019	1.1%	6	(5.8%)	55	(4.8%)	61
12/13/2019	3.3%	11	(15.3%)	101	(20.4%)	112
5/22/2020	64.1%	262	(57.0%)	108	19.7%	370

(1) Golden Cross Date represents the first date in which the XBI 50 Day Moving Average > the XBI 200 Day Moving Average.

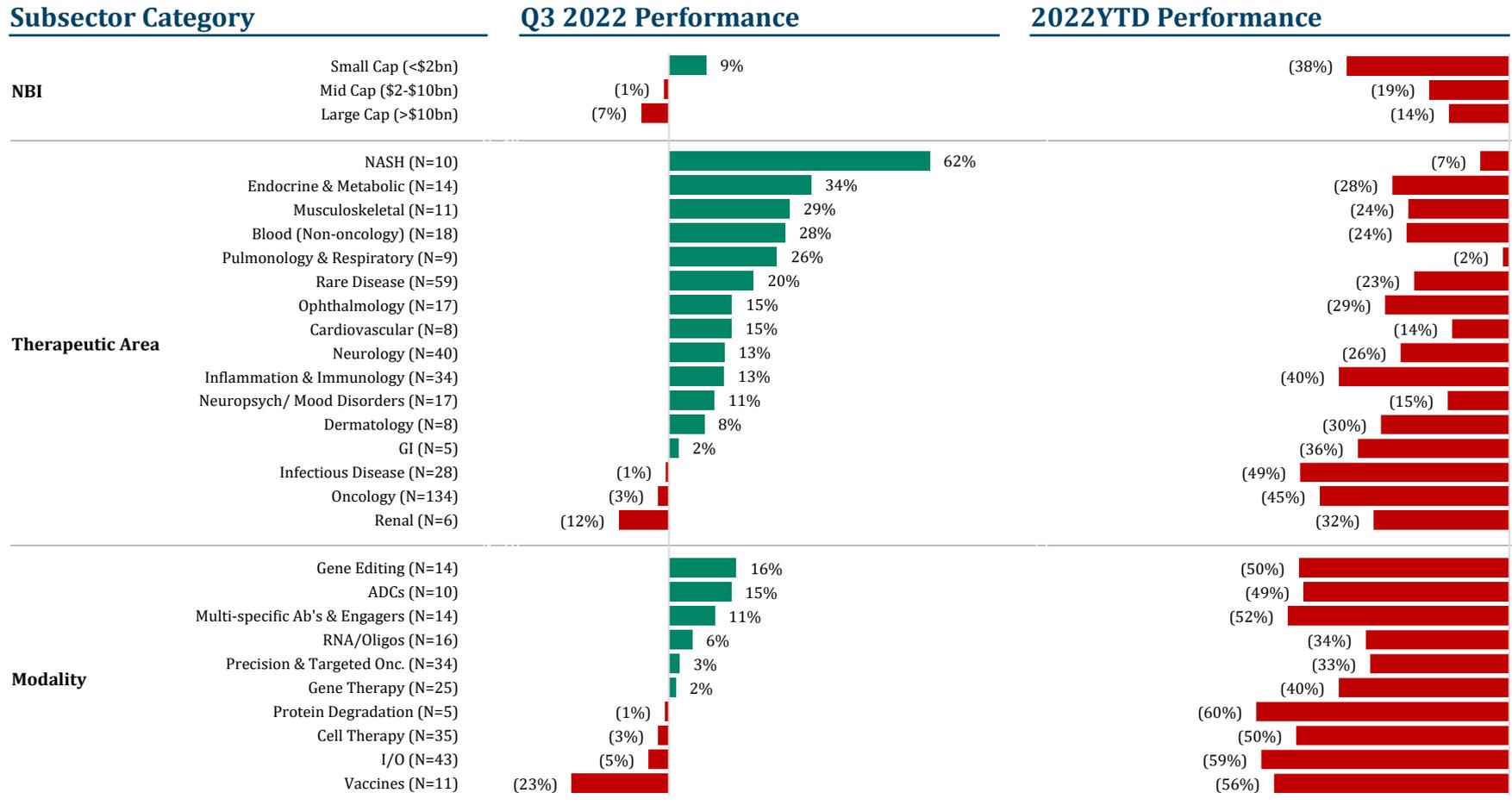
(2) Death Cross Date represents the first date following Golden Cross Date in which the XBI 200 Day Moving Average > 50 Day Moving Average.

(3) In Calendar Days.

Source: FactSet as of September 30, 2022. XBI = SPDR S&P Biotech.

NBI® Subsector Market Performance

The NBI® saw the first quarterly gain in Q3 2022 since late 2020 with NASH representing the largest leader in the quarter and overall positive performance across vast majority of subsectors and modalities



Note: Subsector indices are equally weighted. NBI constituents' market capitalizations calculated as of June 30, 2022.
Source: FactSet, CapIQ and William Blair internal reporting. Q3 2022 and 2022YTD performance as of September 30, 2022.

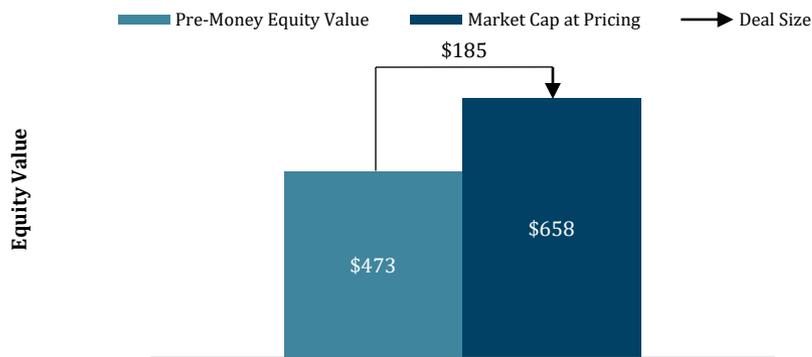
Q3 2022 Biopharma IPO Spotlight:



- Third Harmonic's IPO on September 14th was the first biopharma IPO to price since May 2022
- The deal was upsized by ~20%, priced at the midpoint of the range and traded up 16% on the first day; however, as with other recent biopharma IPOs, the stock broke issue within the first week of trading

Deal Sizing and Valuation

(\$ in millions)



Transaction Details

Deal Overview At Pricing		Post-IPO Performance	
Enterprise Value	\$359.8	Offer/1 Day	+15.8%
Step-Up	1.0x	Offer/1 Week	(0.7%)
Initial File/Offer vs. Range	In Range	Offer/Current	+11.6%
Deal Value as % of Market Value	31.1%		
Insider Shadow Book at Launch	100%		
Allocation to new vs existing investors	40% : 60%		

Source: Dealogic and SEC Filings as of September 30, 2022.

Company Overview

- Clinical-stage company developing a novel oral approach to the treatment of severe allergy and inflammation
- Lead product candidate, THB001, is a highly selective, oral small molecule inhibitor of KIT
- At the time of IPO, the Company had first-in-human data from a Phase 1a trial in healthy volunteers that demonstrated dose dependent increases in THB001 serum concentration levels above the KIT cellular IC₅₀ value
- Plans to pursue development of THB001 in additional skin, airway and gastrointestinal tract indications, including:
 - An ongoing Phase 1b proof-of-concept study in chronic inducible urticaria, expected to report initial data in H2 2023
 - A Phase 1b trial in asthma initiating H1 2023, with initial data expected in H2 2024
 - A Phase 2 trial in chronic spontaneous urticaria expected to initiate in H1 2024
- Completed \$105 million crossover Series B financing in February 2022

Pre-IPO Investors

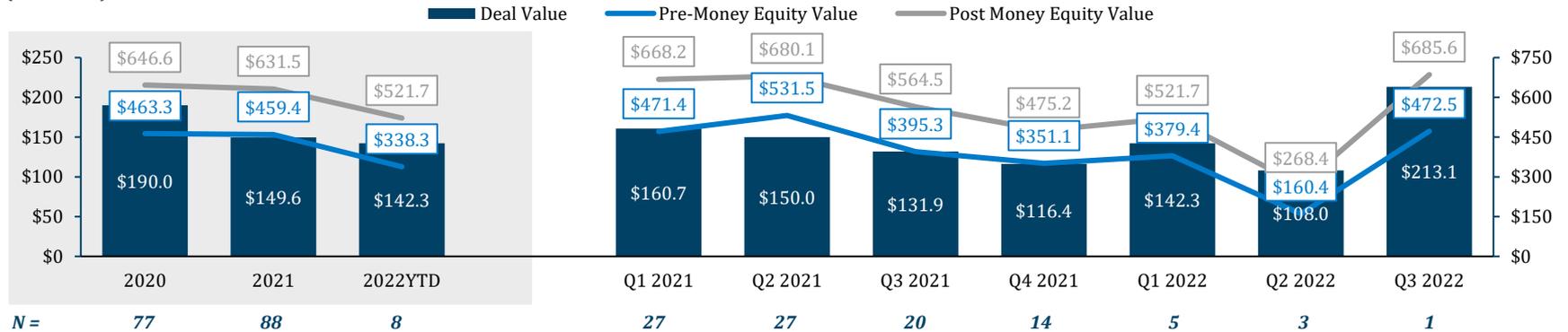


Biopharma IPO Trends

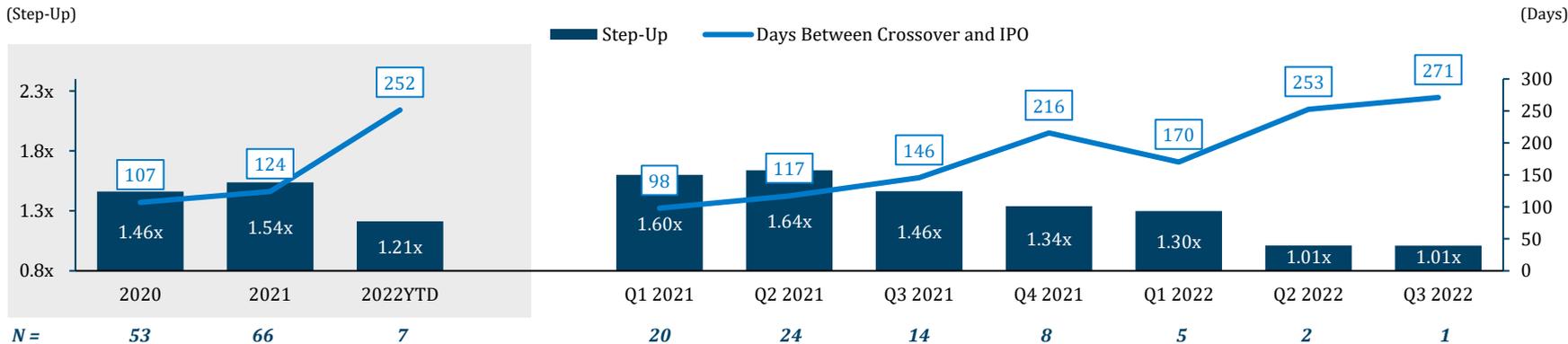
- *Biopharma IPO activity all but came to a halt in Q3 2022*
- *IPO step-ups have compressed while days between crossover and IPO has materially increased given broader market volatility*

Deal Sizing and Valuation

(\$ in millions)



Crossover-to-IPO Metrics⁽¹⁾



Note: Represents median values. Includes U.S. IPOs only. Excludes best efforts IPOs. Excludes IPOs less than \$25 million in gross proceeds.

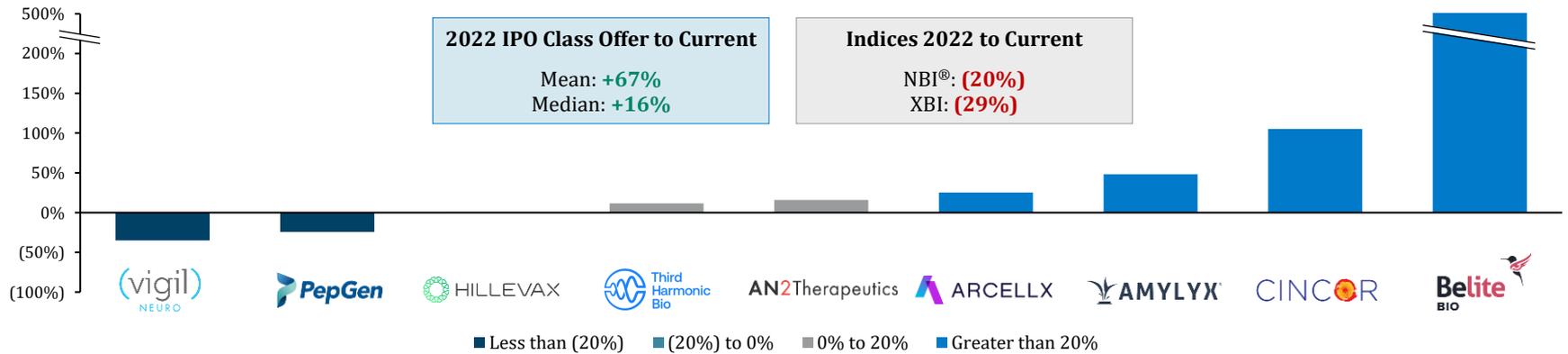
Source: CapIQ, Dealogic, FactSet, and SEC Filings as of September 30, 2022. Note: All valuations performed on basic share count basis.

(1) Crossover rounds defined as pre-IPO financings completed within 365 days of IPO with institutional investor participation.

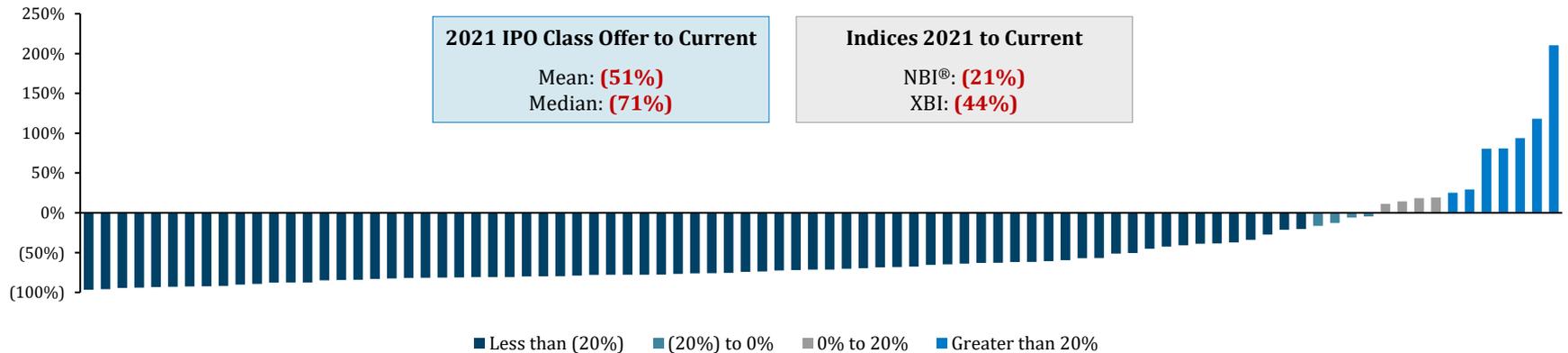
Biopharma IPO Aftermarket Performance for 2021 and 2022YTD Cohorts

- 2022YTD biopharma IPO class has outperformed broader biopharma indices, with 78% (N=7) of IPOs trading above issue price
- 100% of issuers in 2022YTD have been clinical-stage (compared to 32% of issuers in 2021 were preclinical at IPO)

2022YTD Biopharma IPO Class Performance (N=9)



2021 Biopharma IPO Class Performance (N=88)



Note: Includes U.S. IPOs only. Excludes best efforts IPOs and IPOs less than \$25 million in gross proceeds.

Source: CapIQ, Dealogic, FactSet, and SEC Filings. Current index performance compared to December 31st close of year prior and IPO class compared to IPO offer price as of September 30, 2022.

Biopharma Follow-ons Trends

- As public market valuations rebounded, follow-on activity picked up with 34 offerings priced raising over \$5.5 billion; ~80% of follow-on offerings were catalyst driven
- Although pricing discounts have widened relative to Q2 2022, investors continue to push companies to raise larger amounts of capital as median proceeds raised has increased to \$125.0 million in Q3 2022 (second highest in the last 10 years)

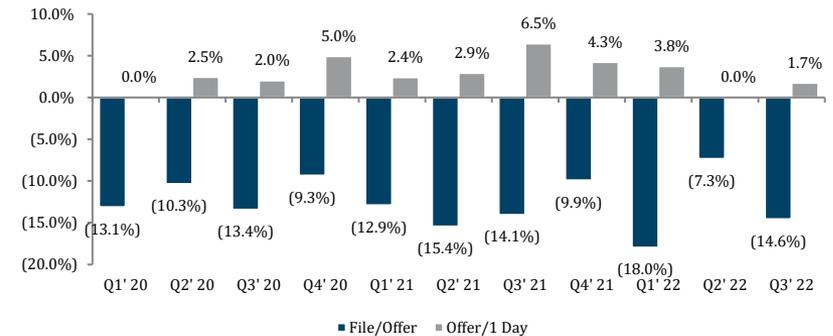
Deal Volume

of Offerings / Total Proceeds Raised (\$ in billions)



Pricing and Performance

Median



Median Proceeds Raised

(\$ in millions)



Deal Sizing Stats

Days of ADTV measured using 30-day ADTV



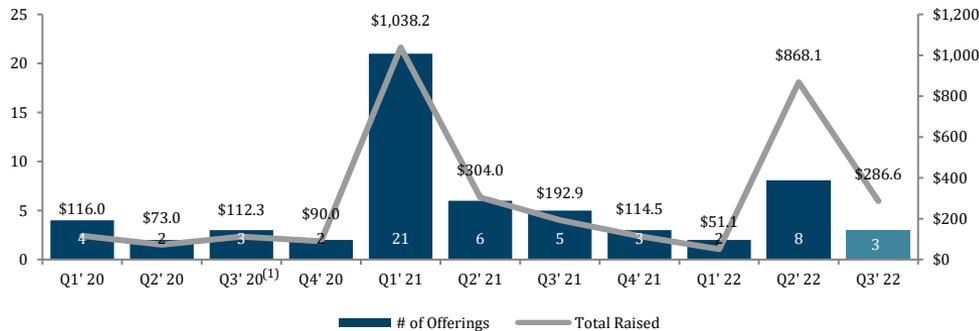
Note: Excludes Registered Directs, PIPEs, and offerings with gross proceeds below \$20 million. Median Pricing and Performance includes offerings with warrants.
Source: Dealogic as of September 30, 2022.

Unregistered PIPEs and Registered Directs Trends

- *PIPEs and Registered Directs continue to be used by issuers as alternative financing vehicles, especially in situations where the offerings are announced concurrently with a catalyst*
- *Fully confidential process allows for extensive investor due diligence and highly concentrated investor allocations*

Registered Directs

of Offerings / Total Proceeds Raised (\$ in millions)



Key Highlights

- Activity reverted back to historical norms with 3 offerings priced in Q3 2022 raising \$286.6 million in gross proceeds
- Activity continues to be largely driven by reverse inquiries and desire to keep allocations highly concentrated amongst smaller investor syndicate
- 2 of the 3 offerings were executed following a catalyst
- Discounts have remained tight with a median pricing at last trade and no warrant coverage in Q3 2022 with strong aftermarket performance of a median +24.8% 1-day return

Unregistered PIPEs

of Offerings / Total Proceeds Raised (\$ in millions)



Key Highlights

- PIPE activity remained elevated in Q3 2022 with 13 offerings raising \$1,410.1 million in gross proceeds
- Discounts have widened slightly to (2.0%) as more offerings were under the 20% Nasdaq threshold, but remain much tighter than the median discount of (8.5%) in 2021
- Only 3 of the 13 offerings (23.1%) in Q3 included warrant coverage; average of 75.0% coverage
- 69% of offerings in Q3 2022 were opportunistic which remained consistent with Q2 2022 of 60% opportunistic

Note: Excludes strategic transactions and transactions with gross proceeds under \$20.0 million.

Source: Dealogic, Company press releases, and Factset as of September 30, 2022.

(1) Excludes BeiGene's \$2.1 billion RD on July 12, 2020.

Focus on Cash Preservation Has Driven Continued Increase in Corporate Restructurings

Another 29 SMID-cap biopharma companies announced corporate restructurings in Q3 2022 (in addition to the 26 in Q2 2022), resulting in a median 33% reduction in workforce and a median cash runway extension of two quarters

(\$ in millions)

Date of Announcement	Company	Market Cap Prior to Announcement	Cash Balance at Announcement	<1 Year of Cash Prior to Announcement	<1 Year of Cash Post-Announcement	Workforce Reduction	Runway Extension in Quarters ⁽¹⁾
9/27/2022	Context Therapeutics	\$19.2	\$42.9	x	x	NA	1.0
9/26/2022	Excure	\$7.6	\$22.2	✓	✓	66%	1.0
9/15/2022	IMV	\$59.5	\$31.1	✓	✓	33%	1.0
9/15/2022	Palisade Bio	\$11.8	\$5.0	✓	x	20%	3.0
9/13/2022	Rubius Therapeutics	\$96.7	\$140.7	✓	x	75%	2.0
9/13/2022	ObsEva	\$19.8	\$14.1	✓	✓	75%	1.0
9/1/2022	Finch Therapeutics	\$103.0	\$104.7	x	x	37%	1.0
8/31/2022	Mereo BioPharma	\$130.4	\$127.7	x	x	NA	2.0
8/30/2022	Codiak BioSciences	\$50.1	\$41.8	✓	✓	37%	2.0
8/24/2022	Aeglea BioTherapeutics	\$41.6	\$88.6	✓	x	25%	2.0
8/18/2022	Clarus Therapeutics	\$60.7	\$163.5	✓	✓	40%	NA
8/15/2022	ContraFect Corporation	\$11.9	\$27.3	✓	✓	37%	NA
8/15/2022	Homology Medicines	\$158.4	\$225.5	x	x	6%	1.0
8/12/2022	Pear Therapeutics	\$315.0	\$107.1	✓	x	9%	2.0
8/11/2022	ProQR Therapeutics	\$59.9	\$163.5	x	x	30%	4.0
8/9/2022	Absci	\$359.3	\$206.0	x	x	20%	3.0
8/8/2022	Atara Biotherapeutics	\$321.3	\$331.3	x	x	20%	1.0
8/8/2022	MacroGenics	\$269.3	\$133.7	x	x	15%	1.0
8/5/2022	Talis Biomedical Corporation	\$20.3	\$165.4	x	x	35%	1.0
8/3/2022	Ampio Pharmaceuticals	\$35.3	\$23.3	✓	✓	55%	NA
8/2/2022	VBL Therapeutics	\$15.9	\$34.1	✓	✓	35%	1.0
8/1/2022	Nuvation Bio	\$602.1	\$703.8	x	x	33%	8.0
8/1/2022	Otonomy	\$81.5	\$53.1	✓	x	55%	2.0
7/21/2022	Assembly Biosciences	\$104.6	\$116.7	x	x	30%	2.0
7/21/2022	X4 Pharmaceuticals	\$78.1	\$47.4	✓	✓	20%	3.0
7/20/2022	Invitae Corporation	\$506.7	\$726.8	x	x	33%	4.0
7/19/2022	Inovio Pharmaceuticals	\$421.4	\$348.1	✓	x	18%	4.0
7/14/2022	CytomX Therapeutics	\$85.0	\$228.2	x	x	40%	5.0
7/6/2022	Adverum Biotechnologies	\$114.6	\$235.8	x	x	38%	4.0
All (N = 29)				% <1 Year of Cash			
Mean		\$143.5	\$160.7	Pre-Announcement	Post-Announcement	35%	2.3
Median		\$81.5	\$116.7	50%	30%	33%	2.0

Source: CapIQ, FactSet, Company press releases as of September 30, 2022. Includes disclosed restructurings for public companies under <\$20B in market capitalization. ND = Not Disclosed. NA = Not Applicable.

(1) Based on estimated cash runway pre and post-restructuring announcement (if available); otherwise estimated based on disclosed annualized cost savings and consensus EBIT estimates.

(2) Clarus filed for Chapter 11 protection in Delaware on September 6th.

(3) Oyster Point's management expects the firm to reach profitability.

Strategic Alternatives Announcements and Outcomes

In 2022YTD, 21 biopharma companies have publicly embarked on strategic alternative processes, of which 12 have announced outcomes that have varied beyond traditional reverse mergers to public-public mergers and asset/portfolio sales for cash

	Outcome	Company	Outcome Announced Date	Summary
21 Companies Announcing Strategic Alternatives in 2022YTD	N=5 Reverse Merger		09/28/2022	Agreed to merge with Aceragen; total expected combined cash balance of \$27M at close, and no concurrent PIPE financing announced
			09/21/2022	Agreed to merge with Carisma Therapeutics; concurrent \$30M PIPE financing, with total expected combined cash balance of \$180M at close. Previously announced sale of EBI-031 and IL-6 mAb technology to Roche for \$70M in total upfront/milestones
			08/10/2022	Agreed to merge with Disc Medicine; concurrent \$53.5M PIPE financing, with total expected combined cash balance of \$175M at close
			07/21/2022	Agreed to merge with ARS Pharmaceuticals; expected \$265M in combined cash at close, and no concurrent PIPE financing announced
			06/06/2022	Agreed to merge with Kineta and concurrently announced sale of YTX-7739 and discovery-stage neuroscience candidates to Janssen for \$26M; concurrent PIPE financing of undisclosed size
N=2 Public-Public Merger		09/06/2022	Agreed to be acquired by Equillum in all-stock transaction; expected to add \$33M in cash to Equillum's balance sheet at close	
		07/05/2022	Agreed to merge with Syros; concurrent \$130M PIPE financing, with total expected combined cash balance of \$240M at close	
N=2 Asset/ Portfolio Sale		09/07/2022	Announced sale of tovinontrine and PDE9 program assets to Cardurion for \$35M in upfront cash and \$60M in milestones; continuing strategic alternatives process	
		05/23/2022	Announced sale of complement portfolio, including CB 2782-PEG, to Vertex for \$60M in cash; following portfolio sale, announced plan to distribute up to \$65M in cash	
N=3 Chapter 11/ Closure		09/05/2022	Announced plan for near-term sale of sole commercial asset, Jatenzo, through Chapter 11 proceedings	
		09/02/2022	Filed for bankruptcy under Chapter 11; terminated employment of substantially all employees	
		05/24/2022	Announced that the Company's Board voted to wind down operations and terminate remaining employees	
N=9 Exploration Ongoing	Companies with announced strategic alternatives processes ongoing			    
			   	

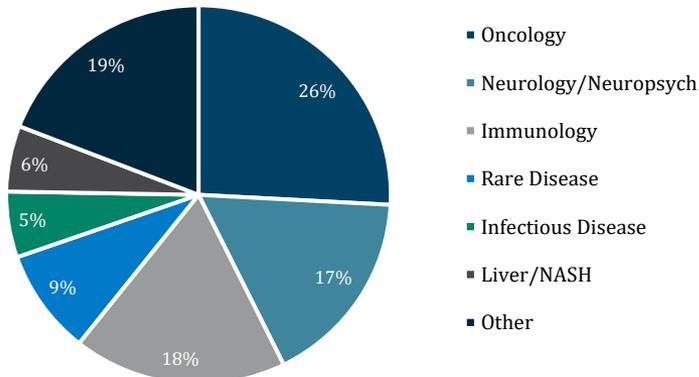
Q3 2022 Clinical Catalysts Analysis

- In notable contrast to the first half of 2022, companies and investors were rewarded for “positive” clinical data
- Highly anticipated pivotal trial readouts for Alnylam’s APOLLO-B and Karuna’s EMERGENT-2 both positive, as well as positive Biogen/Eisai CLARITY data buoyed the sector
- 7 of the top 10 movers successfully raised catalyst-driven equity follow-ons after meaningful stock price appreciation

Key Takeaways

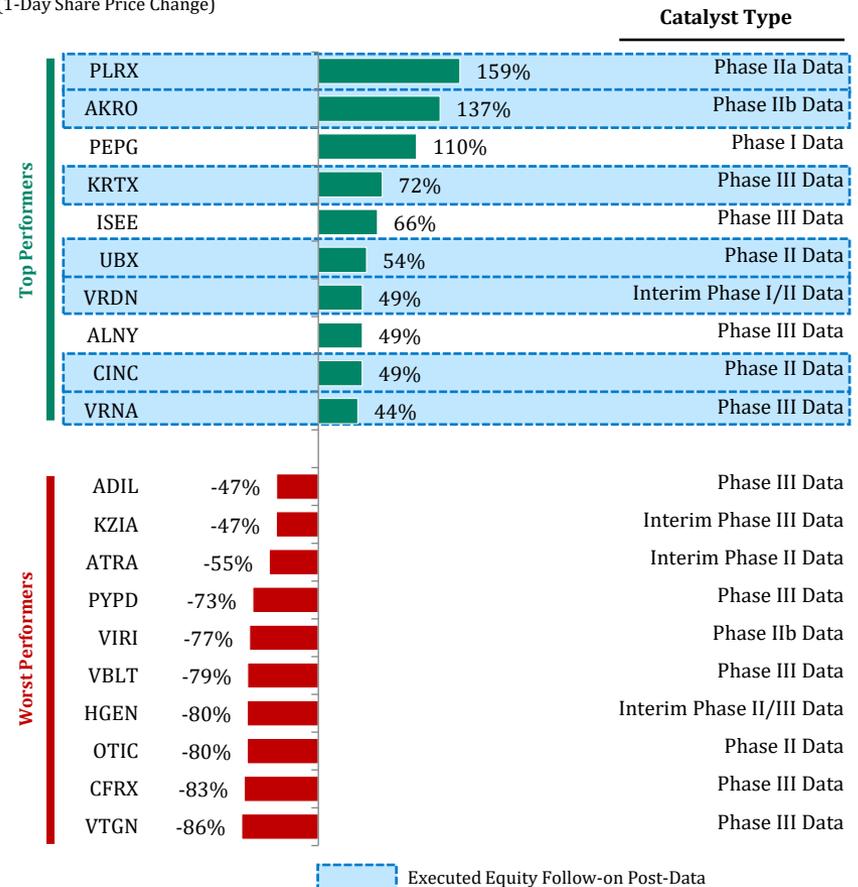
- William Blair analyzed 89 key clinical data readouts in Q3 2022 for US-listed biopharma companies with a market cap <\$30 billion
- Average stock price performance for “positive” clinical data (N=63):
 - 1-day performance: **+17.0%**
 - 1-week performance: **+16.3%**
- Average stock price performance for “negative” clinical data (N=26):
 - 1-day performance: **(34.1%)**
 - 1-week performance: **(35.0%)**
- Nearly \$25 billion in cumulative market cap created across all clinical catalysts

Breakdown of Clinical Catalysts by Therapeutic Area



Top 10 Positive/Negative Movers

(1-Day Share Price Change)

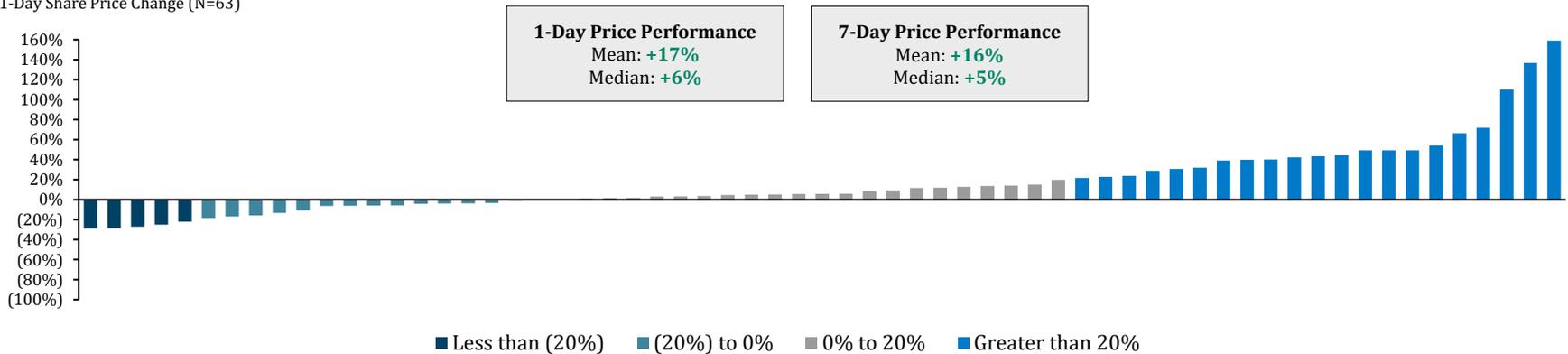


Q3 2022 Positive/Negative Clinical Catalyst Performance Detail

30% of positive clinical catalysts had a >20% one-day stock price movement, while 58% of negative clinical catalysts experienced a one-day price decline greater than 20%

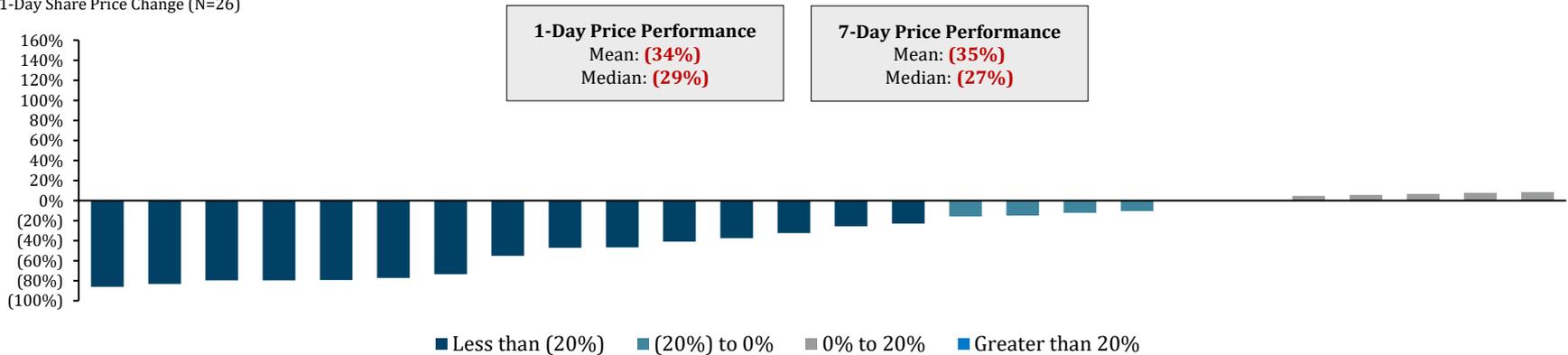
Performance Following a Positive Clinical Catalyst

1-Day Share Price Change (N=63)



Performance Following a Negative Clinical Catalyst

1-Day Share Price Change (N=26)



Q3 2022 Biopharma SPACs & Trading Performance

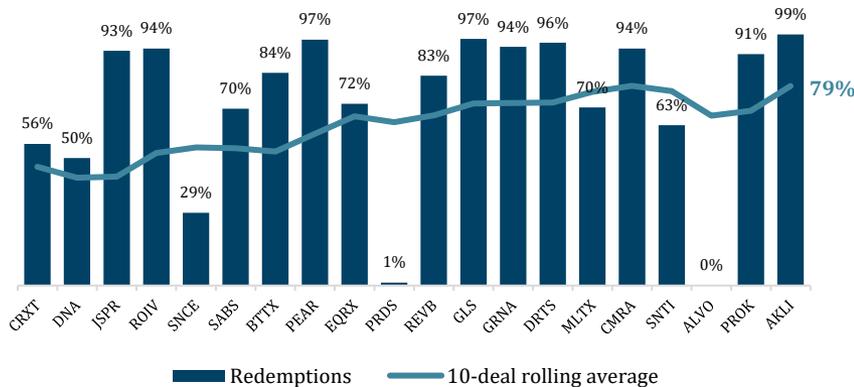
As the SPAC market has become increasingly challenged with higher redemptions and terminated mergers, PIPE has become more important both in terms of valuation and closing

Perspectives on the Current Market

- The SPAC market remains challenged, continuing its correction from unprecedented levels of deal activity in 2020 and 2021 and proposed rule changes regarding SPAC disclosures and advisor liability introduced by the SEC in late March
- Characteristics for high quality SPAC options include strong SPAC sponsors, committed proceeds and confirmed funding through multiple key clinical inflection points, as well as blue chip strategic collaborations and PIPE investors to further confirm scientific IP
- SPAC M&A activity remains at a pace more than five times pre-pandemic levels, with over 95 transactions announced YTD reflecting total enterprise value of over \$69 billion, **with biopharma representing ~14% of deals announced**
- During the last 12 months, the Biopharma sector has seen 19 transactions close, and **six transactions terminated**, one of which occurred in Q3 2022:
- All 32 biopharma SPACs seeking an acquisition will hit their initial expiration date within the next 12 months
 - Notable SPACs Sponsors include: 5AM Ventures, Ally Bridge, ARCH, EcoR1, Falcon Edge, Forbion, LSP, Omega, Perceptive, Panacea, RA Capital, Suvretta/Social Capital

Redemption Trends

Last 20 Closed (NewCo Tickers)



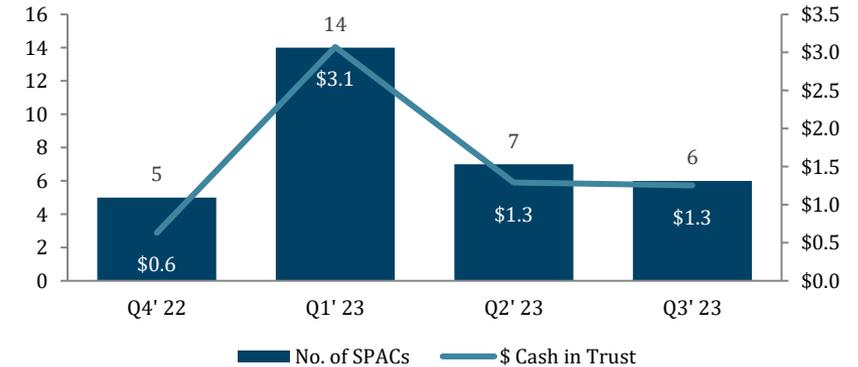
(1) Before extension options.

Note: Excludes SPACs with incomplete information available.

Source: William Blair, SPAC Research as of September 30, 2022.

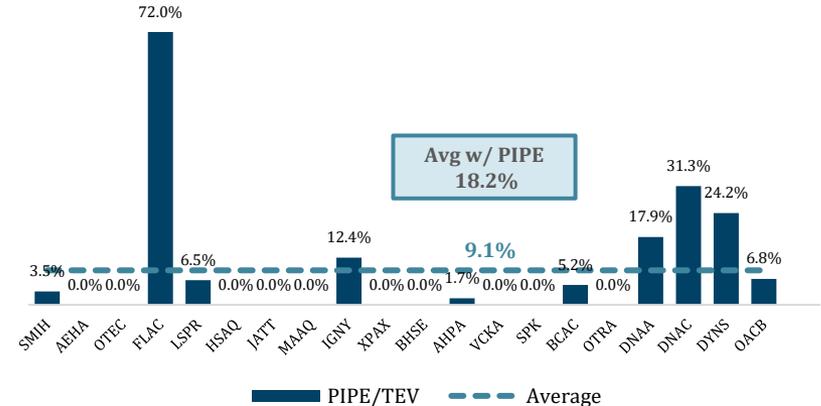
Biopharma SPACs Reaching Termination⁽¹⁾

of SPACs / Cash in Trust (\$ in billions)



M&A Structuring Trends: PIPE Sizing

Last 20 Announced (SPAC Tickers)



Venture Debt in Biopharma

With sustained volatility in equity markets and valuations significantly off their highs, biopharma companies continue to look to venture debt⁽¹⁾ to boost liquidity and provide a bridge to future equity rounds

Market Overview

- Given the lack of positive cash flow, venture lenders take a loan-to-value (LTV) approach to underwriting
 - Significant equity cushions, along with a first-priority lien on the borrower's assets, allow venture lenders to remain aggressive when equity markets fluctuate
 - Lenders are generally looking for broad pipelines, strong management teams, and the ability to raise additional capital
- Despite challenges in the broader market, venture lenders have remained active as they look for opportunities to deploy capital
 - Competition has also led to a significant increase in check sizes
 - While overall deal count has come down somewhat year-over-year, lenders have continued to aggressively pursue good companies and average terms have remained relatively consistent
 - Increased competition in this space has also led to increased hold sizes and higher LTV's

Recent Venture Debt Financings for Public Biopharma Companies

Date	Company	Available at Close	Total Facility ⁽²⁾	Interest Rate	LTM at Close ⁽³⁾		Market Cap at Close	Debt / Market Cap	Facility / Market Cap	Phase of Development
					Revenue	EBITDA				
09/23/22	Spectrum Pharmaceuticals, Inc.	\$30	\$65	8.72%	\$0	(\$104)	\$79	38.2%	82.8%	Approved
09/15/22	VBI Vaccines	\$50	\$100	10.75%	\$1	(\$73)	\$213	24%	47%	Approved
09/06/22	TRACON Pharmaceuticals, Inc.	\$10	\$35	11.25%	\$0	(\$30)	\$40	24.8%	86.9%	Phase II
08/31/22	Provention Bio	\$25	\$125	9.20%	\$3	(\$111)	\$352	7.1%	35.5%	BLA Filed
08/25/22	PDS Biotechnology Corporation	\$25	\$35	11.75%	\$0	(\$29)	\$120	20.9%	29.2%	Phase II
08/15/22	ADC Therapeutics	\$120	\$175	11.05%	\$94	(\$227)	\$713	16.8%	24.6%	Approved
08/08/22	Rani Therapeutics	\$30	\$45	11.85%	\$0	(\$70)	\$294	10.2%	15.3%	Phase I
08/03/22	MeiraGTx	\$75	\$100	13.02%	\$44	(\$75)	\$418	17.9%	23.9%	Phase III
08/02/22	Vericel Corporation	\$150	\$150	5.12%	\$155	(\$14)	\$1,499	10.0%	10.0%	Approved
07/28/22	Elevation Oncology	\$30	\$50	9.45%	\$0	(\$59)	\$29	104.9%	174.8%	Phase II
07/26/22	Inozyme Pharma, Inc.	\$25	\$70	9.60%	\$0	(\$65)	\$135	18.6%	52.0%	Phase I/II
07/26/22	Iveric Bio, Inc.	\$50	\$250	10.25%	\$0	(\$142)	\$1,254	4.0%	19.9%	Phase III
07/21/22	Gritstone Bio, Inc.	\$30	\$80	8.65%	\$16	(\$106)	\$208	14.4%	38.5%	Phase II/III
Mean (N=13)		\$50	\$98	10.05%	\$24	(\$85)	\$412	24.0%	49.3%	
Median		\$30	\$80	10.25%	\$0	(\$73)	\$213	17.9%	35.5%	
Minimum		\$10	\$35	5.12%	\$0	(\$227)	\$29	4.0%	10.0%	
Maximum		\$150	\$250	13.02%	\$155	(\$14)	\$1,499	104.9%	174.8%	

Source: CapIQ, PitchBook Data, Inc., and SEC filings as of September 30, 2022.

(1) "Venture debt" defined here as debt to borrowers who do not yet have positive cash flow.

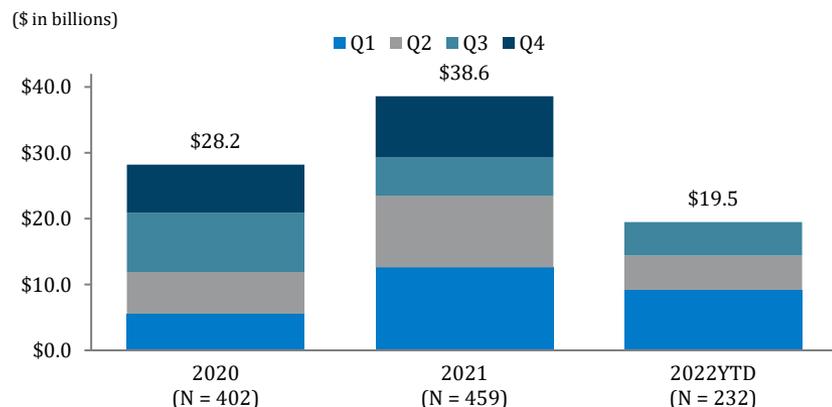
(2) Represents total commitment and includes undrawn revolvers and additional tranches of debt / delayed draw facilities.

(3) LTM financials at time of close are as calculated by CapIQ.

Biopharma Private Financings Trends

- Public markets continue to put pressure on private markets, with \$10B decrease year-over-year in total private biopharma financing activity in 2022YTD
- Challenging financing environment has also led to a sharp increase in insider led private rounds in Q3 2022

Total Proceeds and Deal Volume



Crossover Deals Analysis⁽¹⁾

(\$ in millions)

Quarter	Number of Deals	Median Deal Size	Median Pre-Money	Median Step-Up	Currently Private	Currently Public
Q3 2020	26	\$97	\$226	1.4x	6	20
Q4 2020	23	\$82	\$200	1.5x	4	19
Q1 2021	36	\$108	\$211	2.0x	8	28
Q2 2021	24	\$109	\$250	2.2x	17	7
Q3 2021	24	\$100	\$220	1.6x	19	5
Q4 2021	10	\$141	\$331	2.9x	9	1
Q1 2022	12	\$116	\$300	2.3x	12	0
Q2 2022	12	\$133	\$208	2.0x	11	1
Q3 2022	10	\$152	\$400	2.1x	10	0

Source: CapIQ, PitchBook Data, Inc., FactSet, and SEC Filings as of September 30, 2022. AI/ML = Artificial Intelligence/Machine Learning.

(1) Includes crossover rounds for companies that have completed an IPO as well as crossover rounds where the next round of financing will likely be an IPO (either a \$50M+ raise (Series B onwards) or a \$100M+ raise (Series A) with multiple crossover and/or large mutual funds in the syndicate).

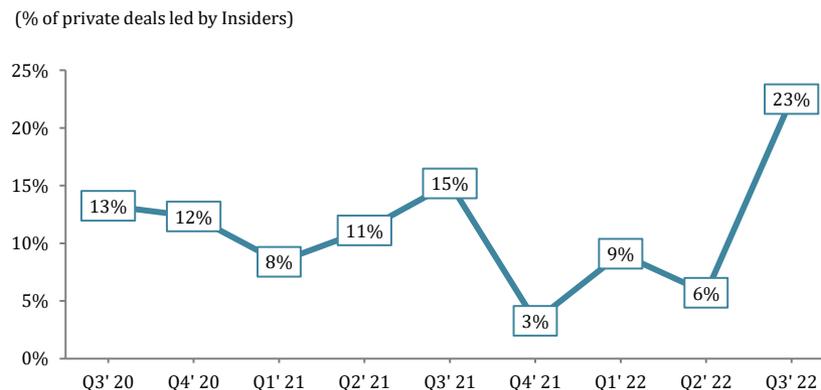
(2) Includes private financings where disclosed lead investors participated in prior financing rounds. Excludes Series A/Seed rounds.

Private Financings by Indication and Modality

(\$ in billions)

Indication/Modality	2021		H1 2022		Q3 2022	
	Value	Number of Deals	Value	Number of Deals	Value	Number of Deals
Oncology	\$14.2	202	\$5.3	59	\$1.6	24
AI/ML	\$3.8	49	\$1.8	26	\$1.1	16
Gene/Cell Therapy	\$9.3	131	\$2.8	35	\$1.0	9
Neurology/CNS	\$4.1	54	\$1.6	20	\$0.4	7
Immunology	\$2.7	30	\$1.7	21	\$0.8	9
Infectious Disease	\$3.3	32	\$0.7	11	\$0.2	4
RNA/Oligonucleotide	\$3.3	30	\$0.6	9	\$0.4	6

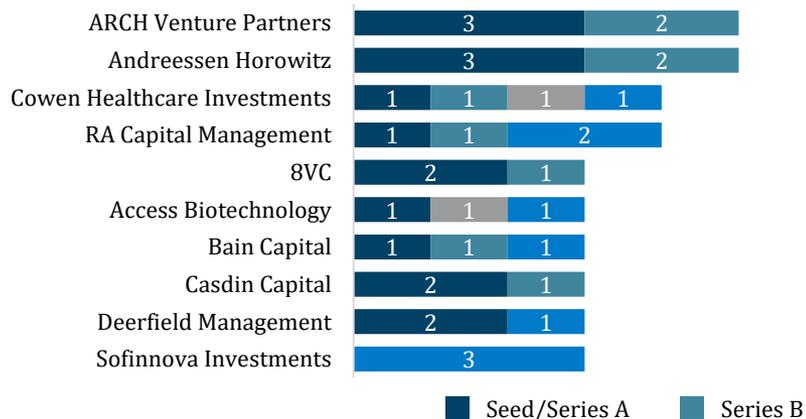
Insider Led Rounds⁽²⁾



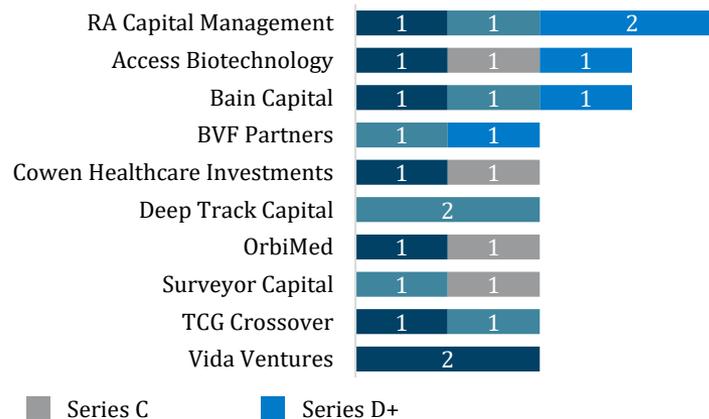
Q3 2022 Biopharma Private Financings Snapshot

- Newer fund launches such as Deep Track and TCGX, are becoming very active participants in crossover financings while mutual fund still remain largely absent
- Company formations remain active in Q3 2022 with 25 launches

Top Investors Across All Rounds



Top Investors in Crossover Rounds

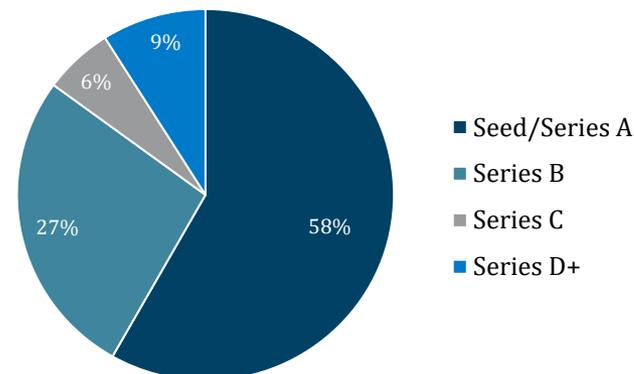


Largest Private Company Raises

(\$ in millions)

Company	Indication	Round	Date	Deal Size
areteia therapeutics	I&I	Series A	7/12/22	\$350
ACELYRIN	I&I	Series C	9/13/22	\$300
ORNA	Oncology	Series B	8/23/22	\$221
ArsenalBio	Oncology	Series B	9/6/22	\$220
SIRONAX	Age-Related	Series B	8/2/22	\$200
capstan therapeutics	Various	Series A	9/14/22	\$165

Breakdown of Total Investing Rounds



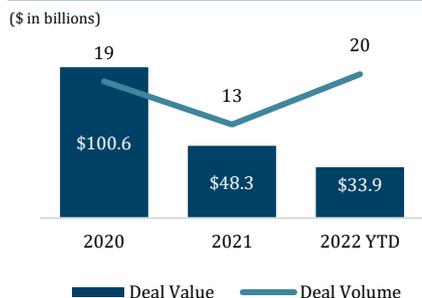
Q3 2022 Public Biopharma M&A Activity

Q3 2022 saw a total of 8 public company acquisitions; while deal volume is on pace to exceed 2020 and 2021, total deal value is down as large M&A, such as the rumored Seagen acquisition, has not come to fruition

Public M&A Overview

- Despite elevated volume, median total deal values and premiums down significantly from 2021 levels:
 - Total deal value:** \$460M in Q3 2022 (vs. \$1,900M in 2021)
 - 1-day premium:** 46% premium in Q3 2022 (vs. 76% premium in 2021)
- In Q3 2022, 50% of deals involved commercial-stage assets and 100% of deals comprised of all upfront consideration
- As seen in Q2 2022, continued appetite from venture/private equity firms for take private acquisitions, with two take private acquisitions in Q3 2022 (Stealth Bio, La Jolla)
- Recent consolidation also being driven by overlapping investors in portfolio companies with synergistic strategic focus areas, technologies, and resources

Total Deal Value and Volume



Q3 2022 Public M&A Activity Detail

Date Announced	Acquirer	Target	Total Deal Value	Total Upfront	Total Milestones	Premium		Lead Asset at Signing			
						1-Day Premium	30-Day Premium	Name	Phase	Therapeutic Area	Modality
09/20/22	Rocket Pharmaceuticals	Renovacor	\$53.0	\$53.0	-	37%	40%	REN-001	Preclinical	Cardiology	Gene therapy
09/01/22	Novo Nordisk	Forma Therapeutics	\$1,100.0	\$1,100.0	-	49%	92%	Etavopivat	Phase II/III	Hematology, Oncology	Small molecule
08/30/22	Neurocrine	Diurnal	\$56.5	\$56.5	-	144%	178%	DNL-0300	Phase I	Endocrinology	Small molecule
08/22/22	Alcon	Aerie Pharmaceuticals	\$770.0	\$770.0	-	37%	70%	Rocklatan	Marketed	Ophthalmology	Small molecule
08/08/22	Pfizer	Global Blood Therapeutics	\$5,394.4	\$5,394.4	-	43%	101%	Oxbryta	Marketed	Hematology, Rare Disease	Small molecule
08/04/22	Amgen	Chemocentryx	\$3,700.0	\$3,700.0	-	116%	116%	Tavneos	Marketed	Immunology	Small molecule
08/01/22	Morningside / J. Wood	Stealth BioTherapeutics	\$27.6 ⁽¹⁾	\$27.6	-	34%	44%	Elamipretide	Phase III	Rare Disease, Ophthalmology, Neurology, Cardiology	Peptide
07/11/22	Innoviva	La Jolla Pharmaceutical	\$149.0	\$149.0	-	84%	78%	Giapreza	Marketed	Acute Care	Peptide
Mean (N=8)			\$1,406.3	\$1,406.3	-	68%	90%				
Median			\$459.5	\$459.5	-	46%	85%				

Note: M&A activity includes deals with disclosed total deal value of \$20M+. Premium calculated using last unaffected trade date prior to acquisition.

Source: PitchBook Data, Inc., Company press releases and SEC filings as of September 30, 2022.

(1) Represents implied fully diluted equity value; 65% of the total issued and outstanding Ordinary Shares owned by Morningside prior to announcement of the acquisition.

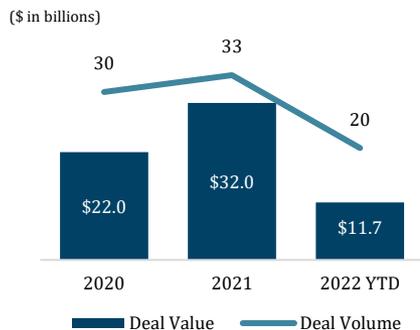
Q3 2022 Private Biopharma M&A Activity

Private biopharma M&A deal volume and value remains below the pace of 2020 and 2021 activity, with only 6 private company buyouts with disclosed terms announced in Q3 2022

Private M&A Overview

- Private M&A transaction volume down slightly from Q2 2022 levels and remains below pace of 2020 and 2021 volumes
 - 6 deals in Q3 2022 (vs. 8 deals in Q2 2022)
- Despite lower volume, median upfront values in Q3 2022 are up from 2021, though median total deal values remain depressed levels due to lower milestones
 - Total deal value:** \$320M in Q3 2022 (vs. \$470M in 2021)
 - Upfront:** \$175M in Q3 2022 (vs. \$120M in 2021)
 - Milestones:** \$115M in Q3 2022 (vs. \$335M in 2021)
- Continued appetite for early-stage clinical assets, with 83% of lead assets in Phase I or II (vs. 85% in Q2 2022)

Total Deal Value and Volume



Q3 2022 Private M&A Activity Detail

(\$ in millions)

Date Announced	Acquirer	Target	Total Deal Value	Total Upfront	Total Milestones	Lead Asset at Signing			
						Name	Phase	Therapeutic Area	Modality
09/19/22	GENFIT	Versantis	\$109.2	\$41.6	\$67.6	VS-01	Phase II	Hepatology	Liposome
09/07/22	Roche	Good Therapeutics	ND	\$250.0	ND	PD1-IL2	Preclinical	Oncology	Protein
08/04/22	Gilead	MiroBio	\$405.0	\$405.0	-	MB272	Phase I	Immunology	Antibody
07/18/22	Ultragenyx	GeneTx Biotherapeutics	\$190.0	\$75.0	\$115.0	GTX-102	Phase I/II	Neurology	Oligonucleotide
07/11/22	Vertex	ViaCyte	\$320.0	\$320.0	-	PEC-01	Phase I/II	Endocrine/Metabolic	Cell Therapy
07/05/22	AstraZeneca	TeneoTwo	\$1,265.0	\$100.0	\$1,165.0	TNB-486	Phase I	Oncology	Antibody
Mean (N=6)			\$457.8	\$198.6	\$449.2				
Median			\$320.0	\$175.0	\$115.0				

Note: M&A activity includes deals with disclosed total deal value of \$20M+.

Source: PitchBook Data, Inc., Company press releases and websites as of September 30, 2022. ND = Not Disclosed.

Summary of Investor Capital Returned from Q3 2022 Public Biopharma Acquisitions

Public biopharma acquisitions announced in Q3 2022 have freed up an estimated \$9.8 billion in institutional investor capital

#	Institution	Total Estimated Capital Returned to Fund ⁽¹⁾						
			aerie	CHEMOCENTRYX	forma THERAPEUTICS	GBT	La Jolla PHARMACEUTICAL	Stealth BIOTHERAPEUTICS
1	The Vanguard Group, Inc.	\$793.8	✓	✓	✓	✓	✓	
2	Fidelity Management & Research Co. LLC	\$776.6	✓	✓	✓	✓	✓	
3	BlackRock, Inc.	\$684.5	✓	✓	✓	✓	✓	
4	State Street Corp.	\$553.0	✓	✓	✓	✓	✓	
5	Baker Bros. Advisors LP	\$389.4		✓	✓	✓		
6	Deep Track Capital LP	\$330.8			✓	✓		
7	Janus Henderson Group Plc	\$307.3		✓		✓		
8	Perceptive Advisors LLC	\$229.5		✓		✓		
9	T. Rowe Price Group, Inc.	\$229.4	✓	✓		✓		
10	RA Capital Management LP	\$180.2			✓			
11	Geode Capital Management LLC	\$152.8	✓	✓	✓	✓	✓	✓
12	Kynam Capital Management LP	\$150.7				✓		
13	Morgan Stanley	\$150.7	✓	✓	✓	✓	✓	
14	OrbiMed Advisors Private Equity	\$140.0				✓		
15	Cormorant Asset Management LP	\$137.5		✓	✓			
16	Banque Pictet & Cie SA	\$133.4		✓		✓		
17	Citadel Securities LLC	\$131.9	✓	✓	✓	✓		✓
18	Point72 Capital Holdings LP	\$114.4	✓	✓	✓	✓		
19	Wasatch Advisors, Inc.	\$109.4		✓				
20	Yiheng Capital Management LP	\$102.8				✓		
21	TIAA Board of Governors	\$99.5	✓	✓	✓	✓		
22	Paradigm BioCapital Advisors LP	\$99.0				✓		
23	Armistice Capital LLC	\$94.7			✓			
24	Invesco Ltd.	\$94.0	✓	✓	✓	✓		
25	Northern Trust Corp.	\$87.9	✓	✓	✓	✓	✓	
26	Affiliated Managers Group, Inc.	\$85.1		✓		✓		
27	Wellington Management Group LLP	\$77.4	✓	✓	✓	✓		
28	The Goldman Sachs Group, Inc.	\$77.0	✓	✓	✓	✓		
29	Bank of America Corp.	\$76.2	✓	✓	✓	✓	✓	
30	Marshall Wace LLP	\$75.6	✓	✓	✓	✓		

Source: Factset and William Blair Analysis as of September 30, 2022.

(1) Total estimated capital in millions returned to fund based on the cumulative \$ value position of all target companies. \$ value position calculated based on latest publicly disclosed institutional ownership of target company multiplied by publicly disclosed final/latest announced per share acquisition price. The following outlines acquisition prices utilized in the analysis: Alcon's acquisition of Aerie Pharmaceuticals for \$15.25/share, Amgen's acquisition of Chemocentryx for \$52.00/share, Novo Nordisk's acquisition of Forma Therapeutics for \$20.00/share, Pfizer's acquisition of Global Blood Therapeutics for \$68.50/share, Innoviva's acquisition of La Jolla Pharmaceutical for \$6.23/share and Morningside and J. Wood's acquisition of Stealth BioTherapeutics for \$0.38/share.

Note: The analysis does not include retail, management, strategic investors, and non-filers.

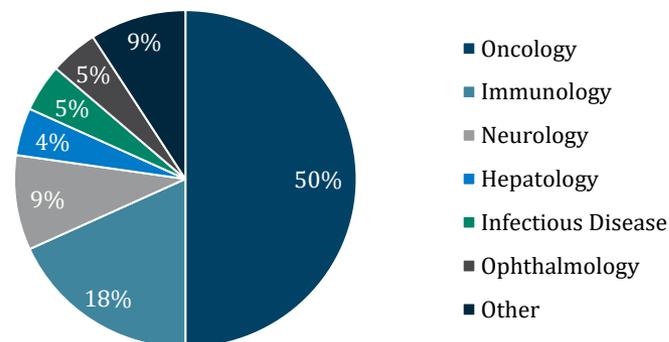
Q3 2022 Saw Increased Economics in Early-Stage Partnerships and Collaborations

Early-stage biopharma collaborations are up 21% compared to the same period in 2021, with 69 deals announced year-to-date, representing \$4B in upfront payments and \$83B in total deal value

Q3 2022 Early-Stage⁽¹⁾ Partnerships & Collaboration

Overview

- 20 early-stage collaborations announced in Q3 2022 (on par with the 19 in Q3 2021)
- Median economic deal terms for early-stage collaborations/partnerships in Q3 2022 surpassed those in 2021:
 - **Upfront (Cash + Equity):** \$50M in Q3 2022 (vs. \$40M in 2021)
 - **Milestones:** \$1,280M in Q3 2022 (vs. \$935M in 2021)
 - **Total deal value:** \$1,050M in Q3 2022 (vs. \$890M in 2021)
- Platform-focused partnerships continue to account for the vast majority of early-stage collaborations (92% in Q3 2022 vs. 95% in 2021)
- 3 companies announced collaborations concurrently with or just prior to financings
- 37% (N=7) of partnering activity in Q3 2022 have been for small molecules



Top 5 Collaborations by Upfront Payment in Q3 2022

(\$ in millions)

Announced Date	Licensor	Licensee	Deal Details	Total Deal Value	Total Upfront Payment	Equity Investment	Milestones
8/16/2022	ORNA	MERCK	Strategic collaboration to develop next generation RNA technology for infectious disease and oncology	\$3,750	\$250	\$100	\$3,500
8/3/2022	POSEIDA PHARMACEUTICALS	Roche	Strategic global collaboration focused on allogeneic CAR-T cell therapies for hematologic malignancies	\$6,110	\$110	NA	\$6,000
8/8/2022	Mersana THERAPEUTICS	GSK	Collaboration agreement for the co-development and commercialization of XMT-2056, an ADC targeting HER2	\$1,460	\$100	NA	\$1,360
8/2/2022	SOSEI HEPTARES	abbvie	Multi-target collaboration targeting neurological diseases	\$1,280	\$80	NA	\$1,200
9/29/2022	Ventus THERAPEUTICS	novo nordisk	Collaboration and research collaboration for NLRP3 inhibitors in cardiometabolic diseases	\$703	\$70	NA	\$633

Note: Partnership data excludes traditional out-licensing deals, COVID-related partnerships and partnerships with undisclosed deal terms.

Source: Company press releases and SEC filings as of September 30, 2022. NA = Not Applicable.

(1) Early stage defined as Phase 1 or earlier.

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