



**Topics: if people avoided SPACs instead of avoiding COVID vaccines, the US would be both wealthier and closer to herd immunity. An update on our SPAC analysis from last February, and a look at the strange mathematical paradox that ends up understating some critical COVID vaccine efficacy data**

*Spaccine hesitancy.* Last February, I wrote a piece with a dour outlook on the SPAC market: too many young risky, unprofitable companies coming to market; abnormal incentives for sponsors to close transactions even if the stocks collapse after closing; over-reliance on company projections rather than historical data; and a warning that poor SPAC merger returns relative to the market were a bad omen<sup>1</sup>. Well, here's an update on the 98 SPAC mergers we analyzed that closed or liquidated from January 2019 to March 2021. Talk about "**red tides**": while SPAC sponsors and "SPAC Arbitrage" investors are still making money, it's an unsightly picture for everyone else in the SPAC ecosystem. See Appendix I for the full table showing average, median and 85<sup>th</sup>/15<sup>th</sup> percentile returns, and all of our assumptions and definitions.

Return analysis for investors in SPAC companies brought public or liquidated from Jan 1, 2019 to Mar 5, 2021		
Investor scenario and cumulative returns	Median	Median
	As of March 11	As of August 17
SPAC Arb investor returns	16%	16%
SPAC investor buy-and-hold gross return	41%	4%
SPAC investor buy-and-hold return vs IPO Index	-70%	-100%
SPAC investor buy-and-hold return vs Russell 2000 Growth Index	-24%	-48%
PIPE investor gross returns	30%	-3%
PIPE investor returns vs IPO index	-25%	-62%
PIPE investor returns vs Russell 2000 Growth Index	-15%	-45%
PIPE investor + sponsor concessions gross returns	41%	3%
PIPE investor + sponsor concessions returns vs IPO Index	-14%	-55%
PIPE investor + sponsor concessions returns vs Russell 2000 Growth Index	1%	-36%
Post-merger buy-and-hold investor gross returns	16%	-15%
Post-merger buy-and-hold investor returns vs IPO index	-41%	-68%
Post-merger buy-and-hold investor returns vs Russell 2000 Growth Index	-32%	-51%
SPAC sponsor returns	712%	507%
SPAC sponsor returns less concessions, forfeiture and vesting	468%	284%

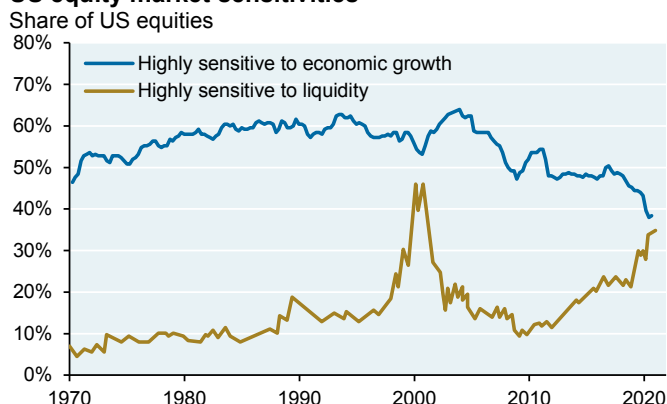
Source: JP Morgan Asset Management, Bloomberg, Dealogic, JP Morgan Securities. August 17, 2021.

These subpar outcomes are not just the case with 2019-March 2021 SPACs. We ran the same analysis for the 85 SPAC mergers *since* March 2021, and the same patterns hold: enormous returns for SPAC sponsors, low positive absolute returns for SPAC Arbitrage investors and negative returns for everybody else.

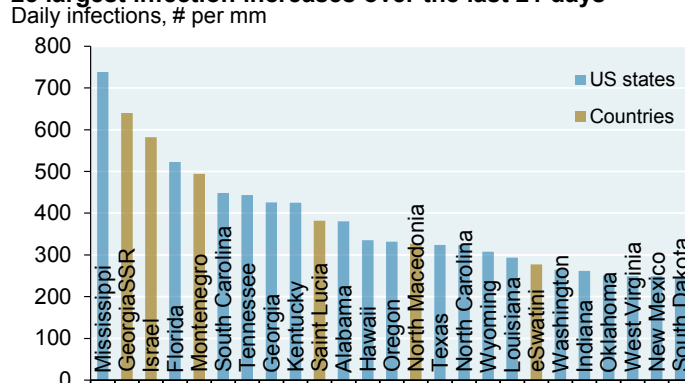
**The latest SPAC news:** institutional "PIPE" financing has dried up, forcing sponsors to allocate more of their economics to securing institutional commitments that are guaranteed to fund at closing; and increased risk that SPACs do not find a merger partner before their 2 year lifespan, in which case the SPAC would be unwound, SPAC investors would receive their capital back and sponsors would lose all of their upfront investment. For arbitrage-oriented investors, SPAC dislocation can create attractive opportunities; but that requires minimizing directional exposure to a group of clearly underperforming and usually unprofitable companies.

**Implications.** While we are very optimistic on the US growth outlook, the primary driver of some assets might be liquidity instead. As the Federal Reserve lays out its plans to start slowing its asset purchases (perhaps by the end of the year), areas like the SPAC market that rely heavily on abundant liquidity may be early casualties. The portion of the stock market that is highly sensitive to liquidity conditions has been rising, just as the share highly sensitive to economic conditions has been falling (see chart below); SPACs may be an exaggerated preview of what lies in store for other overpriced assets unsupported by earnings growth.

<sup>1</sup> "Hydraulic Spacking", Eye on the Market, February 8, 2021

**US equity market sensitivities**

Source: Bridgewater. August 18, 2021.

**25 largest infection increases over the last 21 days**

Source: Johns Hopkins University, IMF, JPMAM. August 17, 2021.

**Vaccine efficacy understatement and the amalgamation paradox**

You've seen the data on the US infection and hospitalization surge and vaccine hesitancy, particularly in hotspot states and counties with high Trump 2020 voting shares. We have all those charts on our web portal so no need to reproduce them here, other than the chart above showing how some US states are suffering the highest infection spikes on earth right now.

I want to highlight something important on vaccines given recent reports from the Israeli Ministry of Health and the Mayo Clinic, since their efficacy data came in lower than prior reports. **Be careful when interpreting vaccine efficacy data releases, since reported numbers can underestimate what you expect them to measure in the first place.** To understand why, let's walk through the two ways a vaccine's impact is often reported: "shares of outcomes", and "efficacy".

**"Shares of outcomes" in vaccinated people.** This simple measure refers to the percentage of infections or hospitalizations in a given place/time that occurred in vaccinated people. One example is the infection outbreak on Cape Cod Massachusetts, where 74% of all infections were reported to have occurred in vaccinated people. This is the **least** helpful statistic to think about, since it does not account for the relative number of vaccinated and unvaccinated people. In other words, in a population overwhelmingly dominated by vaccinated people, it's not surprising that more vaccinated people were infected than unvaccinated people. Another example, in the table below: 31% of all hospitalized people in England were vaccinated, but this is a useless statistic without adjusting for the relative number of vaccinated and unvaccinated people.

**Vaccine "efficacy"** is used by vaccine companies and virus researchers to measure the impact of vaccination in reducing disease and other adverse outcomes. Efficacy normalizes for population size of vaccinated and unvaccinated groups. In England for example, vaccinated people were roughly 2/3 of the population and a third of hospitalizations; efficacy incorporates both figures by comparing rates of hospitalization. As shown, this rate declined from 0.0172% for unvaccinated people to 0.0042% for vaccinated people, a decline of 75%; that's what efficacy measures.

England	Fully vaccinated	Not vaccinated
Hospitalizations	1,355	2,960
Population	31,939,354	17,250,553
Vaccination share of hosp	31%	
Hospitalization rate	0.0042%	0.0172%
Implied efficacy	75%	
Change in hosp rate	0.0129%	
% of cohort vaccinated	65%	

Source: PHE Technical Briefing 20, NHS. August 2021.



**Possible vaccine efficacy understatement.** If you're going to rely on the concept of efficacy, you also have to accept the possibility that it may understate what you expect it to measure. There's a mathematical paradox that can happen when a third variable (a "confounding factor") applied to sub-groups results in substantially different interpretations than when looking at the overall group without this third variable. This is referred to as an **amalgamation paradox**<sup>2</sup>, and in the vaccine efficacy case, the confounding factor is age which is strongly associated with higher vaccination status AND a higher likelihood of being hospitalized.

There's a real life-example in the next table: if we divide the English population into under and over 50 cohorts<sup>3</sup>, we find that **vaccine efficacy vs hospitalization was actually higher for both age cohorts (87% and 94%) than efficacy for the population as a whole (75%)!** According to biostatistics professor Jeffrey Morris at the University of Pennsylvania, this also occurred in Israel: vaccine efficacy vs severe disease was higher for under and over 50 cohorts (92% and 85%) than for the population as a whole (67.5%). This is one of the strangest mathematical outcomes I've run into; evolutionary biologist Carl Bergstrom from the University of Washington and epidemiologist Marc Lipsitch from Harvard have discussed this very issue over the last few days on Twitter.

The important takeaway: vaccine efficacy may be significantly higher for people over 50 than commonly reported numbers. Hopefully, country health ministries will follow up with age stratifications that make this point clearer. Until they do, we will not have a clear picture on how well vaccines are actually performing and how much fading immunity is taking place. A recent Israeli Ministry of Health report showed sharp declines in Pfizer efficacy for January and February recipients (see Appendix II). However, this data was for the entire population of vaccinated and unvaccinated people. When it is eventually adjusted for age and other factors, Pfizer efficacy may look a lot better. Even so, most members of my COVID science advisory group believe that booster shots are merited as a "better safe than sorry" measure. This may have led Israel to adopt a booster policy for its over 50 population already, and to recommend boosters for everyone as early as next month.

#### **Vaccination in England: an example of the amalgamation paradox and understatement of vaccine efficacy**

	Total population		Under 50 population		Over 50 population	
England	Fully vaccinated	Not vaccinated	Fully vaccinated	Not vaccinated	Fully vaccinated	Not vaccinated
Hospitalizations	1,355	2,960	224	2,290	1,131	670
Population	31,939,354	17,250,553	12,125,484	16,541,057	19,813,870	709,496
Vaccination share of hosp	31%		9%		63%	
Hospitalization rate	0.0042%	0.0172%	0.0018%	0.0138%	0.0057%	0.0944%
Implied efficacy	<b>75%</b>		<b>87%</b>		<b>94%</b>	
Change in hosp rate	0.0129%		0.0120%		0.0887%	
% of cohort vaccinated	65%		42%		97%	

Source: PHE Technical Briefing 20, NHS. August 2021.

<sup>2</sup> For more information, see this [article](#) by Biostatistics Professor Jeffrey Morris at the University of Pennsylvania. Morris refers to this as Simpson's Paradox. Thank you to Max Cembalest (Harvard Paulson Graduate School of Engineering and Applied Sciences) for bringing this to my attention.

<sup>3</sup> The over/under 50 stratification may still understate vaccine efficacy given the enormous effect that age has on hospitalization. According to the CDC, hospitalization risk for people over 64 is 2x-4x higher than for people aged 50-64. A more detailed stratification would yield even more accurate efficacy results.

**Appendix I: SPAC return table with definitions and assumptions**

Return analysis for investors in SPAC companies brought public or liquidated from Jan 1, 2019 to Mar 5, 2021						
Investor scenario and cumulative returns		Average	Median	Seasoned Median	Stdev	85th 15th percen. percn.
SPAC Arb investor returns		52%	16%		78%	116% 4%
SPAC investor buy-and-hold gross return		33%	4%	3%	101%	124% -44%
SPAC investor buy-and-hold return vs IPO Index		-69%	-100%	-101%	106%	32% -159%
SPAC investor buy-and-hold return vs Russell 2000 Growth Index		-21%	-48%	-48%	103%	82% -104%
PIPE investor gross returns		15%	-3%	-5%	85%	89% -53%
PIPE investor returns vs IPO index		-49%	-62%	-62%	86%	24% -123%
PIPE investor returns vs Russell 2000 Growth Index		-25%	-45%	-46%	84%	45% -83%
PIPE investor + sponsor concessions gross returns		36%	3%	3%	125%	97% -49%
PIPE investor + sponsor concessions returns vs IPO Index		-28%	-55%	-55%	122%	39% -116%
PIPE investor + sponsor concessions returns vs Russell 2000 Growth Index		-4%	-36%	-36%	124%	56% -81%
Post-merger buy-and-hold investor gross returns		3%	-15%	-15%	76%	58% -58%
Post-merger buy-and-hold investor returns vs IPO index		-61%	-68%	-69%	76%	-1% -122%
Post-merger buy-and-hold investor returns vs Russell 2000 Growth Index		-37%	-51%	-51%	76%	21% -89%
SPAC sponsor returns		655%	507%		641%	1237% 116%
SPAC sponsor returns less concessions, forfeiture and vesting		431%	284%		491%	882% 29%

Source: JP Morgan Asset Management, Bloomberg, Dealogic, JP Morgan Securities. August 17, 2021.

**ASSUMPTIONS**

Universe = 93 closed SPAC mergers and 5 liquidated SPACs that were not closed; liquidations only impact sponsors and SPAC Arb investors

Sponsor share allocation = 20% of IPO SPAC shares without warrants; upfront costs = \$3 mm + 2.5% underwriting fee; hold after merger closing

Second sponsor return scenario assumes 25% share forfeiture, and 25% subject to vesting at \$15 per share

SPAC Arb investor buys at IPO date and exits both stock and warrant positions 7 days before the merger closing date

For SPAC buy-and-hold investors, returns reflect warrant valuations at prevailing prices, and any triggered warrant exchanges into shares or cash

PIPE investors commit prior to merger announcement, buy in at original IPO price, receive no warrants, fund at closing

PIPE concession scenario assumes that SPAC sponsors transfer 20% of their economics to facilitate closing

Post-merger investor buys the SPAC IPO at the time of the merger announcement at the prevailing price

IPO Index benchmark = average of IPOUSA Index and IPXO Index; these indexes do NOT include first day "pops" earned by syndicate participants

SPAC buy-and-hold warrant exercise assumed to take place on first day of tender exchange period, when applicable

**Appendix II: efficacy data by vaccine and efficacy category**

Source	Vaccine	Obs period	Vax pd or age group	Infection	Symptomatic infection	Hospitalization	Severe infection/ICU Mortality
Mayo Clinic	Pfizer	Jan-Jul		76%		85%	93% 100%
Mayo Clinic	Moderna	Jan-Jul		86%		92%	87% 100%
Mayo Clinic	Pfizer	Jul		42%		75%	
Mayo Clinic	Moderna	Jul		76%		81%	
Israel Min Health	Pfizer	Jul	Jan	16%	16%	82%	86%
Israel Min Health	Pfizer	Jul	Feb	44%	44%	91%	91%
Israel Min Health	Pfizer	Jul	Mar	67%	69%	89%	94%
Israel Min Health	Pfizer	Jul	Apr	75%	79%	83%	84%
Israel Min Health	Pfizer	Jul	Jan-Apr	39%	41%	91%	88%
Public Health England	Pfizer	Oct-May			88%		
Public Health England	Pfizer	Apr-Jun				96%	
Public Health England	AstraZeneca	Dec-May			67%		
Public Health England	AstraZeneca	Apr-Jun				92%	
Oxford UK	Pfizer	May-Aug	18-34	90%	96%		
Oxford UK	Pfizer	May-Aug	35-64	77%	88%		
Oxford UK	AstraZeneca	May-Aug	18-34	73%	76%		
Oxford UK	AstraZeneca	May-Aug	35-64	54%	57%		
Public Health Scotland	Pfizer	Apr-Jul		79%			
Public Health Ontario	Pfizer	Dec-May			87%	100%	
J&J trial	J&J	Sep-Jan			66%	85%	
Bharat Biotech trial	Covaxin	Nov-Jan		64%	78%		93%
Chile Ministry of Health	Sinovac	Feb-May		66%	88%		90% 86%
S Afr Med Res Council	J&J	Feb-Aug				71%	94%

Source: JPMAM. August 2021.

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