



COVID-19 UPDATE: Recent study shows Tokyo seroprevalence 47% (near herd immunity) and infection fatality rate of 0.0006%. Latest trifecta epicenter list.

THIS MESSAGE IS BEING SENT SOLELY TO CLIENTS OF FS INSIGHT

STRATEGY: Is election day the key date to clear market uncertainties?

I did a panel last night with Lars Peter Hansen, University of Chicago Professor and Nobel Prize economist. This was an event sponsored by SparkLabs and hosted by the entertaining Jared Carney. There was a wide range of topics discussed, but the key takeaway for me is the central role that "uncertainty" plays in financial markets. In fact, this uncertainty and resulting spillovers is central to the work of Hansen (<http://larspeterhansen.org/>)

And 2020 is a textbook case of galactic-level uncertainties:

- 2020 worse than a science fiction movie
- 2020 global pandemic, so far 1 million deaths
- 2020 First ever global and coordinated economic shutdown
- 2020 US economic contraction exceeding Great Depression
- 2020 US Federal Reserve writes a new playbook within days
- 2020 US Government spends \$5T in stimulus, 25% of GDP
- 2020 Investors panic and sell whatever they can

In the next 40 days, financial markets are dealing with an "event risk" on election day. Taking a step back, unless markets are convinced the economic path for the next 12 months is wildly divergent between Biden or Trump, markets are likely to follow a similar path in the period after the election. But the obvious uncertainty into election day is:

- how long is the period of a contested election?
- are there second order risks if we do not have a clear outcome?

This is probably the reason for the "event risk" window into election day. But Goldman Sachs economists also comment that the combination of early polling, mail-in ballots, and county data will be enough for the clear victor to be established.

- this is contrary to the central narrative we are hearing.

Goldman Says Markets Overestimating Election Result Delay Risk

By Cormac Mullen

(Bloomberg) -- Traders need to reduce expectations that a delayed U.S. election result could upend markets, according to Goldman Sachs Group Inc.

While a delayed outcome is a "tail risk," a combination of early results, voter turnout, county-level data and the high correlation of polling errors across states suggests investors will have enough information on election night to determine the likely victor, wrote economists Michael Cahill and Alec Phillips in a note Thursday. A number of states -- including some key battlegrounds -- allow votes to be processed and counted well before election day, they noted.

"It seems fairly likely that there should be enough information on election night from states that will report results quickly for the market to be able to gauge the likely winner," the pair wrote. "In other words, the S&P can trade the likely outcome, even if the AP does not call the race."

Source: Bloomberg

Some of the rising second order risks might also come from the notion that paying for COVID-19 will come from the wealthy. As PM Trudeau has suggested (see below).



Canada

Trudeau pledges tax on 'extreme wealth inequality' to fund Covid spending plan

PM says government will invest billions in housing, health and jobs, but dismissals from rival parties prompt election speculation

Leyland Cecco in Toronto

Wed 23 Sep 2020 18:18 EDT

<https://www.theguardian.com/world/2020/sep/23/trudeau-canada-coronavirus-throne-speech>

And given that stocks saw such prodigious gains since March, and especially August. Is it any wonder why we are seeing some profit taking? At the same time, there are some certainties, which we believe have a major influence on future market performance:

- Bonds valuations imply higher equity P/E --> IG bonds trade at 53X P/coupon vs 20X equity
- Fed is dovish and supportive of asset prices
- US economy is expanding and recovering
- \$4.5 trillion of cash on sidelines
- retail investors are bearish --> AAll is -21% and persistently negative

The above factors are not associated with major market tops, but rather, seem to argue stocks are in the earlier stages of recovery. And while the incoming economic data has not been universally strong, consumers seem to be healthier than is apparent. Take a look at the latest Chase credit card spending tracking -- September is the best month (yoy) since the start of the pandemic.



Source: twitter

Bottom line, I think stocks are struggling and perhaps not surprisingly. Like we said yesterday, we should be mindful there is a level where "the worst is yet to come is priced in" and one potential level is S&P 500 3,224, because that is a 62% retracement of the gains since June. And just below that is the 200D moving average of 3,100. So, we are in the zip code of these key levels.

I was chatting with Rob Sluymer, our Head of Technical Strategy, and he believes markets will resolve this sometime in the next few weeks. So, it is possible this level of chop continues for a while.

As a last note, US companies survived a stress test that is 5 standard deviations beyond what anybody ever expected. And most have emerged stronger and with better operating leverage. This is the reason we see long-term equity risk premia falling, which translates into higher P/E. And if a vaccine/cure emerges, there is a binary lift to many stocks.

We have updated our "trifecta epicenter" list of stocks (*). These are the names that are OW by:

- Brian Rauscher, Head of Global Portfolio Strategy;
- Rob Slumyer, Head of Technical Strategy;
- DQM ranked 1 by quant model, tireless Ken

20 additions to Trifecta

Consumer Discretionary: BWA, CRI, NWL, MGM, CHH, HLT, MAR, NCLH, RCL, DRI, SBUX, GPC

Industrials: EMR, SNA, LUV

Basic Materials: MLM, CF, NUE, RS

Real Estate: STOR

14 deletions from Trifecta

Consumer Discretionary: LVS, CCL, YUM, EXPE

Energy: HAL, EOG, PXD

Financials: PRU, AFG

Real Estate: ACC, FRT, KIM, NNN, EPR

Revised list is below.

Ticker	Companyname	Sub-industryname	Current Price	Market Cap (\$mm)	DQM Quintile 1	Brian Rauscher	Robert Sluymer
Consumer Discretionary							
Automobiles & Components							
	GM	General Motors Co	Automobile Manufacturers	\$28.98	\$41,659	OW	OW OW
New	BWA	Borgwarner Inc	Auto Parts & Equipment	\$36.99	\$7,675		OW OW
Consumer Durables & Apparel							
New	CRI	Carter'S Inc	Apparel, Accessories & Luxury	\$86.31	\$3,785	OW	OW OW
	VFC	Vf Corp	Apparel, Accessories & Luxury	\$69.14	\$27,030		OW OW
	LEG	Leggett & Platt Inc	Home Furnishings	\$41.15	\$5,456	OW	OW OW
	TPX	Tempur Sealy International Inc	Home Furnishings	\$85.01	\$4,422	OW	OW OW
	PHM	Pultegroup Inc	Homebuilding	\$44.05	\$11,894	OW	OW OW
	TOL	Toll Brothers Inc	Homebuilding	\$47.11	\$5,991		OW OW
New	NWL	Newell Brands Inc	Housewares & Specialties	\$16.65	\$7,092	OW	OW OW
Hotels, Resorts, Cruise Lines, Restaurants & Theme Parks							
New	MGM	Mgm Resorts International	Casinos & Gaming	\$21.18	\$10,453		OW OW
New	CHH	Choice Hotels International In	Hotels, Resorts & Cruise Lines	\$85.00	\$4,696		OW OW
New	HLT	Hilton Worldwde Holdings Inc	Hotels, Resorts & Cruise Lines	\$83.47	\$23,036		OW OW
New	MAR	Mariott International IncMd	Hotels, Resorts & Cruise Lines	\$91.31	\$29,626		OW OW
New	NCLH	Norwegian Cruise Line Holding	Hotels, Resorts & Cruise Lines	\$14.55	\$4,032		OW OW
New	RCL	Royal Caribbean Cruises Ltd	Hotels, Resorts & Cruise Lines	\$59.47	\$12,874		OW OW
	WH	Wyndham Hotels & Resorts Inc	Hotels, Resorts & Cruise Lines	\$46.86	\$4,386		OW OW
	WYND	Wyndham Destinations Inc	Hotels, Resorts & Cruise Lines	\$30.02	\$2,566	OW	OW OW
	SIX	Si xFlags Entertainment Corp	Leisure Facilities	\$20.35	\$1,692		OW OW
New	DRI	Darden Restaurants Inc	Restaurants	\$97.76	\$12,658		OW OW
New	SBUX	Starbucks Corp	Restaurants	\$82.90	\$97,074		OW OW
Retailing							
	FL	Foot Locker Inc	Apparel Retail	\$32.79	\$3,431		OW OW
	GPS	Gap Inc/The	Apparel Retail	\$16.34	\$6,095		OW OW
New	GPC	Genuine Parts Co	Distributors	\$93.84	\$13,552	OW	OW OW
	ULTA	Ulta Beauty Inc	SpecialtyStores	\$214.95	\$12,143		OW OW
Energy							
Oil & Gas Storage & Transporta							
	WMB	Williams Cos Inc/The	Oil & Gas Storage & Transporta	\$19.85	\$24,186		OW OW
Financials							
Banks							
	FITB	Fifth Third Bancorp	Regional Banks	\$19.54	\$13,967	OW	OW OW
	WFC	Wintrust Financial Corp	Regional Banks	\$37.58	\$2,170	OW	OW
Diversified Financials							
	SYF	Synchrony Financial	Consumer Finance	\$24.69	\$14,460	OW	OW OW
Insurance							
	BHF	BrightHouse Financial Inc	Life & Health Insurance	\$25.54	\$2,386	OW	OW

Ticker	Companyname	Sub-industryname	Current Price	Market Cap (\$mm)	DQM Quintile 1	Brian Rauscher	Robert Sluymer	
Industrials								
Capital Goods								
	OC	Owens Corning	Building Products	\$66.19	\$7,193	OW	OW	OW
	ACM	Aecom	Construction & Engineering	\$39.02	\$6,249	OW		OW
	WAB	Westinghouse Air Brake Techni	Construction Machinery& Heavy	\$60.17	\$11,488	OW	OW	
New	EMR	Emerson Electric Co	Electrical Components & Equipm	\$64.06	\$38,479	OW	OW	OW
	CSL	Carlisle Cos Inc	Industrial Conglomerates	\$117.62	\$6,440	OW	OW	
	GE	General Electric Co	Industrial Conglomerates	\$6.05	\$53,045	OW	OW	
	CFX	Colfax Corp	Industrial Machinery	\$29.99	\$3,567	OW	OW	
	DOV	Dover Corp	Industrial Machinery	\$107.02	\$15,425	OW	OW	OW
	MIDD	MiddlebyCorp/The	Industrial Machinery	\$91.98	\$5,135		OW	OW
New	SNA	Snap-On Inc	Industrial Machinery	\$140.82	\$7,701	OW	OW	OW
	XYL	Xylem Inc/Ny	Industrial Machinery	\$82.02	\$14,793		OW	OW
Transportation								
	AAL	American Airlines Group Inc	Airlines	\$11.77	\$5,986		OW	OW
	ALK	Alaska Air Group Inc	Airlines	\$35.73	\$4,414		OW	OW
	DAL	Delta Air Lines Inc	Airlines	\$28.93	\$18,504		OW	OW
	JBLU	Jetblue Airways Corp	Airlines	\$11.32	\$3,078		OW	OW
New	LUV	Southwest Airlines Co	Airlines	\$36.79	\$21,743		OW	OW
	UAL	United Airlines Holdings Inc	Airlines	\$32.70	\$9,527		OW	OW
	UBER	Uber Technologies Inc	Trucking	\$33.18	\$58,450	OW	OW	OW
Basic Materials								
Materials								
	LYB	Lyondellbasell Industries Nv	CommodityChemicals	\$69.34	\$23,442	OW	OW	OW
New	MLM	Martin Marietta Materials Inc	Construction Materials	\$220.38	\$13,756	OW	OW	OW
New	CF	Cf Industries Holdings Inc	Fertilizers & Agricultural Che	\$30.43	\$6,564	OW	OW	OW
	MOS	Mosaic Co/The	Fertilizers & Agricultural Che	\$18.79	\$7,134	OW	OW	OW
New	NUE	Nucor Corp	Steel	\$44.69	\$13,513	OW	OW	OW
New	RS	Reliance Steel & Aluminum Co	Steel	\$101.82	\$6,497	OW	OW	OW
Real Estate								
Reits								
New	STOR	Store Capital Corp	Diversified Reits	\$26.17	\$6,653		OW	OW
	SLG	Sl Green RealtyCorp	Office Reits	\$44.75	\$3,322	OW	OW	
	O	RealtyIncome Cop	Retail Reits	\$58.49	\$20,257	OW	OW	

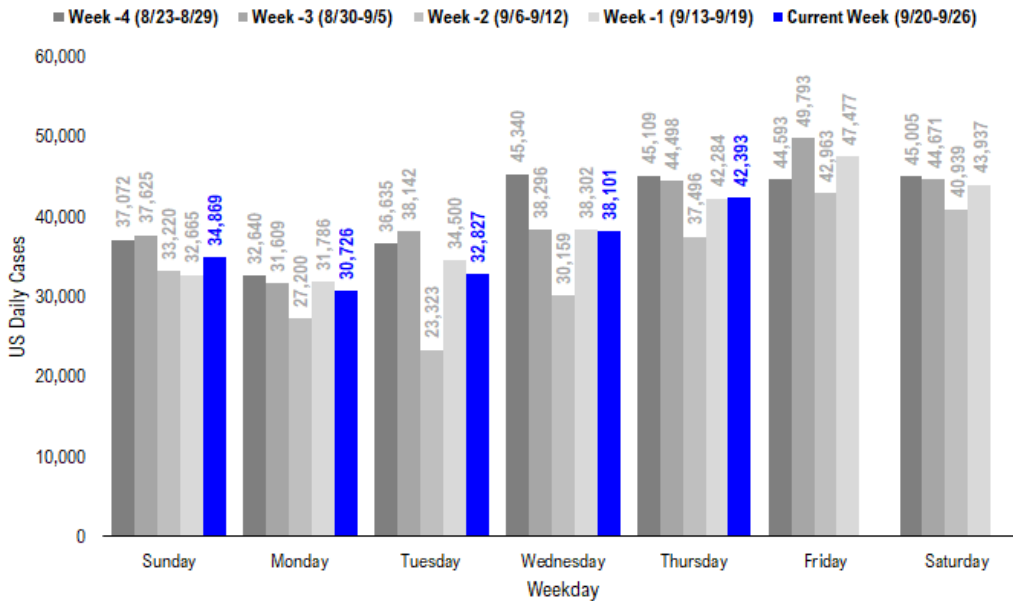
(* Please note that the stocks rated OW on this list meet the requirements of our investment theme as of the publication date. We do not monitor this list day by day. A stock taken off this list means it no longer meets our investment criteria, but not necessarily that it is neutral rated or should be sold. Please consult your financial advisor to discuss your risk tolerance and other factors that characterize your unique investment profile.

Source: Fundstrat, Bloomberg

POINT 1: Daily cases less flat, 42,393 up +109 vs 7D ago but from same set of states

Daily new COVID-19 cases in the US came in at 42,393, which is +109 higher vs 7D ago. The 7D delta turned positive again after being negative for three days (see below). This positive 7D delta might be impacted by the data quality issue of Washington and/or Puerto Rico:

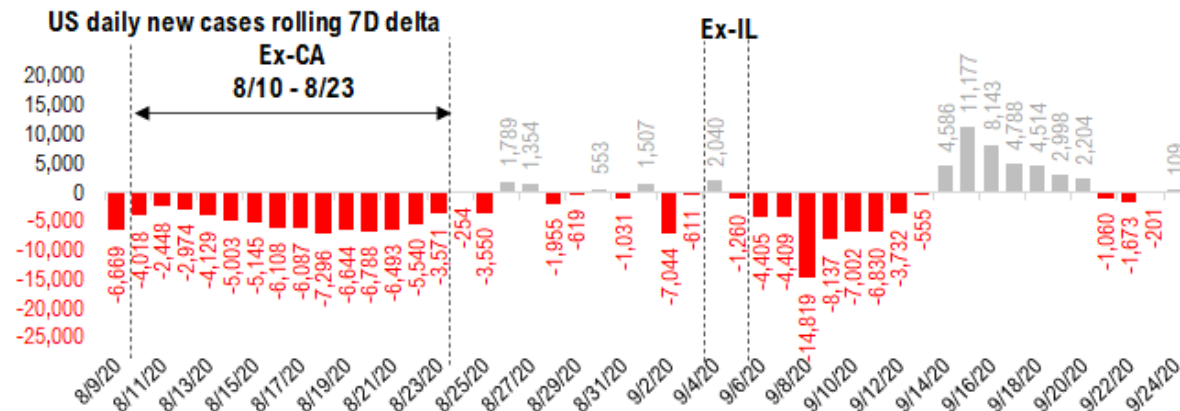
WA Health Department discovered a data error and stopped reporting case data on Sunday (9/20), Monday and Tuesday. Puerto Rico reported an unusual 717 new cases yesterday, up tremendously from 40 cases on Wednesday. However, there's no explanation we could find regarding this spike in daily new cases.



Source: COVID-19 Tracking Project

The data in next few days could give us a clearer picture...

Again, the daily change vs 7D ago, in our view, is the leading indicator as it is what influences the 7D moving average. After the 7D delta turned down in past three days, it turned to positive again yesterday. It is still too early to draw the conclusion based on one-day's data, and the daily cases in next few days are worth watching.

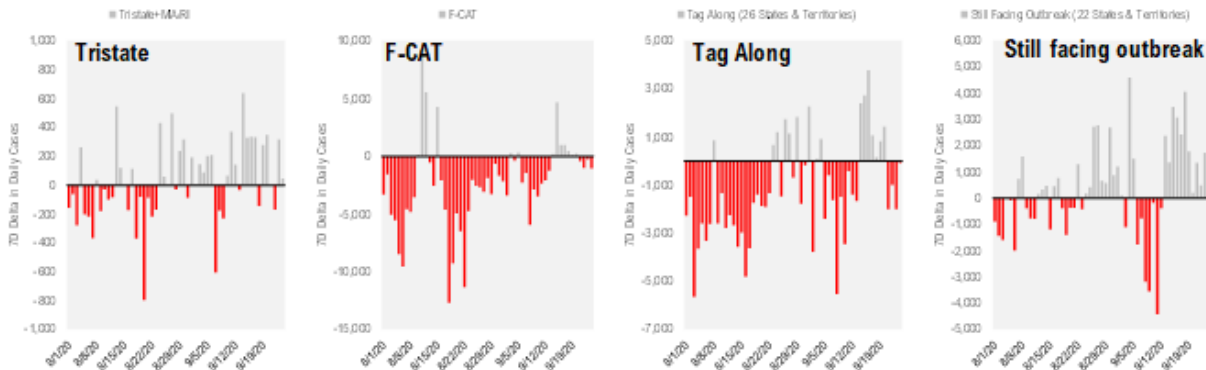


Source: COVID-19 Tracking and Fundstrat

We see US COVID through 4 tiers of US states:

- Wave 1 --> NY tristate areas (inc. RI and MA)
- Wave 2 --> F-CAT (FL, CA, AZ, TX)
- Tag along with Wave 2 -->
- "still facing outbreak" --> 22 states with relatively lower COVID prevalence

Below is the 7D delta for these 4 tiers. And as you can see, the rise in cases vs 7D ago is essentially all in the 4th tier -- states with low case prevalence. And it is these states seeing a rise in cases.



Source: COVID-19 Tracking and Fundstrat

6 states with largest 7D delta in daily cases

Alabama	1,053 vs 670 (-7D)	+383
Wisconsin	2,392 vs 2,034	+358
Puerto Rico	717 vs 382	+335
Texas	3,840 vs 3,518	+322
Utah	1,198 vs 911	+287
Illinois	2,257 vs 2,056	+201
Total		+1,886

6 states with largest 7D delta in daily cases

South Carolina	707 vs 1,425 (-7D)	-718
Florida	2,541 vs 3,255	-714
Arizona	568 vs 1,176	-608
Georgia	1,368 vs 1,847	-479
Missouri	1,365 vs 1,747	-382
Tennessee	835 vs 1,053	-218
Total		-3,119

Daily Case Increases (by State) (09/24)

% total new cases (state cases/ total US cases)
% total US pop (state population/ total US population)

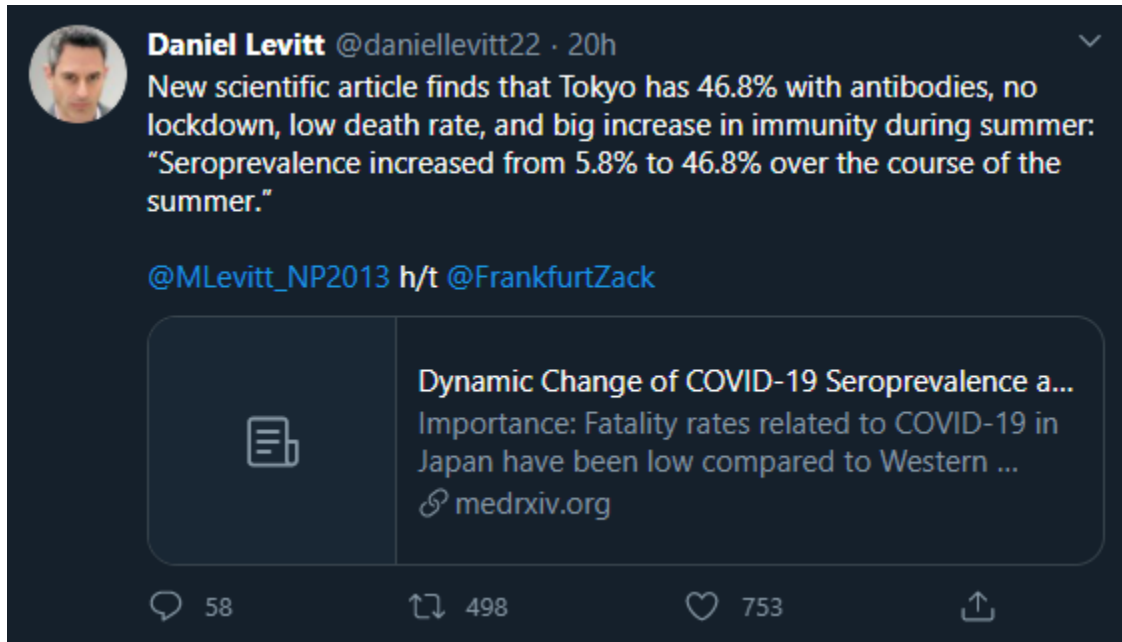
		<i>Sorted</i>				
		7D Ago		Last 3-day Trend		
		9/17/20	9/22/20	9/23/20	9/24/20	vs 7D ago
United States		42,284	32,827	38,101	42,393	+109
States:						
1	Texas	3,518	3,964	2,977	3,840	
2	California	3,238	2,630	3,146	3,170	
3	Florida	3,255	2,470	2,590	2,541	
4	Wisconsin	2,034	1,672	1,762	2,392	
5	Illinois	2,056	1,531	1,848	2,257	
6	North Carolina	1,552	1,168	952	1,688	
7	Georgia	1,847	882	1,457	1,368	
8	Missouri	1,747	1,059	1,580	1,365	
9	Utah	911	650	877	1,198	<-higher
10	Iowa	948	548	1,036	1,148	<-higher
11	Oklahoma	1,034	1,164	1,089	1,083	
12	Alabama	670	804	569	1,053	<-higher
13	Arkansas	883	486	874	1,030	
14	Ohio	1,067	685	903	991	
15	Michigan	829	504	705	982	
16	New York	896	754	665	955	
17	Minnesota	909	480	678	912	
18	Virginia	1,101	872	580	902	
19	Indiana	837	599	711	899	
20	Pennsylvania	933	834	898	853	
21	Tennessee	1,053	739	1,561	835	
22	Mississippi	701	465	552	737	
23	Puerto Rico	382	88	40	717	<-higher
24	South Carolina	1,425	822	742	707	
25	Kentucky	606	814	786	641	
26	Louisiana	478	752	431	577	<-higher
27	Arizona	1,176	595	438	568	
28	New Jersey	569	426	408	564	
29	Colorado	459	654	616	548	
30	Washington	386	0	645	509	<-higher
31	Maryland	631	344	385	503	
32	Nebraska	449	305	397	493	
33	Idaho	396	446	396	491	<-higher
34	Massachusetts	429	173	543	481	
35	North Dakota	390	264	473	470	<-higher
36	South Dakota	395	320	445	463	
37	Nevada	347	262	509	390	
38	Oregon	210	318	190	362	<-higher
39	Montana	216	271	212	330	<-higher
40	New Mexico	158	107	197	237	<-higher
41	West Virginia	234	213	120	202	
42	Connecticut	220	136	155	157	
43	Wyoming	86	72	153	136	<-higher
44	Rhode Island	130	112	133	134	
45	Alaska	105	44	54	128	<-higher
46	Delaware	84	94	69	117	<-higher
47	Hawaii	160	62	168	90	
48	District of Columbia	47	43	29	56	
49	Maine	21	40	25	44	<-higher
50	New Hampshire	34	38	17	37	
51	Guam	32	43	45	28	
52	U.S. Virgin Islands	6	7	2	12	<-higher
53	Vermont	3	2	1	2	
54	Northern Mariana Islands	1	0	0	0	
55	Kansas	0	0	1,267	0	
56	American Samoa	0	0	0	0	

Source: COVID-19 Tracking and Fundstrat

POINT 2: Tokyo "herd immunity"? Recent medRxiv study shows 47% Tokyo seropositive, primarily asymptomatic...

I was intrigued by a tweet by Daniel Levitt. He is the CEO of Bioz Inc. And he is citing a study looking at seroprevalence (antibodies) in Tokyo. The figure that caught my eye:

- Tokyo seroprevalence reached 47% by summer
- Wow.



Source: Twitter

This is the study cited, published this week on 9/21/2020. It was a volunteer-based study and each participant took an antibody test twice between May and August.

medRxiv

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Dynamic Change of COVID-19 Seroprevalence among Asymptomatic Population in Tokyo during the Second Wave

Sawako Hibino,  Kazutaka Hayashida, Andrew C Ahn, Yasutaka Hayashida


doi: <https://doi.org/10.1101/2020.09.21.20198796>

This article is a preprint and has not been certified by peer review [what does this mean?]. It reports new medical research that has yet to be evaluated and so should not be used to guide clinical practice.

Abstract

Info/History

Metrics

 Preview PDF

<https://www.medrxiv.org/content/10.1101/2020.09.21.20198796v1>

There were about 1,900 volunteers in Tokyo and the volunteers had to be healthy. Thus, this was a look at the asymptomatic spread of COVID-19. These were employees of companies around Tokyo.

Design: We conducted an observational cohort study. Healthy volunteers working for a Japanese company in Tokyo were enrolled from disparate locations to determine seropositivity against COVID19 from May 26 to August 25, 2020. COVID-19 IgM and IgG antibodies were determined by a rapid COVID19 IgM/IgG test kit using fingertip blood. Across the company, tests were performed and acquired weekly. For each participant, serology tests were offered twice, separated by approximately a month, to provide self-reference of test results and to assess for seroconversion and seroreversion.

Setting: Workplace setting within a large company.

Participants: Healthy volunteers from 1877 employees of a large Japanese company were recruited to the study from 11 disparate locations across Tokyo. Participants having fever, cough, or shortness of breath at the time of testing were excluded.

Source: MedRvix

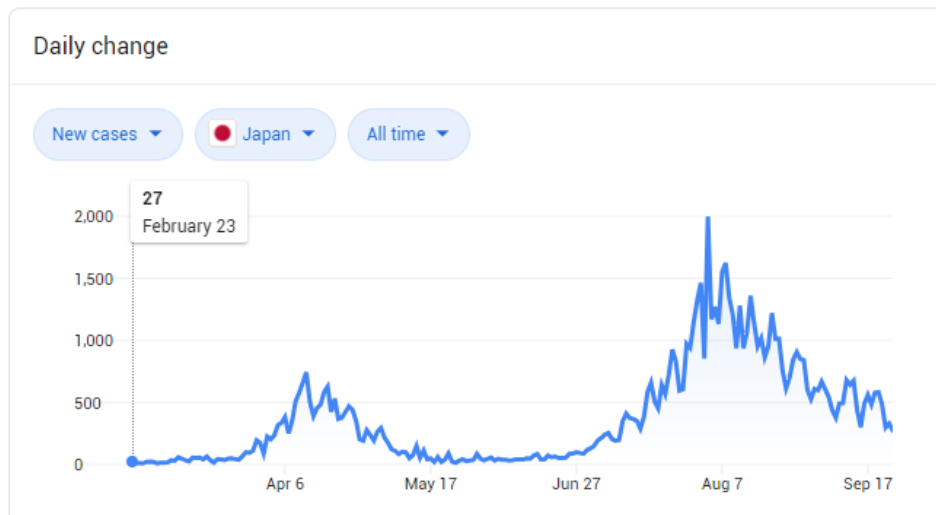
The results are pretty shocking. From May to August, seroprevalence reached 47% in Tokyo, and the surge was in late-June/early-July. Think about that, nearly 50% of the volunteers tested positive for COVID-19 antibodies.

Results: Six hundred fifteen healthy volunteers (mean + SD 40.8 + 10.0; range 19 - 69; 45.7 % female) received at least one test. Seroprevalence increased from 5.8 % to 46.8 % over the course of the summer. The most dramatic increase in SPR occurred in late June and early July, paralleling the rise in daily confirmed cases within Tokyo, which peaked on August 4. Out of the 350 individuals (mean + SD 42.5 + 10.0; range 19 - 69; 46.0 % female) who completed both offered tests, 21.4 % of those individuals who tested seronegative became seropositive and seroreversion was found in 12.2 % of initially seropositive participants. 81.1% of IgM positive cases at first testing became IgM negative in approximately one month.

Source: MedRvix

Tokyo has ~9.3 million residents. So clearly, daily cases below and total cases in Tokyo is not approaching 4 million (seroprevalence implied). Daily cases below peaked at 2,000 in Tokyo and it would take 5.5 years to get to confirmed cases of 4 million.

- so as the authors note, most cases of COVID-19 in Tokyo appear to be asymptomatic.
- It seems less than 1% of cases have symptoms.



Source: Google

The authors also posit that the actual fatality rate of COVID-19 in Tokyo is 0.0006%, which is shockingly low death rate. This is 6 deaths per 1 million infections. Of course, there are many reasons it could be this low:

- lifestyle (health)
- viral load
- mask usage
- etc.

In Tokyo, mask compliance is extremely high, so while there is case spread, it is possible the viral load is smaller.

20) claimed 244 lives. Assuming an infection rate of 40 % within the Tokyo urban population (14 million), the infection fatality rate (IFR) during this period could potentially be as low as 0.0006%, which is as low as the lowest IFR observed among teens in Switzerland⁴. Future studies may consider evaluating whether lifestyle/habits, viral strain, the widespread use of masks, and/or host factors such as immunological memory are responsible for the observed low fatality.

Source: MedRxiv

POINT 3: Ode to Vitamin D, Jamieson Wellness Inc direct play...

Our clients know we have written multiple times on the importance of Vitamin D to maintain a healthy immune system and its potential benefits in fighting and even preventing COVID-19. One of our clients in Boston shared with us this report from the National Bank of Canada on a company called Jamieson Wellness Inc. Among the many supplements and health products the company produces, one of them is Vitamin D.



NATIONAL BANK OF CANADA
FINANCIAL MARKETS

NBCFM Research | Daily Bulletin

Personal Products
Industry Rating: Overweight (NBF Economics & Strategy Group)
September 23, 2020

Jamieson Wellness Inc.

Target Up on Vitamin D's Role in COVID-19 and Expectations of Continued Supplement Use

JWEL (TSX) C\$39.50	STOCK RATING Outperform <small>(Unchanged)</small>	TARGET C\$41.50 <small>(Was C\$39.75)</small>	EST. TOTAL RETURN 6.3%
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Maintain Outperform

Pandemic continues to shine spotlight on supplements

As the pandemic develops into a second wave, we expect demand for vitamins/supplements to remain elevated. While the focus, as discussed in our prior notes, had initially been on Vitamin C, several recent studies have found a statistically significant association between Vitamin D deficiency / levels and C-19 cases, test positivity or mortality. In this note, we look at some of these findings in addition to ones from a recent survey showing that of the supplement users which increased their intake (39%), a large percentage (98%) plan to continue their current, elevated supplement routine.

STOCK DATA

52-Week High and Low (\$)	40.25-22.33
Dividend per Share (\$)	0.50
Dividend Yield (%)	1.3
Shares Outstanding (Min)	39.7
Market Capitalization (\$Min)	1,566.4
Net Debt (\$Min)	157.0

NBCFM ESTIMATES & VALUATION

Fiscal Y/E December	2019A	2020E	2021E
Revenue (\$Min)	345.0	395.0	425.9
Adj. EBITDA (\$Min)	75.9	88.0	97.5
Adj. EPS (\$)	0.96	1.14	1.20
Adj. CFS (\$)	1.11	1.28	1.48
Dividend / Share (\$)	0.40	0.49	0.50
EV/EBITDA (x)	23.0	19.8	17.8
EV/Sales (x)	5.0	4.4	4.1
P/CF (x)	35.7	30.9	26.6
Net Debt to FY+1		1.6	
EBITDA (x)			

Source: National Bank of Canada

This is good news. Foremost, we recommend you take vitamin D supplements (Dr. Fauci does this). And if you want a way to express a way to improve your portfolio health, you can buy this stock.

- It is traded in Canada under the ticker JWEL CN
- The stock has been very good this year



This report also shows 5 studies that show the benefits of Vitamin D. These are shown below.

Figure 1: Studies on the association between Vitamin D and COVID-19

	Study 1	Study 2	Study 3
Conclusion: Vitamin D and Covid Association	Yes	Yes	No
Main Finding	Relative risk of testing positive for C-19 was 1.77x greater for patients with vitamin D deficiency	Vitamin D level is significantly lower in C-19 positive patients versus negative patients	No evidence of link between Vitamin D concentrations and risk of C-19 infection
Location	U.S.	Switzerland	United Kingdom
Number of patients	489	107	1,474
Time of Vitamin D deficiency / level testing	Within 1 year prior being tested for C-19 (the latter March 3, 2020 - April 10, 2020)	Generally 3 days after C-19 test between March 1, 2020 to April 14, 2020	2006 to 2010
Confounding factors / variables	Broad set of demographic and comorbidity indicators	Diet, Vitamin D supplementation	Broad set of demographic and comorbidity indicators
Controlled for confounding factors?	Yes	No	Yes
Statistically significant result	Yes	Yes	Yes
Study Author	Meltzer, et al. 2020	D'Avolio et al. 2020	Hastie et al. 2020
Study Title	Association of Vitamin D Status and Other Clinical Characteristics With COVID-19 Test Results	25-Hydroxyvitamin D Concentrations Are Lower in Patients with Positive PCR for SARS-CoV-2	Vitamin D concentrations and COVID-19 infection in UK Biobank
	Study 4	Study 5	
Conclusion: Vitamin D and Covid Association	Yes	Yes	
Main Finding	Association between mean Vitamin D levels with number C-19 cases and mortality in Europe	Low Vitamin D concentrations appear to be associated with increased C-19 mortality	
Location	Europe	Europe	
Number of patients	NA	NA	
Time of Vitamin D deficiency testing in relation to C-19 test	NA	NA	
Confounding factors / variables	Data from several publications; not tracked at patient level Variability of C-19 data across countries, varied rate of infections, demographics, etc	Data from several publications; not tracked at patient level Variability of C-19 data across countries, varied rate of infections, demographics, etc	
Controlled for confounding factors?	No	No	
Statistically significant result	Yes	Yes	
Study Author	Ilie et al. 2020	Laird et al. 2020	
Study Title	The role of vitamin D in the prevention of coronavirus disease 2019 infection and mortality	Vitamin D and Inflammation: Potential Implications for Severity of Covid-19	

Source: JAMA Network, Nutrients, Diabetes & Metabolic Syndrome, Aging Clinical and Experimental Research, Irish Medical Journal, NICE, NBF

Source: National Bank of Canada

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