

The Coronavirus Chronicles: The Challenges of Stress Testing in a Pandemic

They say risk management is a journey, not a destination. In that spirit, what follows depicts the evolution of a stress test designed to keep pace with a pandemic.

Episode One

The news started to build in early January 2020, as reports of a new SARS-like viral outbreak in China—temporarily named “SARS-CoV-2” by the WHO¹—began to get traction in the media. Little at this point was known about the virus—it even lacked an agreed-upon name—and in its report, the WHO did not “recommend any specific measures for travelers. WHO advises against the application of any travel or trade restrictions on China based on the information currently available.”

Tasked with designing a stress test to estimate the impact of this apparently local health scare, the natural candidate was a historical stress test replaying the events of the SARS outbreak of 2003 over today’s global equity portfolio. Those results can be found in the blog post [“What does it take to recover from the coronavirus? Mostly time and liquidity”](#) on the Qontigo website. In summary, this historical stress test predicted a 13% fall in the STOXX Global 1800 benchmark portfolio in Q1, 2020, followed by a sharp 21% rebound in 2Q2020. We were younger then and, as it turns out, too uninformed to be accurate and too arrogant not to try.

Episode Two

By the third week of February, the Covid-19 outbreak had been declared a global pandemic by the WHO. The data available then offered a mixed picture for investors. China claimed to have tamed the outbreak, but there was clear evidence that the genie was out of the bottle and spreading fast across Europe, even reaching the shores of the US. It was clear that a new stress test was required, one that could merge the past with the present. My esteemed colleague, Christoph Schon, took it upon himself to design a transitive stress test that would use a fall in the US stock market as shock, but reference actual historical periods of market corrections to calibrate the correlation with all other assets in our global multi-asset class model portfolio. For full details, please read his blog post [“Time to put the stress \(test\) on the coronavirus for a change...”](#) on the Qontigo website. In summary, riskier asset classes, such as equities, were seen falling just under 10%, in sympathy with the US market shock used, and safe-haven assets, such as government bonds, the JPY and Gold, were seen rising by a couple of percentage points. All-in-all, not an unexpected result. That said, the key takeaway from this stress test was that this correction would likely happen in a logical and orderly fashion. A week later it was clear that most investors thought now was the perfect time to panic.

¹ [WHO Statement regarding cluster of pneumonia cases in Wuhan, China.](#)

Episode Three

At this point, we sought the help of an outside economist, Milton Ezrati², with whom we have worked previously, to derive several economic scenarios upon which to build a more informed stress test. Based on investors’ emotional reactions and the uncertainty surrounding any economic model inputs at that time, it was decided that the scenarios should focus on the development of the pandemic, as well as the effectiveness of any policy response. Keeping in mind that stress-test scenarios should be extreme but also plausible, the five scenarios³ used for this exercise were named:

1. Black Death
2. SARS Model with Deft Policy
3. SARS Model with Inept Policy
4. HIV Model with Deft Policy
5. HIV Model with Inept Policy

Scenario 1 is by far the worst-case scenario but clearly one that could explain the 30% or so plunge in the stock market and the 200-300 surge in credit spreads seen in the bond market over the course of just 21 trading days (February 19 – March 23, 2020). This scenario would lead to a disorderly exit from risky asset classes and a rush for safety into US Treasuries and other government bonds. The rest of the scenarios offer a more nuanced reaction and focus on the type of policy response as the key variable for the future.

Using the Axioma Risk platform, we performed transitive stress tests on the STOXX Global 1800 as of March 31, 2020 for each of the five scenarios, shocking the S&P 500 and the US 10-Year Treasury yield and using an expanding historical window to calibrate the correlation between these two factors and the holdings in our portfolio. 2020_Q1 correlations were calibrated over the last 60 days. 2020_Q2, used the correlations from the last 90-days. 2020_Q3 used the last 120-days, and the rest used one year of historical data.

STOXX Global 1800	2020_Q1	2020_Q2	2020_Q3	2020_Q4	2021_Q1	2021_Q2	2021_Q3	2021_Q4
Black Death	-0.8%	-12.0%	-18.6%	-32.8%	-33.2%	-28.7%	-25.5%	-20.3%
SARS with Deft Policy	0.8%	9.0%	17.0%	29.1%	30.2%	30.0%	31.2%	31.8%
SARS with Inept Policy	0.8%	9.0%	17.0%	31.5%	37.2%	45.6%	58.8%	51.4%
HIV with Deft Policy	-0.8%	-13.2%	-16.1%	-18.4%	-19.1%	-13.4%	-8.4%	-3.2%
HIV with Inept Policy	-0.8%	-7.5%	-13.3%	-19.6%	-28.0%	-28.5%	-29.9%	-25.5%

A key feature of this round of stress testing was the hypothesis that the pandemic would follow the same path as previous ones and have a disastrous but short-lived impact on the economy, followed by a rebound—the strength and shape of which would be left to the success (or not) of the policy response for each scenario.

² Milton Ezrati is an economist, investment manager and author. He currently serves as the Chief Economist of Vested, a financial communications agency. His blog, [Bitesize Investing](#), discusses the basics of successful investing.

³ A detailed description of Ezrati’s scenarios can be found in Appendix A.

Episode Four

On April 20, 2020, after a nearly 30% rebound in markets, it became clear that a new stress test was needed, one that did not have the health crisis as its key variable, but rather that focused on the future path of economic growth, given both the policy responses that had been announced since the last stress test, and the proposed May reopening of major economies. These new scenarios were designed to answer the question, what's next⁴?

- 1) **Scenario 1: Successful Reopening (SR).** "A coordinated, successful, and timely economic reopening from today's lockdowns and quarantines."
- 2) **Scenario 2: Mismanaged Reopening (MR).** "Poorly organized openings that delay an economic recovery but avoid a renewed spate of infections."
- 3) **Scenario 3: Second Spike Infections (SSI).** "An aggressive reopening that creates a new spike in infections, necessitating another round of lockdowns and quarantines."
- 4) **Scenario 4: Financial Problems (FP).** "A market overreaction to the dangers involved with a reopening, leading to a liquidity squeeze, trading interruptions, and financially induced economic reverses."

We repeated our transitive stress testing exercise on the STOXX Global 1800 as of April 20, 2020, using the revised economic scenarios described above. The table below shows the resulting cumulative quarterly path the benchmark portfolio would follow for a buy-and-hold strategy.

FTSE World Developed (03/31)	2020_Q1	2020_Q2	2020_Q3	2020_Q4	2021_Q1	2021_Q2	2021_Q3	2021_Q4	2022_Q1
Successful Reopening	0.0%	7.3%	13.6%	17.0%	14.1%	12.1%	15.7%	17.6%	19.1%
Mismanaged Reopening	0.0%	7.3%	4.9%	-1.7%	1.7%	6.7%	11.2%	16.1%	17.7%
Second Spike Infections	0.0%	6.4%	13.6%	7.6%	4.3%	-0.2%	-1.0%	5.6%	10.5%
Financial Problems	0.0%	7.3%	6.5%	1.7%	-3.6%	-7.5%	-7.5%	5.6%	1.5%

Scenario 1 is by far the most optimistic of the scenarios and describes investors' hopes for a V-shaped recovery. In this scenario, global equities would follow their current rebound, albeit on a flattening course in the latter stages.

Scenario 2 is simply a more tame variant of Scenario 1, describing a more U-shaped or swoosh-shaped recovery path caused by staggered reopenings across economies, instead of the big-bang approach of Scenario 1. In this scenario, the rebound experienced between March 24 and April 20 takes a pause in Q3 & Q4 on the back of mixed economic data, but eventually regains the same course for the remainder of the forecast period and ends Q1 2022 at almost the same level as Scenario 1.

Scenario 3 answers the question, "what if we reopened too soon and too big?" In this scenario, a return to normal proves to be overly optimistic, as safety measures are ignored and a second wave of infections soon begins. This scenario describes a W-shaped recovery for the economy, with Q2 & Q3 2020 looking like Scenario 1, but a rise in new infections soon turns to renewed

⁴ A detailed description of the rationale behind these revised scenarios can be found in Appendix B.

countermeasures by the local authorities requiring a new set of lockdowns. In this scenario, gains made in Q2 & Q3 2020 quickly evaporate, putting investors at the end of Q3 2021 with nothing to show for their risk-taking. The growth in new cases is soon brought to a halt by the new measures, perhaps a vaccine is now released, and the economy starts its rebound once again.

Scenario 4 describes a situation where the failure of the reopening leads to a consensus that things will not return to normal. This, in turn, leads to sort of 'run-on-the-banks' type of reaction, leading to a liquidity drought and another financial crisis. In this scenario, further damage is done to the economy in addition to the results from the lockdowns and financial markets taking longer to recover. It should be noted that the Fed and other central banks have been keenly aware of this possible scenario and through their early actions have signaled that they intend to stay ahead of the curve and avoid it at all costs.

The next step for us was to assign probabilities to each of these scenarios and present a probability-weighted forecast for our STOXX Global 1800 portfolio. As of April 20, 2020, given the developments in Asia and Europe around the falling number of cases and the announced plan for May reopening across major economies, scenario one's V-shaped recovery forecast was given the highest probability at 50%. Scenario 2's U-shaped recovery was given only a 20% probability, given that by then, most governments had announced their decisions to reopen in May and staggered or uncoordinated reopenings now seemed unlikely. Finally, the sharp rebound in risky assets, the fall in credit spreads, and the insistence of central banks on avoiding another financial crisis as described in Scenario 4, meant that we only gave this scenario a 10% probability.

We ran the four stress tests on our global multi-asset class portfolio and formed a probability-weighted expected shortfall for each of the sub-asset classes in the portfolio. In the table below, the row in green shows the portfolio-level outcome, while the rows below are reported as a percent change in present value for each sub-portfolio. Again, these results are cumulative.

SCENARIO-WEIGHTED RESULTS (WR)	% Weight	WR_2020Q2	WR_2020Q3	WR_2020Q4	WR_2021Q1	WR_2021Q2	WR_2021Q3	WR_2021Q4	WR_2022Q1
MAC Portfolio (April 20 Probabilities)	100	-1.7	1.6	-0.3	0.0	-1.1	2.9	6.9	7.7
US Equities	30	-3.0	6.6	6.3	3.4	0.6	12.1	23.6	27.9
Developed Markets Equities (ex-US)	15	-0.7	1.9	1.0	-0.4	-1.6	2.6	6.5	7.4
Non-US Government Bonds	10	-1.0	-1.1	-1.8	-1.7	-1.8	-2.1	-2.3	-3.5
Non-US IG Corporate Bonds (USD)	8	-0.7	-0.9	-1.3	-1.1	-1.1	-1.3	-1.4	-2.1
US IG Corporate Bonds (USD)	8	-1.5	-2.0	-3.1	-2.7	-2.7	-3.8	-4.8	-7.0
Global Inflation-Linked Bonds (USD)	5	-2.5	-2.8	-4.4	-3.9	-4.2	-4.9	-5.4	-8.2
US treasury Bonds (USD)	5	-1.3	-1.9	-2.9	-2.4	-2.5	-3.3	-4.0	-5.9
Emerging Market Equities (USD)	5	-0.4	1.4	0.6	0.1	-0.8	2.6	5.8	6.8
Global High-Yield Bonds (USD)	4	-0.1	0.0	0.0	-0.4	-0.5	-0.3	-0.1	-0.3
Gold	3	-5.1	-2.8	-4.4	-3.8	-4.3	-3.8	-3.4	-5.6
Euro	2	-0.1	-0.1	-0.1	0.0	0.0	0.2	0.3	0.4
GBP	2	-1.0	-0.2	-0.1	-0.4	-0.6	0.1	0.6	0.7
Oil	2	-0.5	-2.5	-2.9	-2.2	-1.8	-3.9	-5.7	-8.0
JPY	1	-0.4	-0.4	-0.7	-0.4	-0.3	-0.9	-1.4	-1.9

Given that our April 20, 2020 probabilities favor the more optimistic scenarios, we see from these results that risky assets (i.e., US, Global ex-US, and Emerging Market equities) would all perform well,

while safe-haven assets (i.e., US Treasuries, government bonds, gold, and the JPY) would perform poorly.

Episode Five

On June 18, 2020, we repeated the exercise above using as starting point then-current benchmark values for that date and adjusted our factor shocks to reflect the change in the markets since April 20. Given the new narrative around the success rate of various reopenings, signs of second waves in China, Australia, Germany, the UK and the US, as well as the impact of the pandemic in Latin America and other populous emerging markets, we also made adjustments to our probabilities.

Scenario	April 20, 2020	June 18, 2020	Delta
Successful Reopening (V-Shaped)	50%	40%	Down 10%
Mismanaged Reopening (U-Shaped)	20%	20%	Same
Second Spike Infections (W-Shaped)	20%	40%	Up 20%
Financial Problems	10%	0%	Down 10%
Weighted-Sum	100%	100%	0%

The probability of Scenario 1 was downgraded by 10% to reflect the growing noise around rising new cases, but also cognizant of the fact that another round of lockdowns would be politically unacceptable to some, especially during an election year. The probability of Scenario 2 was left the same, at 20%, because although we did see coordinated reopenings, there remained some restrictions in place, especially for travel and sporting events. We are therefore not seeing a return to pre-Covid-19 normal yet. Scenario 3, with its description of the impact of a second wave of infections, has now doubled to 40% in probability, given the recent data on new cases and the growing noise from authorities about the possibility or reinstating certain stay-at-home measures. Finally, the insistence by central banks that they will not let another financial crisis emerge, and their willingness to do whatever it takes, has led us to downgrade the probability of this scenario to zero for the time being, but we are keeping it in the analysis as it may rise again depending on the type of policy response we see going forward.

Updating the starting point for our two factors, the S&P 500 and the USTB 10-Year yield and the size of the shocks being applied to reflect their then-current distance from our economic forecast, we ran the global multi-asset class portfolio through the same transitive stress test and adjusted the results using our new probabilities. The table below shows the probability-weighted forecast for our portfolios (green row) and each of the sub-asset class portfolios as of June 18, 2020.

SCENARIO-WEIGHTED RESULTS (WR)	% Weight	WR_2020Q2	WR_2020Q3	WR_2020Q4	WR_2021Q1	WR_2021Q2	WR_2021Q3	WR_2021Q4	WR_2022Q1
MAC Portfolio (June 18 Probabilities)	100	-1.8	2.2	-0.5	-0.4	-1.7	3.2	6.3	7.2
US Equities	30	-3.0	8.1	5.5	1.2	-2.2	11.4	20.3	26.0
Developed Markets Equities (ex-US)	15	-0.6	2.6	0.7	-0.7	-2.2	3.1	5.9	7.1
Non-US Government Bonds	10	-1.2	-1.1	-1.7	-1.1	-1.2	-1.4	-1.6	-3.3
Non-US IG Corporate Bonds (USD)	8	-0.8	-0.8	-1.3	-0.7	-0.8	-0.8	-0.9	-2.0
US IG Corporate Bonds (USD)	8	-1.8	-2.0	-3.0	-1.6	-1.5	-2.8	-3.5	-6.6
Global Inflation-Linked Bonds (USD)	5	-2.9	-2.7	-4.2	-2.4	-2.7	-3.2	-3.6	-7.8
US treasury Bonds (USD)	5	-1.5	-1.9	-2.8	-1.4	-1.4	-2.3	-2.8	-5.7
Emerging Market Equities (USD)	5	-0.3	1.8	0.4	-0.3	-1.4	2.8	5.2	6.4
Global High-Yield Bonds (USD)	4	-0.1	0.1	0.0	-0.3	-0.4	-0.1	0.0	-0.3
Gold	3	-6.0	-2.5	-4.2	-2.5	-3.2	-2.2	-2.1	-5.2
Euro	2	-0.2	0.0	-0.1	0.0	-0.1	0.2	0.3	0.4
GBP	2	-1.2	-0.1	-0.1	-0.3	-0.6	0.3	0.7	0.7
Oil	2	-0.7	-2.8	-2.8	-1.2	-0.6	-3.3	-4.4	-7.6
JPY	1	-0.4	-0.4	-0.7	-0.2	-0.1	-0.8	-1.1	-1.8

The weighted results above differ only marginally from our April 20, 2020 results, but offer a framework for the ongoing monitoring of potential outcomes as new information is acquired and probabilities are adjusted.

Summary and Conclusion

The above chronicles the ongoing efforts by a risk manager to constantly adjust to new realities through a data-driven process and to present a probability-weighted view of future outcomes for portfolio managers. No one knows with any level of certainty what even the near-future has in store for us in this Covid-19 world. The best way to protect portfolios from future developments and avoid unexpected losses is to design scenarios of possible future states and measure their impact on your portfolios through rigorous and repeated stress testing. The above details an effort for ongoing forecasts using a disciplined and data-driven framework, that ensures both transparency and control, while remaining contemporaneous with the ongoing news flow.

Appendix A: March 6, 2020

1. Black Death

This is the prospect favored by the tabloid press. In it, containment efforts fail utterly. Infections become widespread and overwhelm the medical system so that the disease's lethality soars until Covid-19 runs its course, say later in 2021. Economic effects – like the Black Death and the influenza pandemic of 1918-19 – overwhelm monetary and fiscal palliatives, and the world economy, including the United States, goes into a sharp, severe recession. Corporate earnings collapse and stocks fall for an extended time. Flights to quality expand credit spreads in the bond market and drive Treasury yields down into negative territory. Late in 2021, equity markets, anticipating the beginning or the end of the troubles, rise before the economy and earnings do. The statistical pattern looks like this⁵:

	<u>2020</u>				<u>2021</u>				
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	
Real GDP*	+1.2	-3.0	-4.0	-3.5	-2.5	-1.5	0	+0.5	
S&P Earnings**		-0.5	-15.0	-25.0	-40.0	-45.0	-30.0	-15.0	-10.0
10-Yr. Treas. Yld.***	+0.9	+0.2	0	-0.1	-0.5	-0.5	0	+0.5	
S&P 500 Index****	2500	2056	1772	1309	1300	1439	1580	1780	

2. SARS with Deft Policy

This second scenario assumes that this virus follows a pattern similar to that of SARS, MERS, and other pandemics of the last 20 years. If this were to happen, Covid-19 would run its course relatively quickly, before the second half of this year, in fact. Because this reality would fail to confirm market fears, stocks and bonds would quickly return to their former trends, and the economy would recover almost as quickly. Since this environment would not need much special fiscal or monetary help, this scenario further assumes that the authorities quickly undo any special stimuli in order to guard against excesses that would subsequently unbalance markets and the economy.

	<u>2020</u>				<u>2021</u>			
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
Real GDP	+1.8	+2.2	+3.7	+3.5	+2.0	+2.5	+2.5	+2.0
S&P Earnings	0	+4.0	+10.0	+9.5	+6.0	+5.0	+4.0	+4.0
10-Yr. Treas. Yld.	+1.1	+1.1	+1.4	+1.5	+1.7	+2.0	+2.1	+2.3

⁵ * Percent change quarter-to-quarter stated at an annual rate.

** Percent change vs. quarter the year before.

*** Average yield to maturity prevailing during the quarter.

**** Index level at quarter-end.

S&P 500 Index 2550 2849 3224 3648 3696 3700 3750 3770

3. SARS with Inept Policy

This scenario is essentially the same as the second scenario, except for the assumption that the authorities fail to undo special stimulus measures quickly enough, creating an overheated economy later in 2021 and something of an equity bubble that begins to burst late that year because of evidence of the economic overheating and rising bond yields.

	<u>2020</u>				<u>2021</u>			
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
Real GDP	+1.8	+2.2	+3.7	+3.5	+3.5	+4.0	+3.5	+2.5
S&P Earnings	0	+4.0	+10.0	+12.0	+14.0	+15.0	+12.0	+10.0
10-Yr. Treas. Yld.	+1.1	+1.1	+1.4	+1.8	+2.1	+2.5	+2.8	+3.0
S&P 500 Index	2550	2849	3224	3756	3962	4290	4803	4526

4. HIV Model with Deft Policy

This scenario, in some sense, lies between the Black Death and the SARS Model scenarios. It takes its cue from the world's reaction to the AIDS pandemic, though it assumes something more widespread for Covid-19. When people first became conscious of HIV and AIDS in the 1980s, fears much like today's affected markets and the economy. But unlike SARS and the other pandemics earlier in this century, AIDS lingered and became an ugly fact of life, like heart disease and cancer. Though it brought with it something of a permanent cloud, markets and the economy recovered when it became apparent that initial fears overstated the danger. It took longer than with SARS for markets and the economy to recapture their former trends. Here, I assume a still longer adjust than occurred with AIDS. With policy, the danger is that the authorities give too little monetary and fiscal support during the adjustment. This scenario assumes a deft application of policy so that it accelerates the ultimate adjustment as fears subside. The next scenario will consider this particular policy mistake.

	<u>2020</u>				<u>2021</u>			
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
Real GDP	+1.8	+1.0	+0.5	+1.5	+1.8	+2.3	+2.5	+2.5
S&P Earnings	0	-5.0	-12.0	-15.0	-4.0	+9.0	+12.0	+10.0
10-Yr. Treas. Yld.	+1.1	+0.8	+0.5	0	0	0	+0.5	+0.8
S&P 500 Index	2500	2050	1900	1825	1795	1990	2206	2400

5. HIV Model with Inept Policy

This scenario makes the same assumptions as the fourth scenario except to assume that the authorities wait too long to generate sufficient stimulative policies.

	<u>2020</u>					<u>2021</u>			
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>		<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
Real GDP	+1.8	+0.5	0	-0.7		-1.5	0	+1.8	+2.5
S&P Earnings	0	-9.0	-15.0	-20.0		-25.0	-15.0	0	+10.0
10-Yr. Treas. Yld.	+0.9	+0.8	+0.5	+0.5		+0.3	0	0	0
S&P 500 Index	2500	2241	2000	1800		1500	1480	1415	1560

Appendix B: April 20, 2020

1. Successful Reopening

This is the brightest scenario of the four. The U.S. economy begins to reopen in the middle of May. The legacy of shutdowns and quarantines imposes a real GDP decline for this quarter, but a recovery begins in June and gains momentum in the third quarter. The economy shows still stronger growth in the fourth quarter of this year and the first quarter of 2021. More organic growth rates return by the spring of 2021. Corporate earnings follow with a slight lag. Because of a lingering preference for safety and the Fed's efforts to support the recovery, Treasury yields stay low initially but then begin to rise as faith in the recovery builds and the Fed begins to unwind its earlier monetary support. Credit spreads gradually shrink.

	<u>2020</u>			<u>2021</u>					<u>2022</u>
	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>	
Real GDP*	-3.5	+3.5	+4.5	+3.5	+2.5	+2.0	+2.3	+2.3	
S&P Earnings**		-10.0	+5.0	+7.0	+15.0	+30.0	+35.0	+20.0	+15.0
10-Yr. Treas. Yld.***	+0.9	+1.1	+1.5	+2.3	+2.3	+2.5	+2.7	+3.0	
S&P 500 Index****	3100	3566	3922	3960	3800	4140	4350	4560	

2. Mismanaged Reopening

Because this scenario assumes that the virus does not rise again, it resembles the first scenario, except that the recovery proceeds in a halting way.

	<u>2020</u>			<u>2021</u>					<u>2022</u>
	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>	
Real GDP	+3.5	+1.5	+1.0	+1.5	+2.5	+2.0	+2.3	+2.3	
S&P Earnings	-10.0	-5.0	0	0	+7.0	+15.0	+25.0	+35.0	
10-Yr. Treas. Yld.	+0.9	+0.9	+0.8	+0.9	+1.0	+1.3	+1.5	+2.0	
S&P 500 Index	3100	2950	2507	275	3100	3500	3890	4160	

3. Second Spike in Infections

The assumption here is that things go much as in the first scenario until summer, when infections begin to rise again, requiring a renewal of shutdowns and quarantines and hence a return of recessionary conditions late in the third quarter and into the fourth quarter, more severe than presently because the economy lacks the momentum it had coming into the present lockdowns and quarantines. As the Fed responds and investors fly to quality, Treasury yields fall, credit spreads

widen and the equity market losses considerable ground. The pressure remains until spring 2021 when “herd immunity” or a vaccine relieves it, allowing a recovery to begin anew in the second half of that year. It proceeds at a slower pace than in the first scenario due to the lingering fears instilled by two pandemic spikes.

	<u>2020</u>			<u>2021</u>				<u>2022</u>
	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>
Real GDP	-3.5	+3.5	0	-4.0	-2.0	0	+3.5	+4.0
S&P Earnings	-10.0	+5.0	-10.0	-25.0	-30.0	-5.0	+40.0	+35.0
10-Yr. Treas. Yld.	+1.1	+1.1	+1.2	+0.9	+0.7	+0.7	+0.9	+1.1
S&P 500 Index	3100	3566	3209	2728	2455	2400	2823	3387

4. Financial Problems

This scenario implicitly assumes that the less than ideal opening of the second scenario engenders a panic in financial markets – that things “will never get back to normal.” Equities falter, credit spreads widen, and liquidity dries up, delaying any economic recovery until much later in the year and keeping it slower even after the recovery begins. The flight to quality and the Fed’s response drive Treasury yields lower. The absence of any further problems with the virus and the Fed’s response allows a slow recovery to begin later in 2021. As in the last financial crisis, equities rise and credit spreads narrow even as the economic response remains sluggish.

	<u>2020</u>			<u>2021</u>				<u>2022</u>
	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>
Real GDP	-3.5	+1.5	+0.5	-3.0	-2.0	+1.0	+1.5	+2.0
S&P Earnings	-10.0	+5.0	-10.0	-25.0	-30.0	-10.0	-5.0	+15.0
10-Yr. Treas. Yld.	+0.9	+1.1	+1.1	+0.7	+0.5	+0.5	+0.8	+0.9
S&P 500 Index	3100	3100	2790	2239	2008	2008	2309	2771