Macroeconomic Forecasts, 2Q2020

Domestic Metrics

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Overview

The economic condition of the United States has changed significantly in the last 6 months. On March 1, 2020 the US had roughly 100 confirmed cases of COVID-19 – by April 1, 2020 there were more than 200,000 confirmed cases, and there are now (as of early July, 2020) approximately 3 million confirmed cases[1]. The nation is currently grappling with massive societal, economic, and political issues, both domestically and abroad.

What is in store for the economy and where are we headed? In forecasting the next stages of our economy, we are drawing on the currently published knowledgebase about the spread of the COVID-19 pandemic, and the recovery locally, domestically, and abroad.

COVID-19, "Stay-at-Home", and Unemployment

The COVID-19 pandemic has severely affected the US and global economies over the past six months. With over 500,000 deaths globally, and 130,000 deaths in the U.S.[2], every aspect of life has become inextricably linked to the Coronavirus. The predominant amount of the population of the U.S. was subject to "stay-at-home" orders by early April, with many of those states lifting their orders in 45 days.

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[1] https://www.worldometers.info/coronavirus/country/us/
[2] https://ourworldindata.org/grapher/total-deaths-covid-19

Figure 1: Initial COVID-19 driven "Stay-at-Home" orders

When State Stay-at-Home Orders Due to Coronavirus Went into Effect
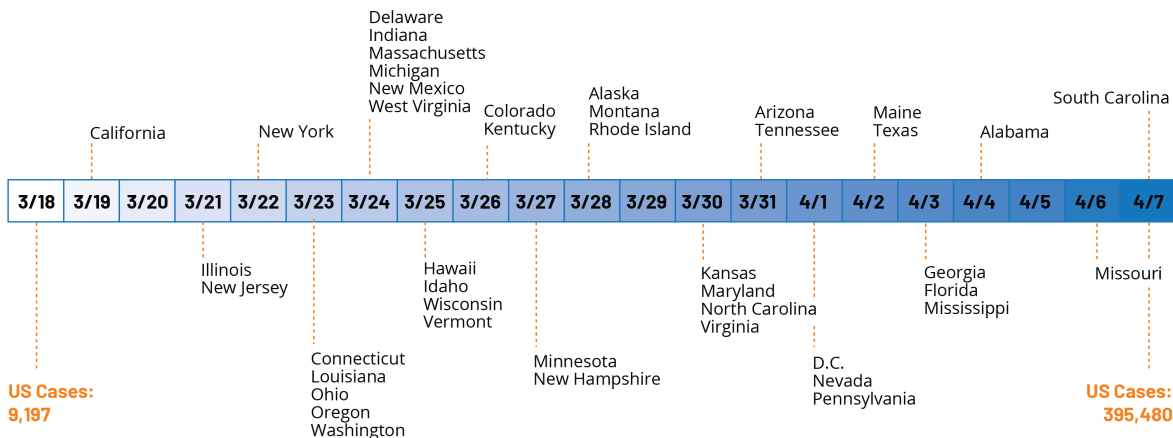
SOURCE: KFF, State Data and Policy Actions to Address Coronavirus, https://www.kff.org/health-costs/issue-brief/state-data-and-policy-actions-to-address-coronavirus/#note-3-10 and state government websites.

Source: https://www.kff.org/wp-content/uploads/2020/04/WEB2-Stay-at-Home-Orders-by-State_1-2.png

The focus of the "Stay-at-Home" orders was to restrict contact between individuals given the virulent characteristics of the new virus. As a result, many of the "Stay-at-Home" orders focused on closing "non-essential" businesses, which had a dramatic, sweeping effect on many portions of the US economy. Since the general population was unsure what their needs would be and where would be available to satisfy those needs (and in what timeframe), savings rates dramatically increased (from 7.7% in December of 2019 to 32% in April 2020[3]), spending decreased[4] (going from a steady annual rate of 4-5% during 2019 to -15.8% in April 2020[5]), and some items became consistently difficult to find at the retail level[6].

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[3] See https://fred.stlouisfed.org/graph/fredgraph.png?g=sJ9a
[4] https://www.bloomberg.com/news/articles/2020-05-29/u-s-consumer-spending-plunges-jobless-benefits-boost-incomes
[5] See https://fred.stlouisfed.org/graph/fredgraph.png?g=sJ9n
[6] See, e.g., https://www.npr.org/2020/03/07/813191533/why-is-there-a-worldwide-run-on-toilet-tissue-amid-the-coronavirus and https://www.usatoday.com/story/money/2020/04/09/coronavirus-clorox-lysol-shortages-walmart-costco-publix-winco-lowes/2961818001/

Figure 2: States with current COVID-19 driven "Stay-at-Home" orders (as of July 8, 2020)

Source: https://www.nbcnews.com/health/health-news/here-are-stay-home-orders-across-country-n1168736
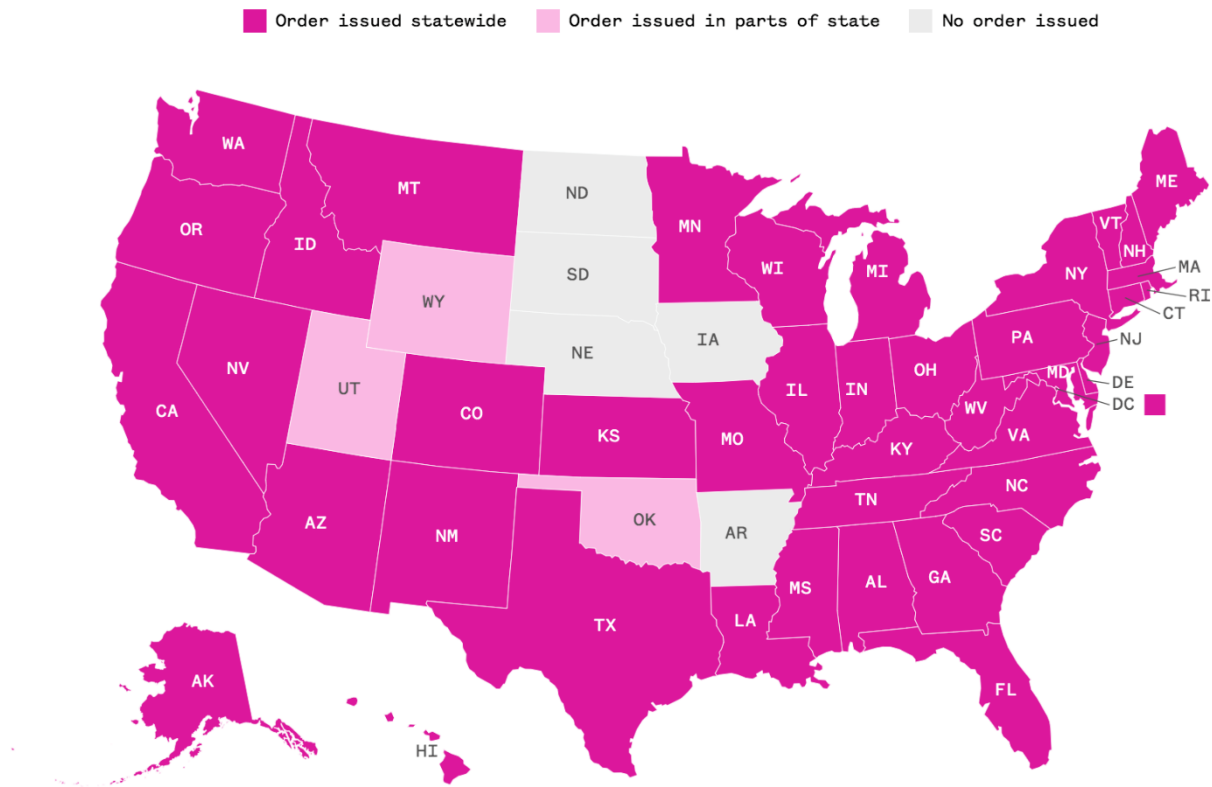
Cumulative new unemployment claims since February 1 (nationally) have surpassed 45 million (as of June 27), as shown in Figure 3; weekly continued unemployment claims peaked at almost 25 million as of May 9, and are shown in Figure 4 below[7]. Figure 5 illustrates that the percentage of the population that was employed; this percentage dropped from about 61 to 51 between February and April of 2020. To highlight the uncertainty of the situation from investors' perspectives, Figure 6 is included to show the CBOE Volatility Index (the VIX), which had traditionally (generally) hovered under 20, spiking at almost 83 in mid-March 2020, and still remains around 30 as of early July.

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[7] We will discuss concerns about the BLS' reported unemployment figures later within this report.

Figure 3: Weekly US Initial Unemployment Claims
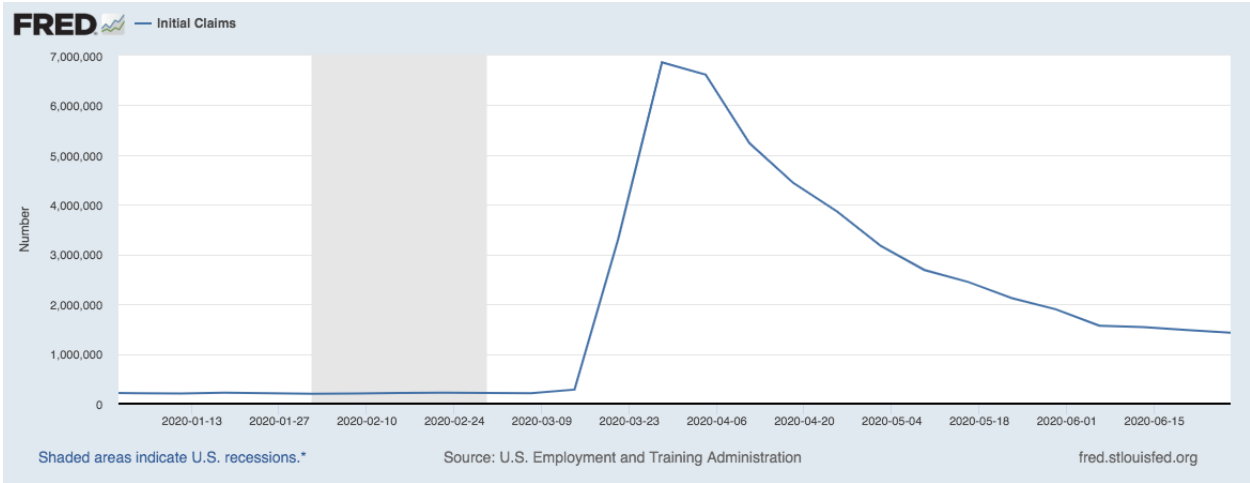
Source: Federal Reserve Bank of St. Louis, Economic Research

Figure 4: Weekly US Continued Unemployment Claims
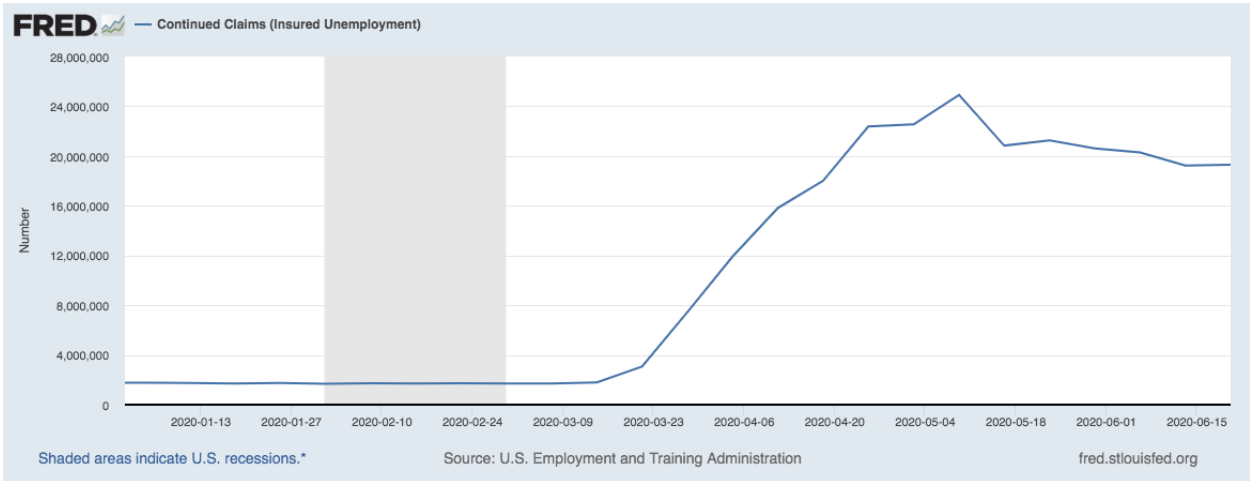
Source: Federal Reserve Bank of St. Louis, Economic Research

Figure 5: Employment-Population Ratio

Source: Federal Reserve Bank of St. Louis, Economic Research

Figure 6: CBOE Volatility Index (VIX)
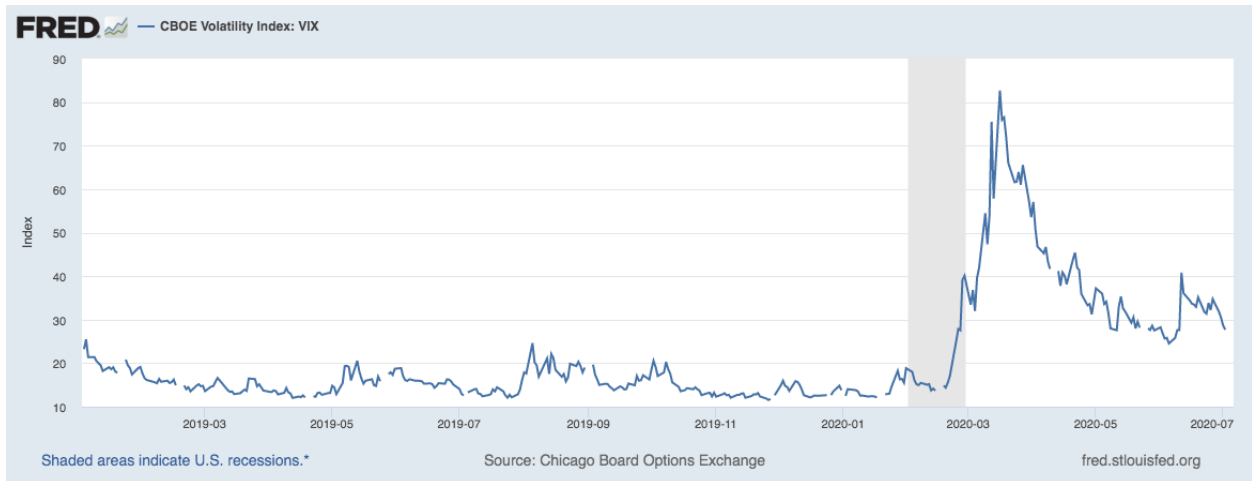
Source: Federal Reserve Bank of St. Louis, Economic Research

The "CARES Act"

To address the situation, the US Congress and President Trump signed The Coronavirus Aid, Relief, and Economic Security Act (the "CARES Act") into law on March 27, 2020[8]. The CARES Act[9] included new fiscal policies as well as expansions to existing economic stabilizing programs (unemployment insurance). The act includes the following economic stimulus/emergency elements:

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[8] https://www.washingtonpost.com/us-policy/2020/03/27/congress-coronavirus-house-vote/
[9] https://www.congress.gov/bill/116th-congress/senate-bill/3548/text

- Expansion to the current unemployment insurance program
  - **FEDERAL PANDEMIC UNEMPLOYMENT COMPENSATION ("FPUC")**: Eligible individuals received an extra $600 weekly benefit for all weeks of unemployment between April 5, 2020 and July 31, 2020
  - **PANDEMIC UNEMPLOYMENT EMERGENCY COMPENSATION ("PUEC")**: Individuals who had exhausted their unemployment benefits received an additional 13 weeks of unemployment insurance;
  - **PANDEMIC UNEMPLOYMENT ASSISTANCE ("PUA")**: Individuals who were ordinarily not covered by unemployment insurance (self-employed, gig-economy workers, and employees who had not worked the minimum-eligibility hours and accumulated the minimum-eligibility earnings) are now eligible for unemployment insurance.

- Expansion to the current cadre of Small Business Administration loan programs[10]
  - **Paycheck Protection Program** provided up to $100 billion in loans for businesses with less than 500 workers: loan amounts worth 2.5 times average monthly payroll with forgiveness of up to 25% of the loan if funds are used to retain employees (extended until August 8[11]) ;
  - **Economic Injury Disaster Loans and Emergency Grants** provided a $10,000 grant for immediate expenses for small businesses;
  - **Small Business Debt Relief:** The SBA would automatically pay the principal, interest, and fees of **CURRENT 7(A), 504, AND MICROLOANS** for a period of six months and will pay the principal, interest and fees of new 7(a), 504, and microloans for loans received before September 27, 2020;
  - **Emergency Bridge Loans** allowed small businesses who currently have a business relationship with an SBA Express Lender to access up to $25,000 in bridge/gap loans.
- Recovery Rebates for Individuals and Families[12]
  - **Checks to individuals/families in the amounts of $1,200 for individuals and $2,400** for families. Rebate amounts were dependent on earning reported in 2018 taxes and phase-out families earning more than $199,000. Individuals and families received additional rebates of $500 per dependent child.

The total value of the CARES Act is reported to be valued at $2.2 trillion[13], and its most noticeable programs are reaching their ends as we enter the 3rd quarter of 2020:

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[10] https://www.sba.gov/funding-programs/loans/coronavirus-relief-options
[11] https://www.cnn.com/2020/07/01/politics/ppp-loan-extension-passes-house/index.html
[12] https://www.congress.gov/bill/116th-congress/senate-bill/3548/text#toc-idC62A2A4676F44E44B6A0D677C490FD17
[13] https://www.wsj.com/articles/whats-in-the-2-trillion-senate-coronavirus-bill-11585185450

1. **Without intervention, the additional $600 unemployment supplements will conclude at the end of July**. The concern of continuing this form of aid is that " … the payment encourages many jobless Americans to stay on unemployment rather than return to work. Many restaurant and retail workers, for example, are earning more from jobless benefits than their previous wages."[14]
2. PPP funds to small businesses were replenished after being initially exhausted, but then paid back by some borrowers due to rules clarifications[15] and public backlash[16,17,18]. **$130B in funds are available as of July 1, 2020**.
3. Additional tax incentives are offered as part of the CARES Act to various entities (including the USPS, US DoD contractors, and federal student loan holders), but not cash outlays to these particular groups.

Recent Issues

Through much of May 2020, it appeared that the US was "getting a handle" on the COVID crisis, with the number of new cases receding and states starting to allow businesses to reopen. Since the Memorial Day weekend, however, the rate of new COVID cases has been increasing at approximately the same rate as the original outbreak in late March. Figure 7 and Figure 8 below shows the number of reported new cases of COVID-19 per the New York Times.

Using California as a representative benchmark, Table 1 shows the distribution of COVID-19 infections by patient age, and

Table 2 shows national death rates by patient age in the US.

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[14] https://www.usatoday.com/story/money/2020/06/22/cares-act-600-unemployment-other-covid-19-relief-set-end/3211921001/

[15] https://www.cnn.com/2020/07/01/politics/ppp-loan-extension-passes-house/index.html

[16] https://www.forbes.com/sites/sarahhansen/2020/04/23/ruths-chris-steak-house-returns-20-million-ppp-loan-as-treasury-issues-new-guidance/#27fbeca86ef7

[17] https://www.forbes.com/sites/sarahhansen/2020/04/29/potbelly-shake-shack-axios-here-are-all-the-companies-returning-ppp-money-after-public-backlash/#48dc95fd7ea0

[18] https://www.cnn.com/2020/06/19/politics/paycheck-protection-program-borrowers-disclosure/index.html

Figure 7: New COVID-19 Cases Reported (per day, rolling reverse-looking 7-day average)

New reported cases by day in the United States
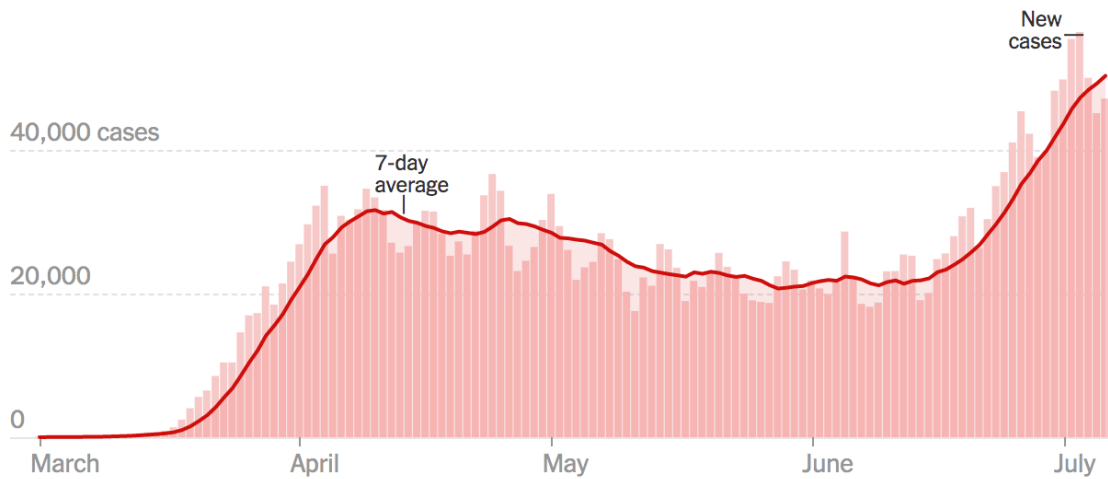
Note: The seven-day average is the average of a day and the previous six days of data.

Source: https://www.nytimes.com/interactive/2020/us/coronavirus-us-cases.html

Figure 8: US New COVID-19 Cases (June 23- July 7)

Source: https://www.nytimes.com/interactive/2020/us/coronavirus-us-cases.html
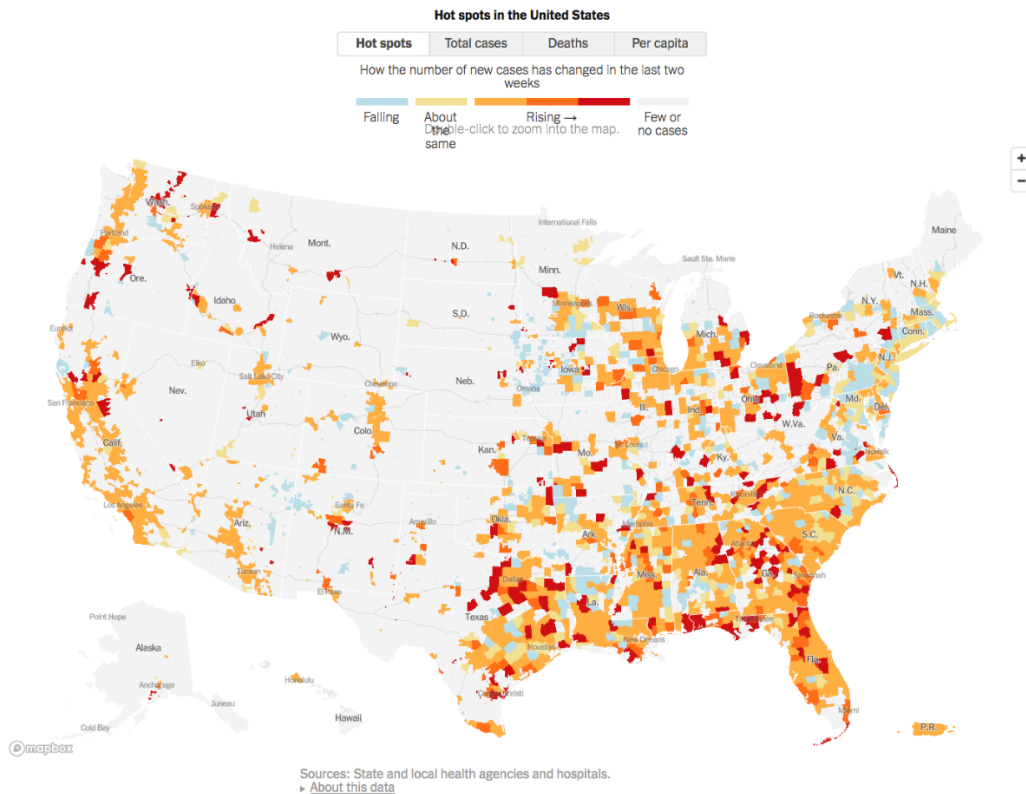
Table 1: Current COVID-19 Infections and Deaths by Age Group: California (as of July 9, 2020)

Age Group	No. Cases	Percent Cases	No. Deaths	Percent Deaths	Percent CA Population
<5	5539	1.8	0	0	5.8
5-17	19,621	6.4	0	0	16.7
18-34	103,001	33.8	80	1.2	24.3
35-49	76,726	25.2	357	5.3	19.3
50-59	44,192	14.5	658	9.7	12.5
60-64	16,516	5.4	490	7.2	5.9
65-69	11,540	3.8	627	9.2	5
70-74	8,276	2.7	722	10.6	4.1
75-79	5,955	2	801	11.8	2.7
80+	12,575	4.1	3,051	45	3.9
missing	356	0.1	1	0	0
Total	304,297	100	6, 787	100	100

Source: https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/COVID-19/COVID-19-Cases-by-Age-Group.aspx

Table 2: COVID Deaths Feb 1 - June 17, 2020

Age Group	Covid-19 Deaths	Percent Deaths
<1	8	0.008%
1-4	5	0.005%
5-14	13	0.013%
15-24	125	0.121%
25-34	699	0.676%
35-44	1,780	1.722%
45-54	4,976	4.815%
55-64	12,307	11.909%
65-74	21,462	20.769%
75-84	27,529	26.640%
85+	34,435	33.322%
ALL AGES	103,339	100.000%

Source: https://www.acsh.org/news/2020/06/23/coronavirus-covid-deaths-us-age-race-14863

The impact of the resurgence of the COVID virus is the return of governmental orders to limit human contact in some states, meaning diminished economic activity. **California, Texas, Michigan, Nevada, and other states actually reversed their relaxed orders**, requiring various measures that had been abandoned to be re-implemented (including limiting occupancy or closing, e.g., bars and restaurants). **Several New England states, Alaska, and Hawaii (seventeen states in total) now require travelers entering from many or all other states to isolate for 14 days, or prohibit travelers from those regions altogether, further limiting economic activity from tourists.**

For instance, in Texas, Gov. Greg Abbott ordered anyone 10 or older to wear a mask in indoor public spaces or when outside if a 6-foot distance from others cannot be maintained. (Counties with no more than 20 active COVID-19 cases are exempt.) Abbott also signed an order to roll back parts of the state's reopening plan. Under this directive, restaurants, which were previously allowed to offer dine-in service at 75 percent capacity, must scale back to 50 percent. Most other businesses can operate at 50 percent capacity. The occupancy limits don't apply to worship services, government operations or youth camps. Hair salons, nail salons and other personal-care businesses don't have an occupancy limit, but workstations must be spaced 6 feet apart. Also, several counties have ordered businesses to require their employees to wear face masks[19]. See Figure 9 for Texas' current geographic distribution of COVID cases.

Figure 9: Texas Coronavirus Cases (as of July 8, 2020)

Sources: State and local health agencies and hospitals.
▶ About this data

Source: https://www.nytimes.com/interactive/2020/us/texas-coronavirus-cases.html
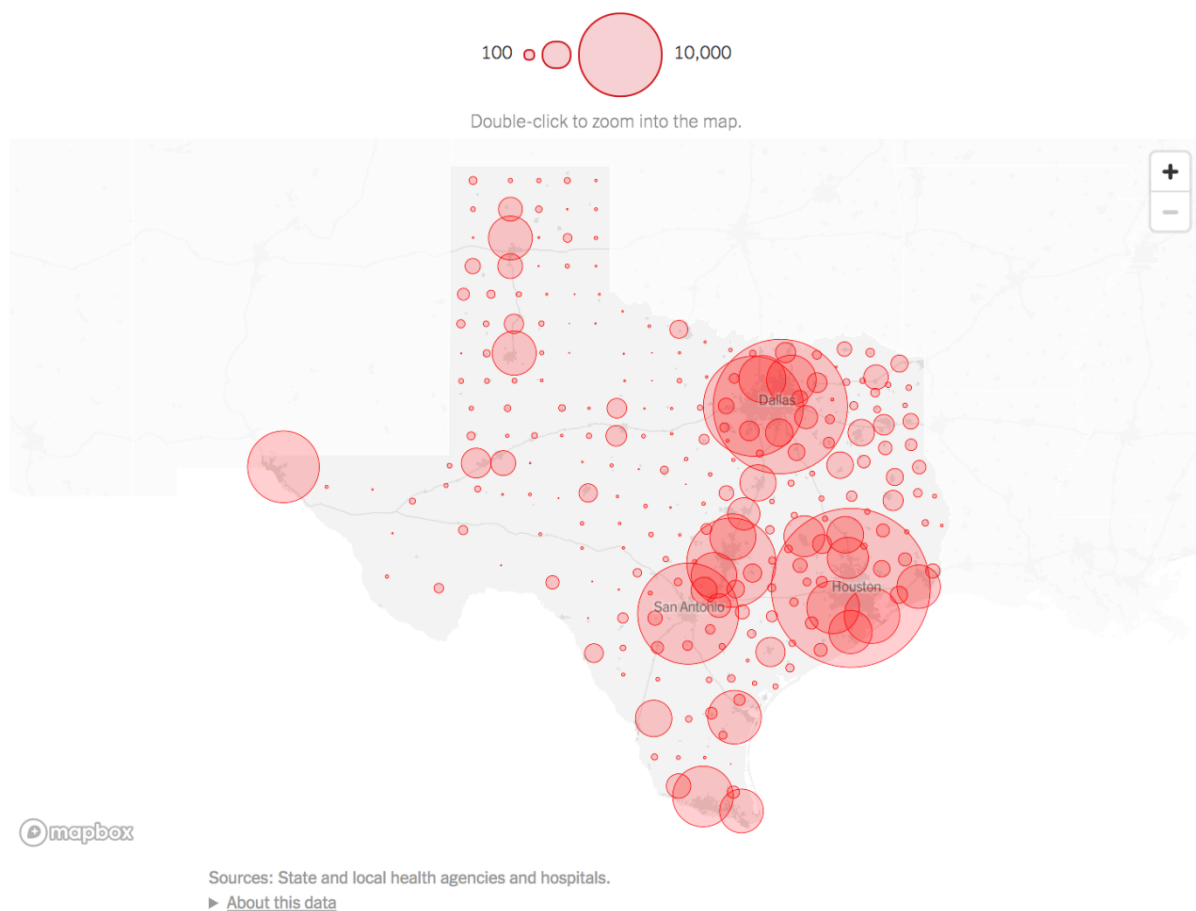
In Louisiana, Gov. John Bel Edwards extended their Phase 2 of the state's reopening plan through July 24. Hair salons, gyms, theaters, churches, museums, restaurants, bars and breweries are among the businesses that can operate at 50 percent capacity. Bars and breweries without food permits are

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[19] See https://gov.texas.gov/travel-texas/page/covid19

permitted to reopen, with restrictions. Amusement parks, concert halls and children's indoor play centers are among businesses that must remain closed.[20] See Figure 10 for Louisiana's current COVID-19 case distribution.

Figure 10: Louisiana Coronavirus Cases (as of July 8, 2020)

Source: https://www.nytimes.com/interactive/2020/us/louisiana-coronavirus-cases.html
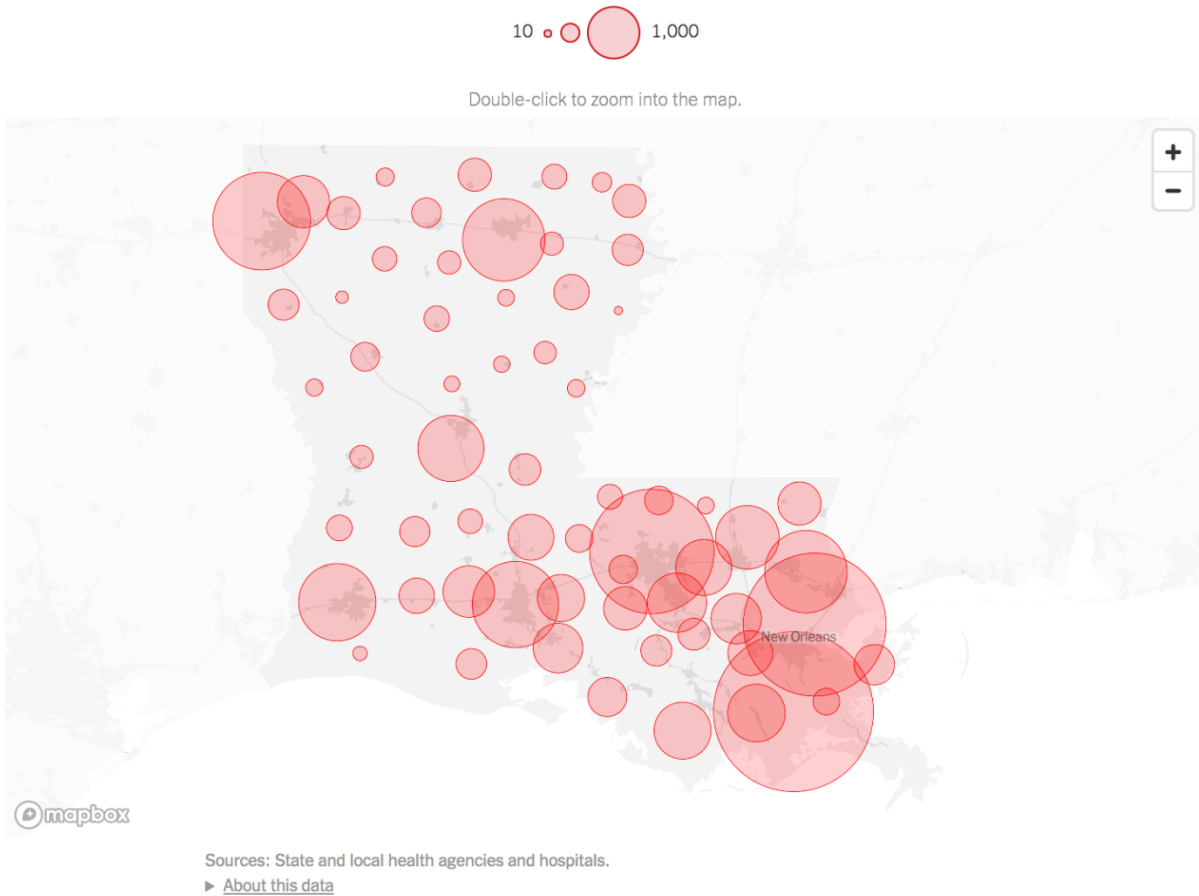
In Florida, Gov. Ron DeSantis signed an order that permitted most counties to begin Phase 2 of their reopening plan on June 5. Restaurants can offer indoor service at 50 percent capacity. Movie theaters may also reopen at 50 percent capacity. Gatherings of up to 50 people are permitted. DeSantis modified a travel mandate, requiring most people who arrive from Connecticut, New Jersey, New York or Louisiana to self-quarantine for 14 days; students traveling for academic work or activity are exempt. On June 26, Halsey Beshears, secretary of the Department of Business and Professional Regulation, ordered bars that derive more than 50 percent of their sales from alcohol to stop selling alcohol for on-premises consumption. See Figure 11 for Florida's current COVID-19 case distribution.

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[20] See https://gov.louisiana.gov/home/

Figure 11: Florida Coronavirus Cases (as of July 8, 2020)
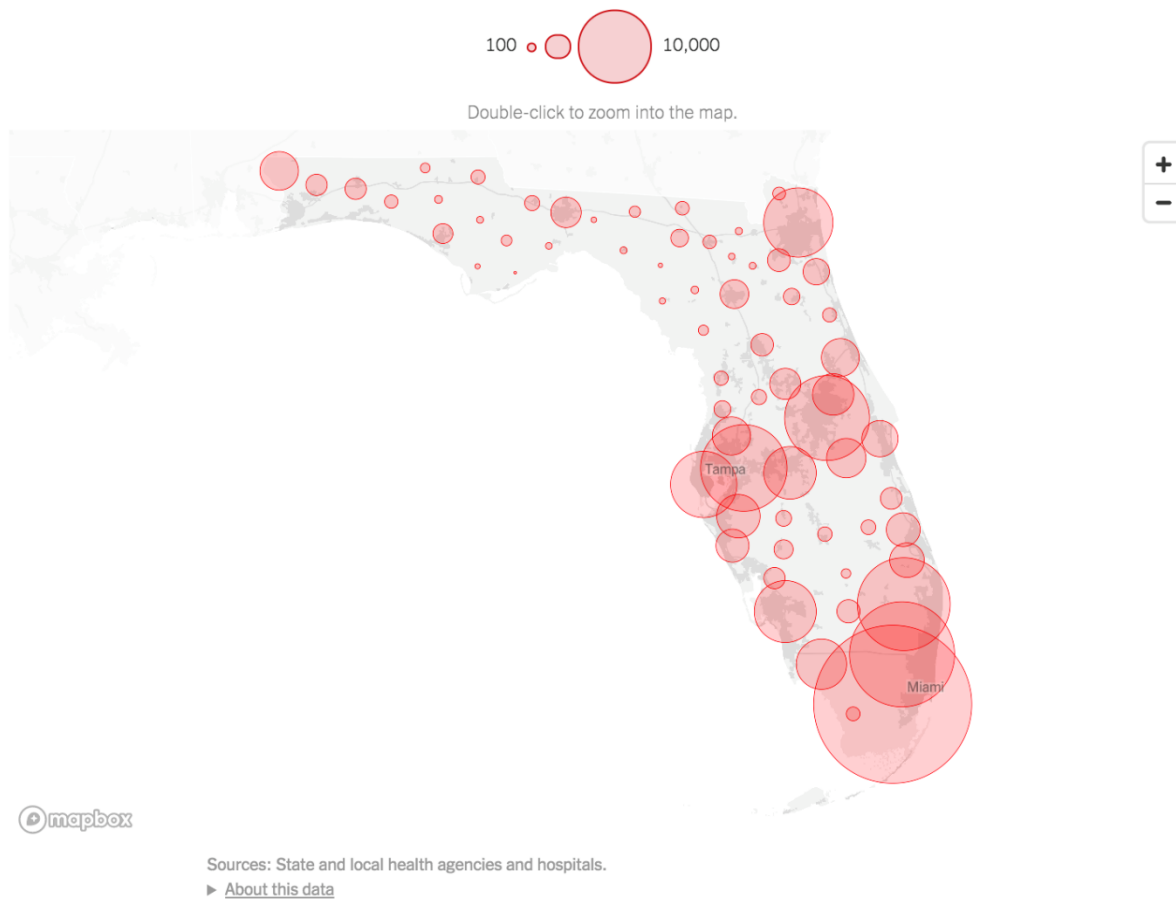
Source: https://www.nytimes.com/interactive/2020/us/florida-coronavirus-cases.html

Fuel prices, though, still appear to be encouraging Americans to take to the road this summer. AAA expects that road travel will be down by approximately 3% from 2019, whereas air travel will be down (expectedly) by 74%, and other forms of travel will be down by 85% since 2019.[21] In line with that forecast (and with the resolution of the Russian-OPEC agreement calling for a 20% reduction in crude oil production), EIA anticipated Brent crude to be approximately $41/barrel during 2H2020 and to reach $50/barrel in 2021, translating to their expectation of regular grade **automotive fuel staying near $2/gallon through 2020 and diesel fuel remaining at about $2.50/gallon**[22]; Kiplinger also echoes these conclusions.[23] It is noted that airplane fuel demands accounted for just under 10% of US petroleum requirements in 2019.

In keeping with these factors, Gulf Coast businesses seem to be pleased with the economic rebound that they are seeing since Florida, Alabama, and Mississippi started allowing them to reopen. Recent articles

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[21] See https://newsroom.aaa.com/2020/06/aaa-forecasts-americans-will-take-700-million-trips-this-summer/
[22] See https://www.eia.gov/outlooks/steo/report/prices.php, as of July 7, 2020
[23] Per https://www.kiplinger.com/economic-forecasts/energy

have consistently expressed that revenue seems to be doing well[24], leading us to consider the factors that may play into a continued or a new resurgence of the virus that **may prolong a true recovery**[25].

Expected Near-term Issues

A. Housing

One aspect of The CARES Act is that tenants living in a <u>building</u> financed by a federally backed mortgage would be automatically granted a grace period to pay their rent for 120 days from the date of passage of the law; that period expires on July 25, 2020. Renters of single-family homes are given a similar grace period until August 31, 2020. **Tenants could then be removed from the property as early as 30 days after the corresponding grace period expires.** [26] About half of all multifamily buildings and 40% of single-family homes are federally financed, according to the National Housing Law Project. Even if a building is covered under the CARES Act, many lawyers have noted that the law lacks any enforcement and a renter will only gain relief if the judge and lawyer understand the CARES Act and mandate that the owner of the building prove that the building isn't covered under the act[27].

Also, per USA Today, "At least 34 states and dozens of cities issued broader moratoriums that apply to all rental units. But some of those bans have ended and 12 states never took steps to halt evictions. Twenty-four states are now processing evictions, a figure that's likely to climb to at least 30 states by the end of June, even though tens of millions of Americans remain unemployed."

Continuing, "Homeowners could suspend their mortgage payments for up to a year for federally backed mortgages, the CARES Act says. About 70% of outstanding single-family mortgages are owned or backed by a federal agency, according to NHLP.

Other homeowners have been granted 90-day deferments on private mortgages from large banks such as Wells Fargo, Bank of America and Chase." [28]

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[24] See https://www.pnj.com/story/news/2020/06/22/locals-pack-pensacola-beach-during-pandemic-tourists-follow/3209398001/ and http://www.gulfcoastnewstoday.com/stories/foley-year-to-date-revenue-better-than-anticipated,94701

[25] See https://mynbc15.com/news/local/dr-anthony-fauci-risky-behavior-in-alabama-amid-coronavirus-pandemic

[26] See https://nlihc.org/resource/national-housing-law-project-provides-multiple-resources-relating-coronavirus-april-13

[27] https://www.tpr.org/post/its-fairly-merciless-texas-resume-evictions-san-antonio-renter-protection-ordinance-dies

[28] See https://www.usatoday.com/story/money/2020/06/22/cares-act-600-unemployment-other-covid-19-relief-set-end/3211921001/

Table 3: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30 + dpd) as of June 2020: Alabama & SMSAs

State	Unit Type	Number	Current	30-59 dpd	60-89 dpd	90-119 dpd	120+dpd	% 30dpd	% 30 + dpd	% 30 dpd or More
Alabama	Single	68111	65757	1120	853	117	264	1.64%	1.81%	3.46%
	Condo	136	132	2	2	0	0	1.47%	1.47%	2.94%
	Multi-Unit	66	66	0	0	0	0	0.00%	0.00%	0.00%
Birmingham-Hoover	Single	22096	21364	335	287	38	72	1.52%	1.80%	3.31%
	Condo	16	16	0	0	0	0	0.00%	0.00%	0.00%
	Multi-Unit	8	8	0	0	0	0	0.00%	0.00%	0.00%
Daphne-Fairhope-Foley	Single	5223	4971	125	105	9	13	2.39%	2.43%	4.82%
	Condo	10	10	0	0	0	0	0.00%	0.00%	0.00%
	Multi-Unit	2	2	0	0	0	0	0.00%	0.00%	0.00%
Huntsville	Single	9992	9718	132	95	9	38	1.32%	1.42%	2.74%
	Condo	14	14	0	0	0	0	0.00%	0.00%	0.00%
	Multi-Unit	28	28	0	0	0	0	0.00%	0.00%	0.00%
Mobile	Single	4062	3901	71	60	17	13	1.75%	2.22%	3.96%
	Condo	11	11	0	0	0	0	0.00%	0.00%	0.00%
	Multi-Unit	4	4	0	0	0	0	0.00%	0.00%	0.00%
Montgomery	Single	4542	4382	83	52	7	18	1.83%	1.70%	3.52%
	Condo	11	11	0	0	0	0	0.00%	0.00%	0.00%
	Multi-Unit	7	7	0	0	0	0	0.00%	0.00%	0.00%
Tuscaloosa	Single	3667	3550	63	41	5	8	1.72%	1.47%	3.19%
	Condo	4	4	0	0	0	0	0.00%	0.00%	0.00%
	Multi-Unit	0	0	0	0	0	0	0.00%	0.00%	0.00%
Outside MSAs	Single	7888	7572	149	102	19	46	1.89%	2.12%	4.01%
	Condo	39	36	1	2	0	0	2.56%	5.13%	7.69%
	Multi-Unit	5	5	0	0	0	0	0.00%	0.00%	0.00%

Data: STACR Freddie Mac

Table 4: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30 + dpd) as of June 2020: Arkansas & SMSAs

State	Unit Type	Number	Current	30-59 dpd	60-89 dpd	90-119 dpd	120 + dpd	% 30 dpd	% 30 + dpd	% 30 dpd or More
Arkansas	Single	47258	45737	680	536	77	228	1.44%	1.78%	3.22%
	Condo	236	230	2	4	0	0	0.85%	1.69%	2.54%
	Multi-Unit	40	36	1	3	0	0	2.50%	7.50%	10.00%
Fayetteville-Springdale-Rogers	Single	15703	15322	168	147	20	46	1.07%	1.36%	2.43%
	Condo	101	97	1	3	0	0	0.99%	2.97%	3.96%
	Multi-Unit	15	15	0	0	0	0	0.00%	0.00%	0.00%
Hot Springs	Single	1845	1776	26	23	6	14	1.41%	2.33%	3.74%
	Condo	6	6	0	0	0	0	0.00%	0.00%	0.00%
	Multi-Unit	0	0	0	0	0	0	0.00%	0.00%	0.00%
Jonesboro	Single	1862	1792	38	20	2	10	2.04%	1.72%	3.76%
	Condo	2	2	0	0	0	0	0.00%	0.00%	0.00%
	Multi-Unit	5	5	0	0	0	0	0.00%	0.00%	0.00%
Little Rock-North Little Rock-Conway	Single	15385	14806	264	203	29	83	1.72%	2.05%	3.76%
	Condo	45	43	1	1	0	0	2.22%	2.22%	4.44%
	Multi-Unit	40	36	1	3	0	0	2.50%	7.50%	10.00%
Memphis, TN-MS-AR	Single	316	309	3	1	1	2	0.95%	1.27%	2.22%
	Condo	0	0	0	0	0	0	0.00%	0.00%	0.00%
	Multi-Unit	0	0	0	0	0	0	0.00%	0.00%	0.00%
Outside MSAs	Single	9119	8813	132	100	18	56	1.45%	1.91%	3.36%
	Condo	67	67	0	0	0	0	0.00%	0.00%	0.00%
	Multi-Unit	7	7	0	0	0	0	0.00%	0.00%	0.00%

Data: STACR Freddie Mac

Table 5: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30 + dpd) as of June 2020: Louisiana & SMSAs

State	Unit Type	Number	Current	30-59 dpd	60-89 dpd	90-119 dpd	120 + dpd	% 30dpd	% 30 + dpd	% 30 dpd or More
Louisiana	Single	60347	56862	1414	1455	216	400	2.34%	3.43%	5.77%
	Condo	1551	1371	79	93	6	2	5.09%	6.51%	11.61%
	Multi-Unit	451	380	28	42	0	1	6.21%	9.53%	15.74%
Baton Rouge	Single	14992	14320	297	227	44	104	1.98%	2.50%	4.48%
	Condo	42	39	3	0	0	0	7.14%	0.00%	7.14%
	Multi-Unit	42	36	0	6	0	0	0.00%	14.29%	0.00%
Houma-Bayou Cane-Thibodaux,	Single	2548	2433	50	42	7	16	1.96%	2.55%	4.51%
	Condo	4	4	0	0	0	0	0.00%	0.00%	0.00%
	Multi-Unit	1	1	0	0	0	0	0.00%	0.00%	0.00%
Lafayette	Single	6403	6032	151	139	16	65	2.36%	3.44%	5.79%
	Condo	8	5	0	3	0	0	0.00%	37.50%	37.50%
	Multi-Unit	18	11	7	0	0	0	38.89%	0.00%	38.89%
Lake Charles	Single	2744	2586	61	73	11	13	2.22%	3.53%	5.76%
	Condo	11	11	0	0	0	0	0.00%	0.00%	0.00%
	Multi-Unit	4	4	0	0	0	0	0.00%	0.00%	0.00%
New Orleans-Metairie-Kenner	Single	19739	18305	556	692	91	95	2.82%	4.45%	7.26%
	Condo	1014	892	62	59	0	1	6.11%	5.92%	0.00%
	Multi-Unit	280	232	17	30	0	1	6.07%	11.07%	0.00%
Shreveport-Bossier City	Single	5058	4781	113	118	13	33	2.23%	3.24%	5.48%
	Condo	4	4	0	0	0	0	0.00%	0.00%	0.00%
	Multi-Unit	7	7	0	0	0	0	0.00%	0.00%	0.00%
Outside MSAs	Single	4352	4109	98	82	20	43	2.25%	3.33%	5.58%
	Condo	457	406	14	30	6	1	3.06%	8.10%	11.16%
	Multi-Unit	95	85	4	6	0	0	4.21%	6.32%	10.53%

Data: STACR Freddie Mac

Table 6: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30 + dpd) as of June 2020: Mississippi & SMSAs

State	Unit Type	Number	Current	30-59 dpd	60-89 dpd	90-119 dpd	120 + dpd	% 30dpd	% 30 + dpd	% 30 dpd or More
Mississippi	Single	21203	20183	446	419	51	104	2.10%	2.71%	4.81%
	Condo	38	36	2	0	0	0	5.26%	0.00%	5.26%
	Multi-Unit	14	14	0	0	0	0	0.00%	0.00%	0.00%
Gulfport-Biloxi	Single	2875	2733	64	60	8	10	2.23%	2.71%	4.94%
	Condo	19	18	1	0	0	0	5.26%	0.00%	0.00%
	Multi-Unit	8	8	0	0	0	0	0.00%	0.00%	0.00%
Jackson	Single	5957	5652	112	148	15	30	1.88%	3.24%	5.12%
	Condo	5	5	0	0	0	0	0.00%	0.00%	0.00%
	Multi-Unit	3	3	0	0	0	0	0.00%	0.00%	0.00%
Memphis, TN-MS-AR	Single	3578	3443	71	54	6	4	1.98%	1.79%	3.77%
	Condo	2	2	0	0	0	0	0.00%	0.00%	0.00%
	Multi-Unit	0	0	0	0	0	0	0.00%	0.00%	0.00%
Outside MSAs	Single	7190	6842	161	118	18	51	2.24%	2.60%	4.84%
	Condo	9	8	1	0	0	0	11.11%	0.00%	0.00%
	Multi-Unit	2	2	0	0	0	0	0.00%	0.00%	0.00%

Data: STACR Freddie Mac

Table 7: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30 + dpd) as of June 2020: Tennessee & SMSAs

State	Unit Type	Number	Current	30-59 dpd	60-89 dpd	90-119 dpd	120 + dpd	% 30dpd	% 30 + dpd	% 30 dpd or More
Tennessee	Single	127941	123679	2071	1750	120	321	1.62%	1.71%	3.33%
	Condo	694	666	14	14	0	0	2.02%	2.02%	4.03%
	Multi-Unit	140	131	6	3	0	0	4.29%	2.14%	6.43%
Chattanooga, TN-GA	Single	9116	8825	148	109	9	25	1.62%	1.57%	3.19%
	Condo	119	118	1	0	0	0	0.00%	0.00%	0.00%
	Multi-Unit	12	11	1	0	0	0	0.00%	0.00%	0.00%
Clarksville, TN-KY	Single	2463	2389	27	28	3	16	1.10%	1.91%	3.00%
	Condo	8	8	0	0	0	0	0.00%	0.00%	0.00%
	Multi-Unit	19	15	2	2	0	0	10.53%	10.53%	0.00%
Cleveland	Single	2346	2276	29	30	4	7	1.24%	1.75%	2.98%
	Condo	10	9	1	0	0	0	10.00%	0.00%	10.00%
	Multi-Unit	4	4	0	0	0	0	0.00%	0.00%	0.00%
Knoxville	Single	14939	14542	204	143	9	41	1.37%	1.29%	2.66%
	Condo	33	32	0	1	0	0	0.00%	0.00%	3.03%
	Multi-Unit	18	18	0	0	0	0	0.00%	0.00%	0.00%
Memphis, TN-MS-AR	Single	16088	15522	299	224	8	35	1.86%	1.66%	3.52%
	Condo	73	68	3	2	0	0	4.11%	2.74%	6.85%
	Multi-Unit	13	13	0	0	0	0	0.00%	0.00%	0.00%
Nashville-Davidson--Murfreesboro--Franklin	Single	59811	57623	1033	986	64	105	1.73%	1.93%	3.66%
	Condo	360	344	6	10	0	0	1.67%	2.78%	4.44%
	Multi-Unit	46	43	3	0	0	0	0.00%	0.00%	6.52%
Outside MSAs	Single	16378	15893	244	160	19	62	1.49%	1.47%	2.96%
	Condo	77	73	3	1	0	0	3.90%	1.30%	5.19%
	Multi-Unit	14	14	0	0	0	0	0.00%	0.00%	0.00%

Data: STACR Freddie Mac

Table 8: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30 + dpd) as of June 2020: Texas & SMSAs

State	Unit Type	Number	Current	30-59 dpd	60-89 dpd	90-119 dpd	120 + dpd	% 30dpd	% 30 + dpd	% 30 dpd or More
Texas	Single	492863	466414	12296	11446	1045	1662	2.49%	2.87%	5.37%
	Condo	2747	2609	79	57	0	2	2.88%	2.15%	5.02%
	Multi-Unit	1054	982	28	43	0	1	2.66%	4.17%	6.83%
Abilene	Single	2623	2537	40	37	3	6	1.52%	1.75%	3.28%
	Condo	10	10	0	0	0	0	0.00%	0.00%	0.00%
	Multi-Unit	1	1	0	0	0	0	0.00%	0.00%	0.00%
Amarillo	Single	2967	2843	56	51	4	13	1.89%	2.29%	4.18%
	Condo	9	9	0	0	0	0	0.00%	0.00%	0.00%
	Multi-Unit	2	2	0	0	0	0	0.00%	0.00%	0.00%
Austin-Round Rock-San Marcos	Single	65507	62529	1393	1360	107	118	2.13%	2.42%	4.55%
	Condo	818	770	30	18	0	0	3.67%	2.20%	5.87%
	Multi-Unit	128	124	2	2	0	0	1.56%	1.56%	0.00%
Beaumont-Port Arthur	Single	3837	3667	82	49	13	26	2.14%	2.29%	4.43%
	Condo	1	1	0	0	0	0	0.00%	0.00%	0.00%
	Multi-Unit	6	5	0	1	0	0	0.00%	0.00%	0.00%
Brownsville-Harlingen	Single	1764	1618	62	72	5	7	3.51%	4.76%	8.28%
	Condo	24	24	0	0	0	0	0.00%	0.00%	0.00%
	Multi-Unit	25	24	1	0	0	0	0.00%	0.00%	0.00%
College Station-Bryan	Single	4822	4641	81	82	7	11	1.68%	2.07%	3.75%
	Condo	71	68	2	1	0	0	2.82%	1.41%	0.00%
	Multi-Unit	41	38	2	1	0	0	4.88%	2.44%	0.00%
Corpus Christi	Single	4903	4626	141	105	8	23	2.88%	2.77%	5.65%
	Condo	8	8	0	0	0	0	0.00%	0.00%	0.00%
	Multi-Unit	12	12	0	0	0	0	0.00%	0.00%	0.00%

El Paso	Single	4137	3840	140	126	10	21	3.38%	3.80%	7.18%
	Condo	44	40	0	4	0	0	0.00%	9.09%	9.09%
	Multi-Unit	24	24	0	0	0	0	0.00%	0.00%	0.00%
Houston-Sugar Land-Baytown	Single	127960	119954	3587	3477	336	606	2.80%	3.45%	6.26%
	Condo	190	180	5	4	0	1	2.63%	2.63%	5.26%
	Multi-Unit	169	153	6	6	0	4	3.55%	5.92%	9.47%
Killeen-Temple-Fort Hood	Single	4228	4079	68	63	5	13	1.61%	1.92%	3.52%
	Condo	154	149	2	3	0	0	1.30%	1.95%	3.25%
	Multi-Unit	133	123	4	6	0	0	0.00%	0.00%	7.52%
Lubbock	Single	5519	5294	94	107	10	14	1.70%	2.37%	4.08%
	Condo	53	50	1	2	0	0	1.89%	3.77%	5.66%
	Multi-Unit	9	9	0	0	0	0	0.00%	0.00%	0.00%
Midland	Single	4190	3944	125	95	11	15	2.98%	2.89%	5.87%
	Condo	13	10	3	0	0	0	23.08%	0.00%	23.08%
	Multi-Unit	1	1	0	0	0	0	0.00%	0.00%	0.00%
San Antonio-New Braunfels	Single	35631	33734	901	824	73	99	2.53%	2.80%	5.32%
	Condo	218	206	4	8	0	0	1.83%	3.67%	5.50%
	Multi-Unit	145	135	1	9	0	0	0.69%	6.21%	6.90%
Waco	Single	3256	3124	65	56	4	7	2.00%	2.06%	4.05%
	Condo	29	29	0	0	0	0	0.00%	0.00%	0.00%
	Multi-Unit	0	0	0	0	0	0	0.00%	0.00%	0.00%
Outside MSAs	Single	24150	23081	487	410	54	118	2.02%	2.41%	4.43%
	Condo	436	421	7	8	0	0	1.61%	1.83%	3.44%
	Multi-Unit	51	50	0	1	0	0	0.00%	1.96%	1.96%

Data: STACR Freddie Mac

The tables on the preceding pages (Table 3 through

Table 8) identify **the percentage of mortgages and home loans held by Freddie Mac[29] that are current and past due** in six states: Alabama, Arkansas, Louisiana, Mississippi, Tennessee and Texas. Typically, banks track mortgages as they become 30 days-past-due (dpd), 60 dpd, and 90 dpd and, historically, start foreclosure proceedings when a mortgage become 90 or more days-past-due.

In Alabama, for example, the state is seeing between 2.75% and 4.80% of its single-resident houses and condominiums fall 30 days past due or more. Owners of multi-family structures, however, are not falling behind on their payments. The story is considerably different in Louisiana, where nearly 6% of single-family mortgages are 30 dps, owners of condos are starting to fall behind on payments (11% at 30 + dpd). In Lafayette, LA, nearly 40% of mortgages for multi-family dwellings are 30 days-past-due. The high COVID case-count in Louisiana and continued high unemployment in the state is creating a scenario where building owners are finding it difficult to make loan payments.

The ability for owners of multi-family dwellings to pay loans is directly tied to the rent payment from tenants. Table 9 show the percentage of renters in the US and the percentage of renters in specific states – AL, AR, LA, MS, TN, and TX – that are not current on their rent. Renters in Louisiana are missing rent payments at an incredibly high rate; 30% of renters are late on their payments as of 6/30/20 in Louisiana, compared to 14% in Alabama and 18.7% in Texas. **If rent payments continue to be late, owners of multi-family buildings will start missing mortgage payments**.

*Table 9: Percentage of Renters NOT current on Payments by Week and State: US Total, AL, TX, LA, MS, TN, AR*

Date	% Renters NOT Making Payment (US Total)	% Renters NOT Making Payments (AL)	% Renters NOT Making Payments (TX)	% Renters NOT Making Payments (LA)	% Renters NOT Making Payments (MS)	% Renters NOT Making Payments (TN)	% Renters NOT Making Payments (AR)
5/5/2020	14.31%	19.00%	18.16%	26.40%	16.33%	11.21%	17.97%
5/12/2020	16.28%	24.20%	15.95%	28.20%	31.75%	11.72%	15.88%
5/19/2020	15.46%	9.11%	16.31%	21.13%	20.37%	22.25%	17.24%
5/26/2020	14.86%	14.46%	19.48%	17.30%	18.16%	13.64%	20.21%
6/2/2020	15.21%	16.69%	10.29%	13.59%	19.02%	11.88%	24.15%
6/9/2020	15.99%	20.24%	13.80%	20.57%	20.24%	14.83%	14.87%
6/16/2020	14.71%	15.62%	15.53%	15.85%	21.73%	8.62%	29.04%
6/23/2020	16.47%	18.11%	16.71%	20.98%	17.94%	13.07%	17.90%
6/30/2020	17.38%	14.11%	18.83%	30.70%	21.67%	13.36%	18.74%

Source: https://www.census.gov/programs-surveys/household-pulse-survey/data.html

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[29] Note that Freddie Mac holds just over 28% of agency held mortgages per https://www.urban.org/research/publication/housing-finance-glance-monthly-chartbook-june-2020/view/full_report.

Figure 12: Percentage of CMBS 30 + Days Past Due
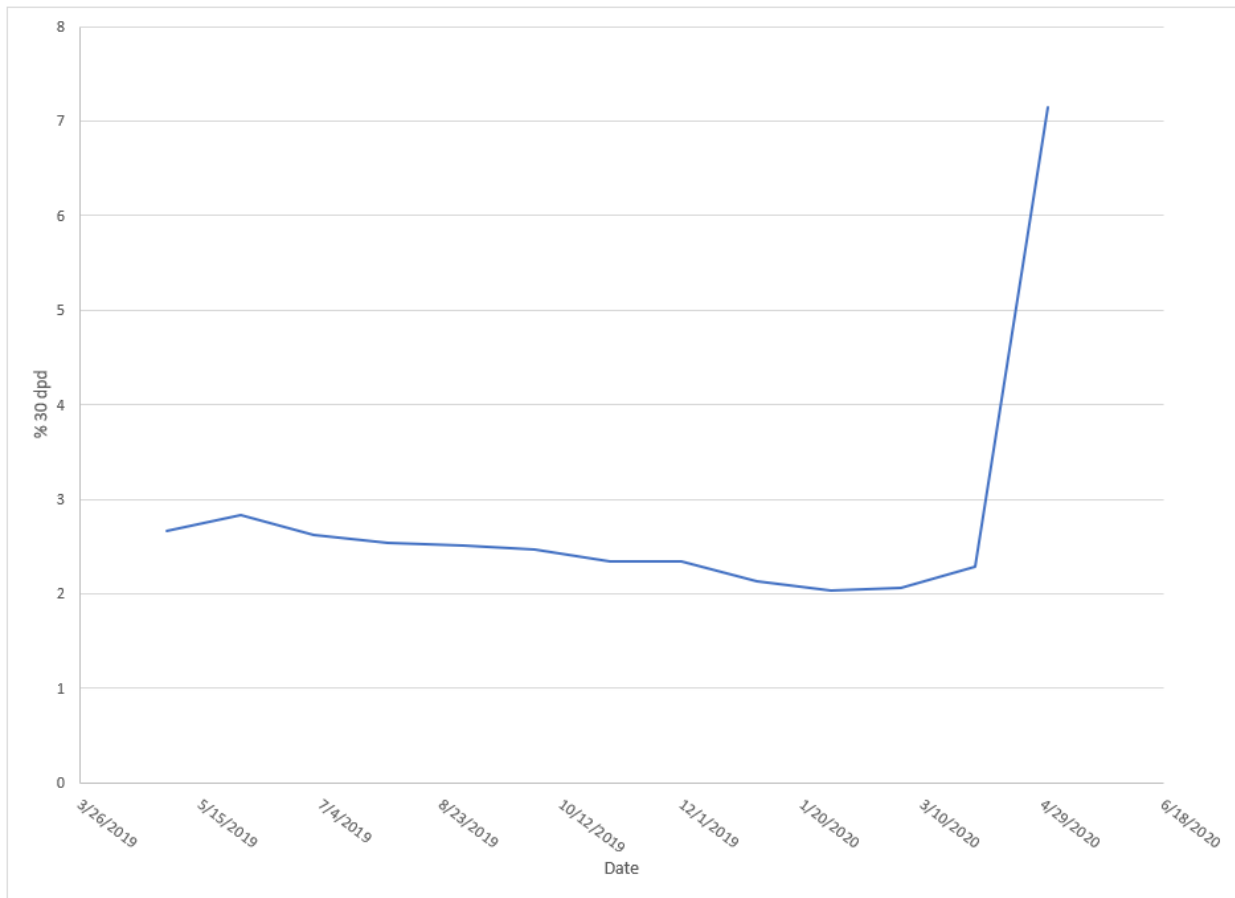
Source: Trepp

Although the data from CMBS delinquency is nearly 2 months behind, it does point to a dramatic change in the status of these securities. **The sharp rise in delinquencies of these securities is likely caused by the 'non-essential business' closures across the country**. The lack of cash flow for most businesses would have decreased rent payments which would, in turn, **increase default rates** for groups than own the loans on those businesses.

An increase in the number of businesses who are not paying rents due to COVID-19 will add to the delinquency rates of CMBS class assets. Table 10 shows the 12 largest US Bank holding companies and the percentage of total assets held in various asset types. Although these banks are holding between 0 and 2.5% of their assets in CMBSs, smaller banks are likely holding a larger percentage of their assets in CMBSs.

Table 10: Asset Holdings of 12 Largest US Bank (Holding Companies) as a Percentage of Total Assets (2017)

Bank	US Treasury and Agency Securities	Municipal bonds	Agency MBS	Nonagency Residential MBS	Nonagency commercial MBS	ABS and other
JPMorgan Chase	2.6	2.1	5.2	0.5	0.5	6.5
Bank of America	4.1	1.1	15.6	0.3	0.1	3.5
Wells Fargo	4.1	3.2	12.7	0.4	0.3	3.3
Citigroup	7.3	1	5	0.3	0.1	12.3
Goldman Sachs	5	0.1	3.2	0.2	0.1	6.7
Morgan Stanley	7.7	0.3	6.6	0.1	0.4	5.9
US Bancorp	5.7	1.3	17.1	0	0	0.3
PNC	4	1.2	11.6	0.9	1.1	2.5
Bank of New York Mellon	8.1	1	16.9	0.7	0.2	7.1
Capital One	1.5	0	16.3	0.7	0.5	0.5
TD Bank Group	10.3	0	7	1.7	2.5	12.5
HSBC	12.3	0	7.8	0	0	2.3

Source: Cleveland Federal Reserve Bank[30]

The number of companies that have either completely stopped paying rent or partially paying rent is increasing. These firms include[31]:

- Cheesecake Factory
- Burlington Companies
- 24 Hour Fitness
- H & M
- Bed, Bath & Beyond
- Famous Footware
- AMC
- Regal Cinemas
- Victoria's Secret/Limited/Express
- Petco
- Hennessy Louis Vuitton
- Staples
- Subway
- Urban Outfitters
- Mattress Firm
- Starbucks

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[30] https://www.clevelandfed.org/en/newsroom-and-events/publications/economic-commentary/2019-economic-commentaries/ec-201901-asset-commonality-in-us-banks-and-financial-stability.aspx
[31] https://www.washingtonpost.com/business/2020/06/03/next-big-problem-businesses-cant-or-wont-pay-their-rent-its-setting-off-dangerous-chain-reaction/

Some companies, such as Starbucks, might very well have the capacity to pay rent, but have seized on the current climate to change rental agreements. According to industry experts, Starbucks has requested modifications on rents for up to 12 months[32]. These types of **modifications are being requested by other "credit clients"** – renters that would have higher credit ratings compared to the "one-off" stores and establishments (e.g., "Bob's Nail Salon" or "Mary's Cigar Boutique") that might occupy commercial and retail space.

B. Economic Impacts and Children

Some of the issues exposed by the current COVID crisis are extremely uncomfortable. One of those issues is how the presence of children in a household affects financial decisions in a stressed household. While the elderly have been prominently reported on in the press due to their likelihood of death once they contract COVID, the strain of a sick or hospitalized family dependent at any age puts an unexpected and dramatic stress on a household.

Mortgage Payments with Children in the Home

Let us first consider the case of an arbitrary household in the Southern/Southeastern states. Per the information in

Table 11, we see that mortgage-holders who have children are making difficult decisions about where their available capital is going. Nationally, over the past two months, we see that **mortgage holders with children are in arrears (on mortgage payments) by approximately a two-to-one ratio over those without children**. In areas in which there are a significant number of single working parents (due to divorce or an ill member of the family – potentially due to a resurgence of the COVID virus), **that ratio grows above six-to-one**.

We do see two specific points worth noting in this table:

1. In Mississippi, we see that mortgages from owners with children lapsed from a notable percentage of mortgage holders until the end of the school year (the last week of May), at which time the percentage of mortgages that were in arrears dropped by half (and rising again at the last week of June).
2. In Tennessee, the percentage of mortgage holders that were in arrears rose considerably in mid-June. We believe that this is attributable to the concerns of mortgage holders in the area as the state had several days in early June with unusually high numbers of deaths, with 20 deaths (a high value for the state at the time) being reported on June 12. Since the percentages dropped quickly thereafter, we suspect that press coverage of these events likely influenced the decisions of mortgage holders around that time period.

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[32] Ibid.

Table 11: Percent of Owners 30 + Days Past Due by State and Family Status

Date	US Total		AL		TX		LA	
	Owners without Children	Owners with Children	Owners without Children	Owners with Children	Owners without Children	Owners with Children	Owners without Children	Owners with Children
5/5/2020	3.7%	7.6%	2.9%	4.6%	5.9%	12.0%	1.4%	10.0%
5/12/2020	3.6%	6.9%	0.7%	4.7%	2.1%	5.0%	4.0%	7.1%
5/19/2020	3.6%	7.0%	2.9%	4.2%	3.1%	7.1%	1.3%	6.7%
5/26/2020	3.5%	7.1%	2.4%	10.8%	5.5%	6.5%	7.5%	6.2%
6/2/2020	3.3%	7.5%	2.8%	9.1%	3.8%	6.1%	2.4%	9.9%
6/9/2020	3.2%	8.0%	4.2%	16.6%	5.4%	10.9%	1.1%	10.6%
6/16/2020	3.5%	7.6%	1.0%	11.2%	2.6%	11.6%	6.1%	5.8%
6/23/2020	3.2%	7.7%	4.6%	6.5%	2.9%	8.3%	7.9%	19.1%
6/30/2020	3.9%	8.5%	4.6%	10.7%	2.1%	12.3%	6.7%	8.7%

Date	TN		AR		MS	
	Owners without Children	Owners with Children	Owners without Children	Owners with Children	Owners without Children	Owners with Children
5/5/2020	3.8%	12.0%	2.9%	4.6%	5.9%	12.5%
5/12/2020	2.5%	8.0%	0.7%	4.7%	2.4%	21.4%
5/19/2020	1.9%	5.7%	2.9%	4.2%	2.7%	21.2%
5/26/2020	2.7%	5.8%	2.4%	10.8%	4.0%	13.1%
6/2/2020	1.4%	6.8%	2.8%	9.1%	2.7%	6.0%
6/9/2020	1.8%	7.8%	4.2%	16.6%	3.7%	7.7%
6/16/2020	4.1%	22.0%	1.0%	11.2%	2.8%	7.9%
6/23/2020	4.0%	19.7%	4.6%	6.5%	3.2%	5.8%
6/30/2020	3.3%	3.0%	4.6%	10.7%	4.8%	19.3%

Source: Bureau of Labor Statistics

Choices on Childcare with COVID

While we have previously discussed unemployment issues and the fact that millions of people have lost their jobs due to slashed demand, bankruptcies, and the pandemic, some people will leave the workforce because of school and child-care closures.[33] In some cases, due to the need for supervision of children and isolation of family members, in conjunction with elementary & secondary school re-

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[33] See https://www.wsj.com/articles/how-to-rethink-your-budget-with-just-one-income-11593252170

opening plans, some dual-income households will transition to single-income households, requiring the reapportionment of the single income towards the household's obligations.[34]

C. Continued Bankruptcies and Unemployment

The number of large (well recognized) companies that have filed for bankruptcy/restructuring or have ceased operations since March 1, 2020 is considerably large. (See Table 12.) Some of these companies, such as True Religion, have been in and out of bankruptcy for several years[35], while other companies were caught off-guard by the COVID crisis. Some of these organization will continue to operate while working with their creditors while other organizations will shutter their physical stores and/or cease operations entirely. **This list is likely to grow (perhaps double or triple) by the end of the summer** as PPP money is exhausted and some states move towards re-instating business closures[36] and stricter operational rules[37].

Figure 13 and Figure 14 show initial unemployment claims by week for Alabama, Arkansas, Louisiana, Tennessee, Mississippi and Texas, and Figure 15 and Figure 16 show continued unemployment claims for these same states. (Texas is shown separately in both Figure 14 and Figure 16 for purposes of scale.) Each of these states are showing the same general trend – a huge spike in initial unemployment claims staring in the second week or March and then small decreases in weekly initial clams through the start of May. The initial claims for May through July are quite large, but much smaller than the spikes we saw the second and third weeks of March. The continued unemployment claims in these states are also showing consistency – with large spikes in mid-March and a decreasing trend for April through July. It is likely that the number of claims being reported are smaller than the number of people who are without jobs. **The BLS has reported difficulties categorizing people** who are reporting "temporarily absent" or "furloughed" from work[38]. **The true number of people unemployed (nationally, and per state) may be up to 300 bps higher**[39].

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[34] An example of how this scenario may play out is illustrated at https://www.npr.org/2020/06/28/883458147/how-coronavirus-could-widen-the-gender-wage-gap.

[35] https://www.forbes.com/sites/laurendebter/2020/04/13/true-religion-files-for-bankruptcy-again-as-coronavirus-hobbles-retail-industry/#1fb1e9d744af

[36] https://www.elpasotimes.com/story/news/2020/07/03/covid-texas-coronavirus-timeline-greg-abbott-close-reopen/5368894002/

[37] https://www.tampabay.com/news/health/2020/06/26/drinking-alcohol-at-florida-bars-suspended/

[38] https://www.bls.gov/cps/employment-situation-covid19-faq-april-2020.pdf

[39] https://www.cnbc.com/2020/06/05/heres-why-the-real-unemployment-rate-may-be-higher-than-reported.html

Table 12: Bankruptcies Since March 1, 2020

Company	Date Filed Bankruptcy/Ceased Operations	Additional notes
24 Hour Fitness	15-Jun-20	Chapter 11
Advantage Rent A Car	26-May-20	
Akorn	20-May-20	
ALDO Group	7-May-20	
American Addiction Centers	20-Jun-20	
APC Automotive	3-Jun-20	
Apex Parks Group	8-Apr-20	Chapter 11
Art Van Furniture	8-Mar-20	Chapter 11 reorganization to chapter 7 liquidation in early April
Avianca	10-May-20	
Bar Louie	27-Jan-20	
Bluestem Brands	9-Mar-20	
Broden Dairy	5-Jan-20	
BrightHouse	30-Mar-20	Entered administration (equivalent of bankruptcy)
Brooks Brothers	8-Jul-20	
Carluccio's	30-Mar-20	
Centric Brands	18-May-20	
Chesapeake Energy	28-Jun-20	
Chuck E. Cheese (CEC Entertainment)	24-Jun-20	
Cirque du Soleil	29-Jun-20	Chapter 15
CMX Cinemas	25-Apr-20	
Comcar Industries	17-May-20	
Cosi	24-Feb-20	Chapter 11
CraftWorks	3-Mar-20	
Dean & DeLuca	1-Apr-20	
Debenhams	6-Apr-20	
Diamond Offshore Drilling	27-Apr-20	sought bankruptcy protection
Digicel	15-May-20	Chapter 15
Earth Fare	4-Feb-20	
Edcon	29-Apr-20	Filed for Business Rescue
Exide Technologies	22-May-20	
Fairway Market	23-Jan-20	
Flybe	5-Mar-20	Entered administration
Foodora	27-Apr-20	Filed for Insolvency; ceased operations

Company	Date	Notes
Foresight Energy	10-Mar-20	
Frontier Communications	14-Apr-20	
GNC	23-Jun-20	Chapter 11
Gold's Gym	4-May-20	Chapter 11
Grupo Famsa	26-Jun-20	
Helios and Matheson	29-Jan-20	Chapter 7
Hertz	22-May-20	Chapter 11
Hin Leong	18-Apr-20	
Hornbeck Offshore Services	19-May-20	Filed a Prepackaged Plan
IntegraMed America	20-May-20	
Intelsat	13-May-20	
Interactive Health Solutions	14-Jun-20	Chapter 7; Ceased Operations
Internap	16-Mar-20	
Intu Properties	26-Jun-20	Entered Administration
Jason Industries	24-Jun-20	
JCPenny	15-May-20	Chapter 11
J.Crew	4-May-20	
J.Hilburn	4-May-20	
Krystal	19-Jan-20	
Latam Airlines	26-May-20	
Le Pain Quotidien's	27-May-20	Chapter 11
Libbey	1-Jun-20	
Libre Abordo	31-May-20	Announced bankruptcy
LSC Communications	13-Apr-20	
Lucky Brand	3-Jul-20	Chapter 11
Lucky's Market	27-Jan-20	
Maines Paper & Food Service	10-Jun-20	
Mallinckrodt	25-Feb-20	Chapter 11
McClatchy	13-Feb-20	
McDermott International	21-Jan-20	Chapter 11
Modell's Sporting Goods	11-Mar-20	Chapter 11
MQ	16-Apr-20	
Neiman Marcus	7-May-20	Chapter 11
NMC Healthcare	28-May-20	Chapter 15
Nygard Entities	19-Mar-20	Chapter 15
OneWeb	27-Mar-20	
Papyrus' parent company	24-Jan-20	
Petersen-Dean	11-Jun-20	
Pier 1	17-Feb-20	Chapter 11
Pioneer Energy	2-Mar-20	
Pullmantur Cruceros	22-Jun-20	
Pyxus International	15-Jun-20	

Quorum Health	7-Apr-20	Chapter 11
RavnAir	5-Apr-20	
Reitmans	19-May-20	Restructure Process
RentPath	11-Feb-20	
Rubie's Costume Company	30-Apr-20	Chapter 11
Sail Outdoors	2-Jun-20	
Skillsoft	14-Jun-20	
Smiths City	21-May-20	
Specialist Leisure Group	22-May-20	Entered Administration
Spectra Premium	10-Mar-20	
Speedcast International	23-Apr-20	
Stage Stores	10-May-20	Chapter 11
Sur La Table	8-Jul-20	Chapter 11
Technicolor	22-Jun-20	Filed for restructuring
Techniplas	6-May-20	
Trane Technologies spin-offs	18-Jun-20	
True Religion	13-Apr-20	Chapter 11
Tuesday Morning	27-May-20	Chapter 11
Ultra Petroleum	14-May-20	
Unit Corporation	22-May-20	
Virgin Australia	21-Apr-20	
Vision Group Holdings	30-May-20	
Vista Proppants and Logistics	10-Jun-20	
Whiting Petroleum	1-Apr-20	
Wirecard	25-Jun-20	Filed for insolvency

Source: https://www.forbes.com/sites/hanktucker/2020/05/03/coronavirus-bankruptcy-tracker-these-major-companies-are-failing-amid-the-shutdown/#5c08277b3425; https://www.nbcnews.com/business/consumer/which-major-retail-companies-have-filed-bankruptcy-coronavirus-pandemic-hit-n1207866; https://www.cnbc.com/2020/05/15/these-companies-have-filed-for-bankruptcy-since-the-coronavirus-pandemic.html
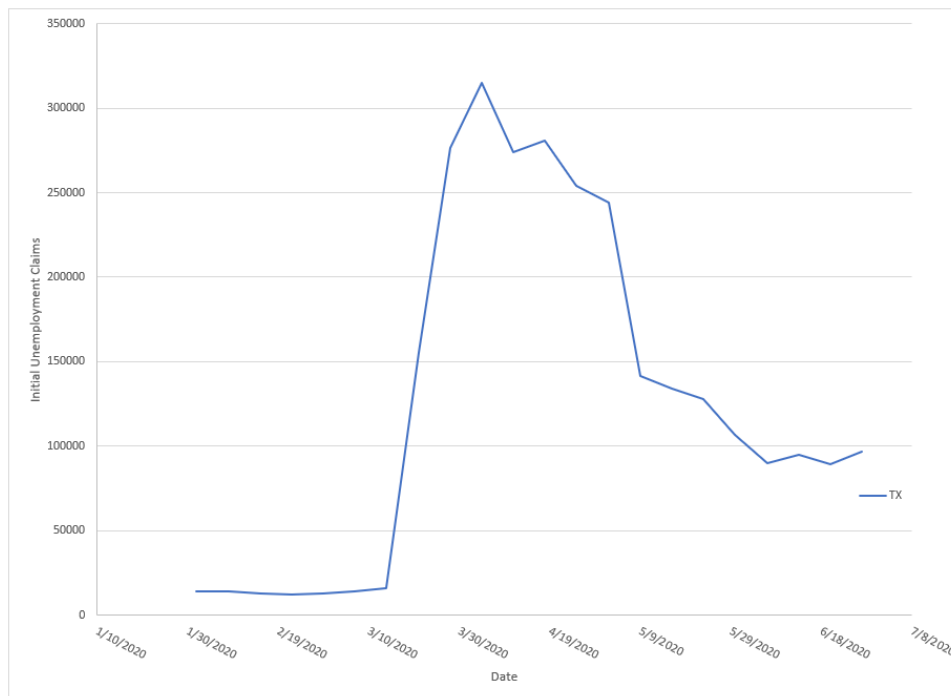
Figure 13: Initial Unemployment Claims 2/1 - 6/20/2020: AL, LA, TN, AR, MS
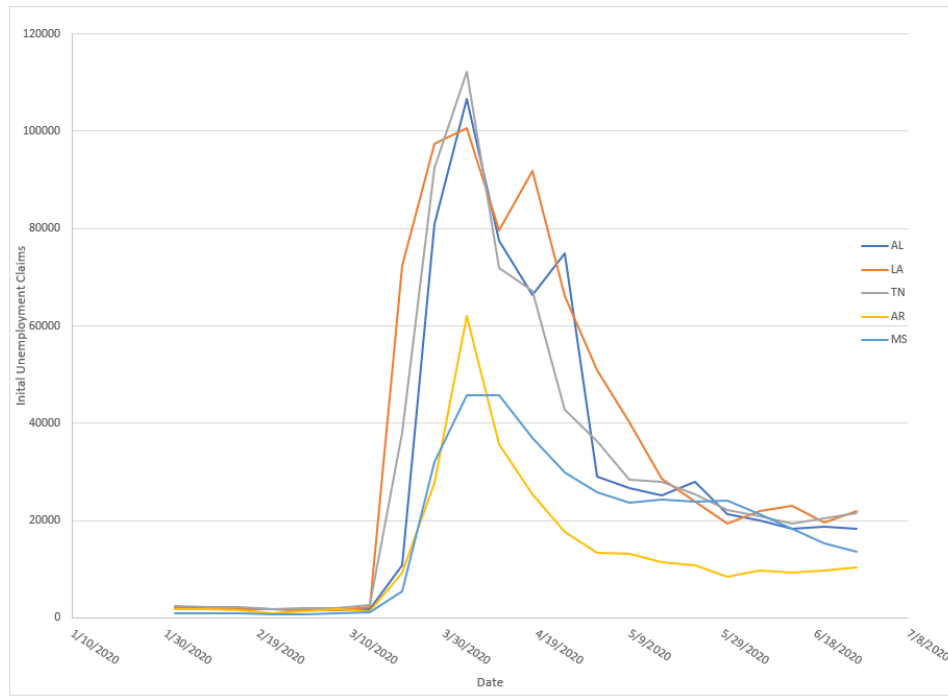
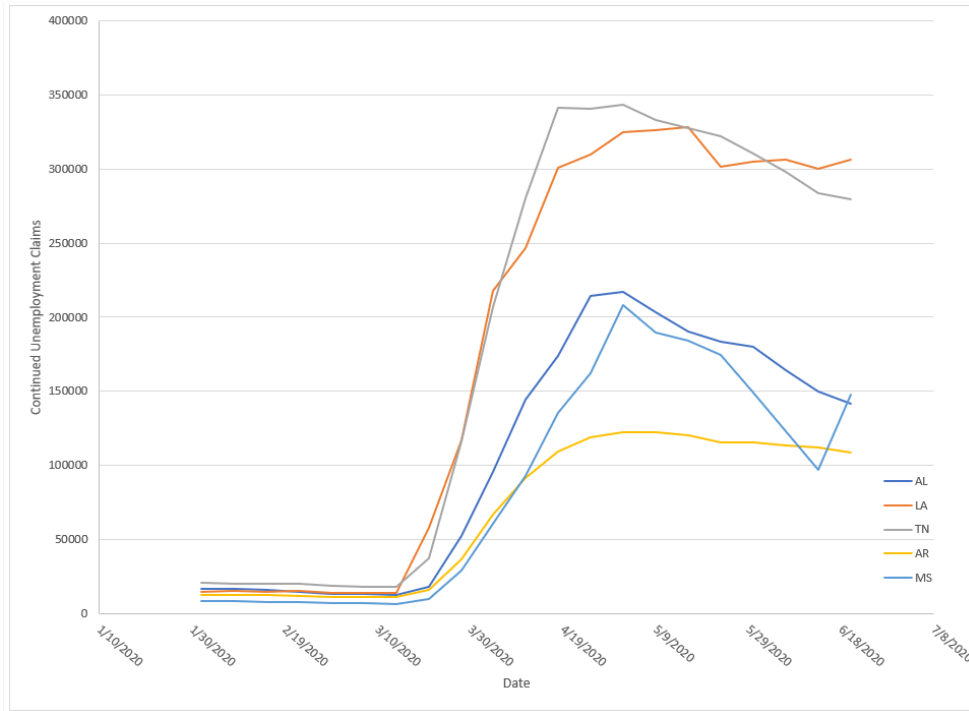Source: Federal Reserve Bank of St. Louis, Economic Research

Figure 14: Initial Unemployment Claims 2/1 - 6/20/2020: TX

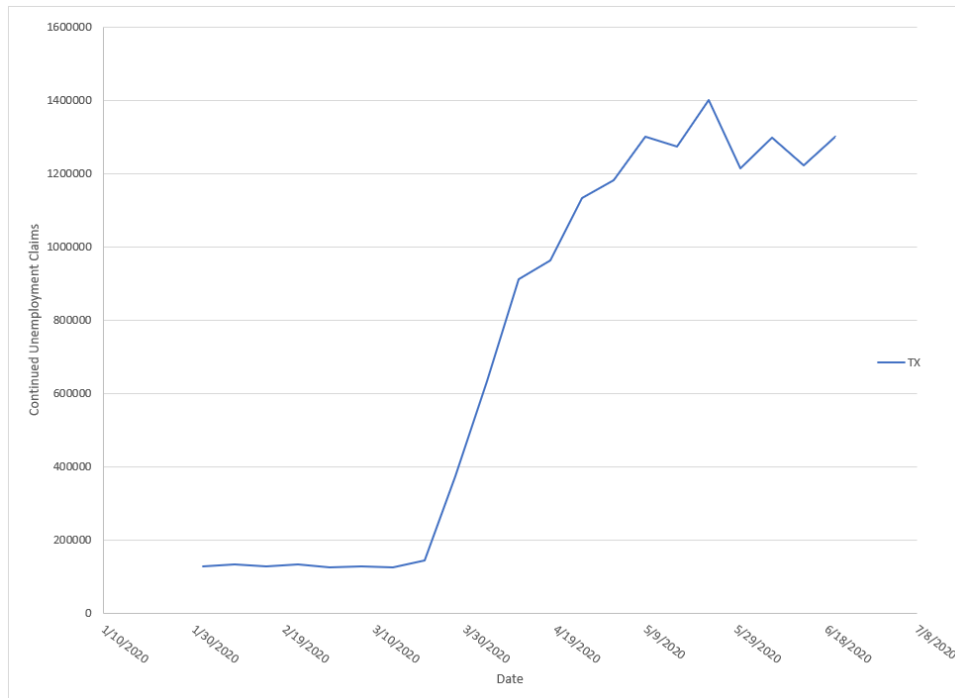Source: Federal Reserve Bank of St. Louis, Economic Research

Figure 15: Continued Unemployment Claims 2/1 - 6/20/2020: AL, LA, TN, AR, MS

Source: Federal Reserve Bank of St. Louis, Economic Research

Figure 16: Continued Unemployment Claims 2/1 - 6/20/2020: TX

Source: Federal Reserve Bank of St. Louis, Economic Research

    D.   The Role of the Federal Reserve Bank

"The Basel Committee" - initially named the Committee on Banking Regulations and Supervisory Practices - was established by the central bank Governors of the Group of Ten countries at the end of 1974 in the aftermath of serious disturbances in international currency and banking markets[40]" In short, the Basel Committee establishes rules, guidelines for financial institutions to help minimize the risk of banking failures which could lead to more catastrophic market failures.

As a result of the 2008-2009 financial collapse, the Basel Committee[41] issued a set of guidance documents to strengthen the financial sector's capital framework through additional regulation and supervision. The committee outlined capital structure guidelines in July 2009 and again in December 2010. The committee established strict requirements for the quality and quantity of capital and assets under control by financial intermediaries. These requirements include:

- (2011) A leverage ratio, a minimum amount of loss-absorbing capital relative to all of a bank's assets and off-balance sheet exposures regardless of risk weighting
- (2012) Liquidity requirements: a minimum liquidity ratio, i.e., the Liquidity Coverage Ratio (LCR), intended to provide enough cash to cover funding needs over a 30-day period of stress; and a longer-term ratio, the Net Stable Funding Ratio (NSFR), intended to address maturity mismatches over the entire balance sheet;
- (2012) Capital requirement for banks' exposure to central counterparties;
- (2013) Margin requirements for non-centrally cleared derivatives and capital requirements for banks' equity in funds;
- (2014) A standardized approach for measuring counterparty credit risk exposures, improving the previous methodologies for assessing the counterparty credit risk associated with derivatives transactions;
- (2014) A more robust framework for calculating capital requirements for securitizations, as well as the introduction of large exposure limits to constrain the maximum loss a bank could face in the event of a sudden failure of a counterparty; and
- (2016) A revised market risk framework that followed a fundamental review of trading book capital requirements.

What does all this mean? Banks are required to hold a certain level of capital against assets on their balance sheets, and risk attributed to the assets determines the level of capital that banks must hold.

The global pandemic has caused massive turmoil in the market. From one perspective, the very large and sudden increases in business shut-downs created a fear that companies would not be able to make coupon payments on bonds. This fear translated to spiking yields on corporate debt. Figure 17, for example, shows the yield for a previously A-rated coupon bond issued by Carnival Corp. The increase in the yield pushed this bond into "junk" territory and likely triggered capital requirements for banks holding such assets.

[40] https://www.bis.org/bcbs/history.htm
[41] Ibid.

Figure 17: Yield on Carnival Corp Bond (6.65% Coupon Bond CUSIP: 143658AH5)

As a result, banks, private equity companies and other financial intermediaries started scrambling in mid-March for sources of capital – selling assets in search of liquidity. With a tumble in the equities market and failures in the bond market, the Federal Reserve Bank took a unique step in providing liquidity to the market in the form of massive purchasing programs across asset categories.

Figure 18: Federal Reserve Balance Sheet: Total Assets
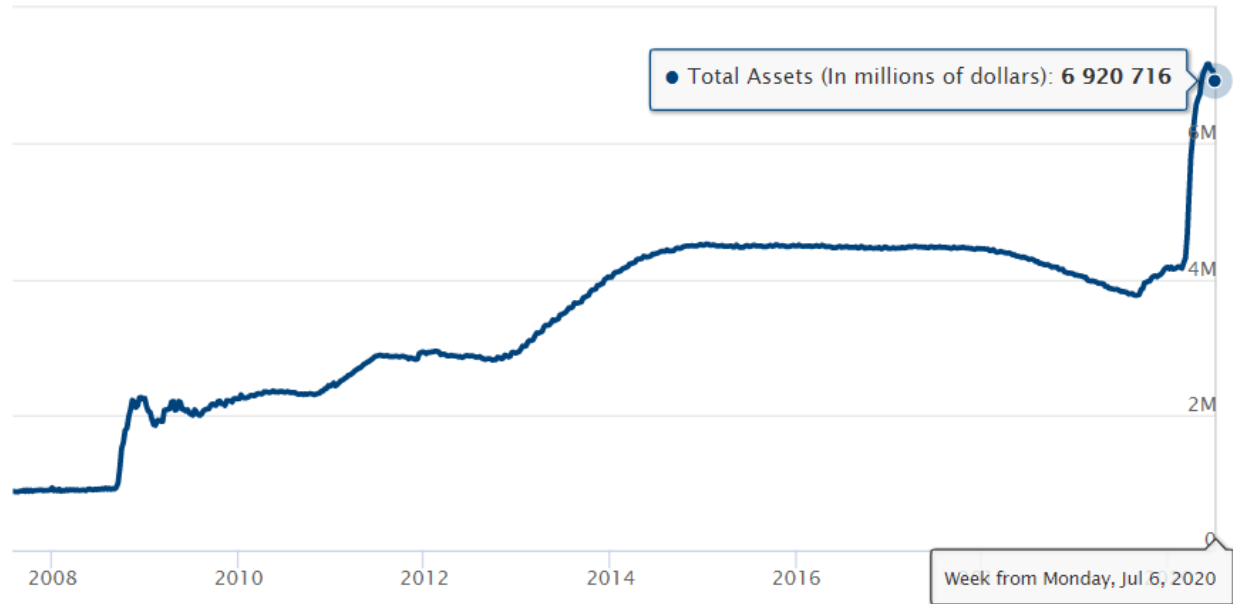
Source: https://www.federalreserve.gov/monetarypolicy/bst_recenttrends.htm

For the week of July 6, 2020, the Federal Reserve held $6.9 trillion worth of assets[42] – more than triple what the Fed held on its balance sheets during the height of the 2008-09 financial crisis. **The Fed has become the buyer for all types of assets** – creating liquidity in the market in ways that the Fed wouldn't have considered in 2008.

Although the Fed saw the first signs of light between June 15 and July 6 – with a decrease in approximately $200 billion in assets – the US is still quite a ways from conquering the COVID-19 crisis. As we have mentioned, several states are reverting to past quarantining plans and re-issuing "stay at home orders"[43]. With an additional round of shut-downs and business closing, the need for the Fed' to provide liquidity will continue (and likely grow) through the next year.

E.   Assets Moving Forward? What Could Happen After Election

During a July 2, 2020 press conference, President Trump stated that if another person (i.e., Vice President Biden) was elected president then:

"Your 401(k) will drop down to nothing, and the stock market will drop down to nothing." [44]

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[42] https://www.federalreserve.gov/monetarypolicy/bst_recenttrends.htm
[43] https://www.cnn.com/2020/06/29/health/us-coronavirus-monday/index.html
[44] https://www.marketwatch.com/story/trump-with-other-presidents-your-401-k-s-will-drop-down-to-nothing-11593712819?link=MW_latest_news

Clearly, it would take a cataclysmic event for the stock market to drop to nothing, but is there evidence that a first term Democratic president would preside over a worse equities market than a second term Trump (Republican) presidency?

Figure 19 traces the return on the S&P during the first 100 days after inauguration for all first-term presidents (approximately 70 trading days). Trump did have a very good first 100 days with an S&P return of approximately 5%; only Bush H. W. 1989 (8%) and Obama 2009 (8.5%) had better returns during their first 100 days in office.

Figure 19: S&P Return First 100 Days in Office (First Term by President)
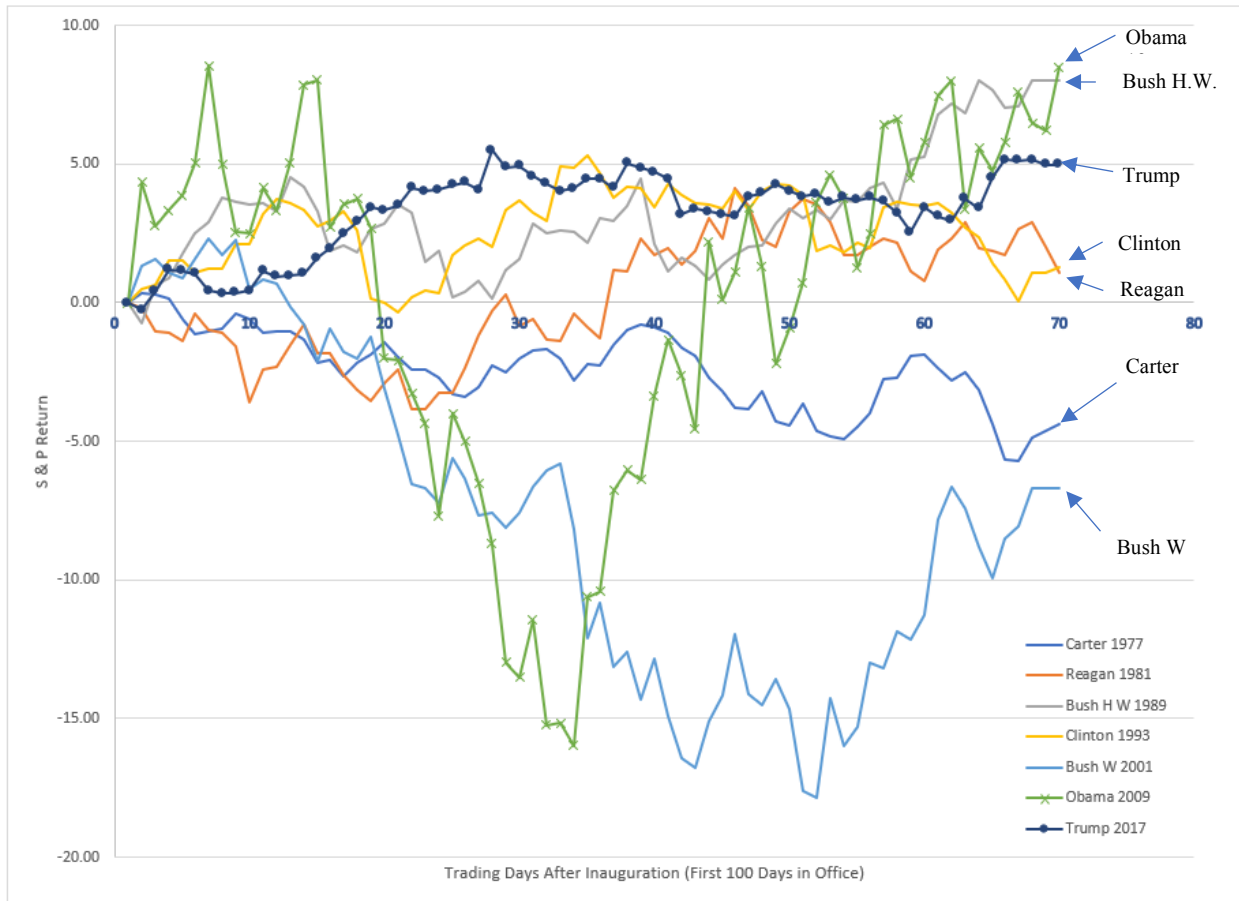
Source: Standard & Poor's

Figure 20: S&P Return: First 100 Days in Office by Party (First Term)
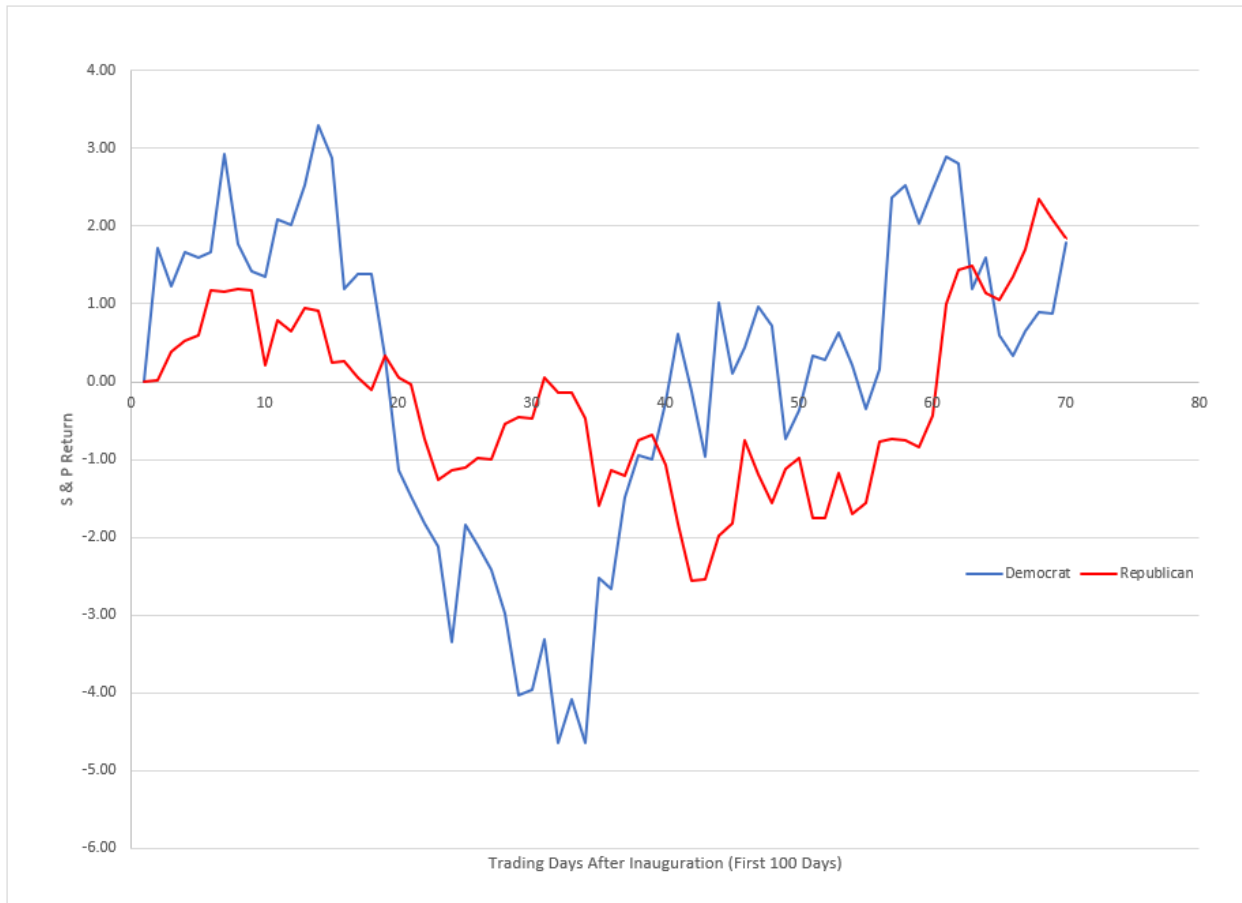
Source: Standard & Poor's

Looking at the average return by party reveals that there is **no statistical difference** between the two groups. Figure 19 shows that the S & P return for the first 100 days for both Democrats and Republicans is approximately 1.8%; the return for both Democrats and Republicans fell into negative territory around the 21st trading day after the inauguration (around February 14th) and started trending upwards again between the 35th and 42nd day after inauguration (Feb 28th to March 5th).

When comparing a first-term Democratic president versus a second-term Republican president (i.e., Biden 1.0 versus Trump 2.0), the returns for Republicans fall about 100 bps below the Democrats. The variance for the first-term Democrats is larger than that of second-term Republicans, but the return after 100 days is higher for Democrats.

Figure 21: S&P Return First 100 Days After Inauguration (First Term Democrats v. Second Term Republicans)
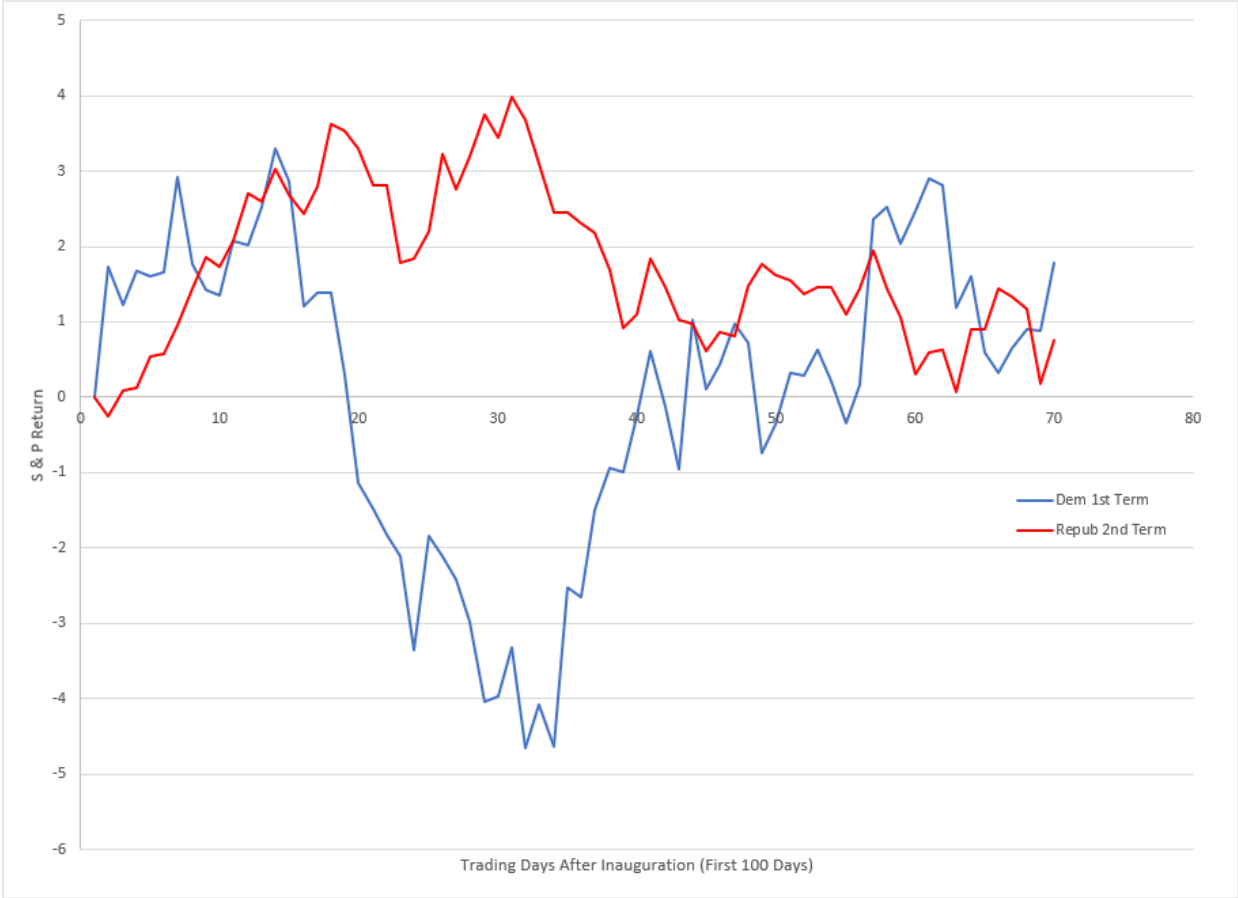
Figure 22: S&P Return for 6 months Prior Through 12 months after Inauguration (First term Democrats vs Second term Republicans)
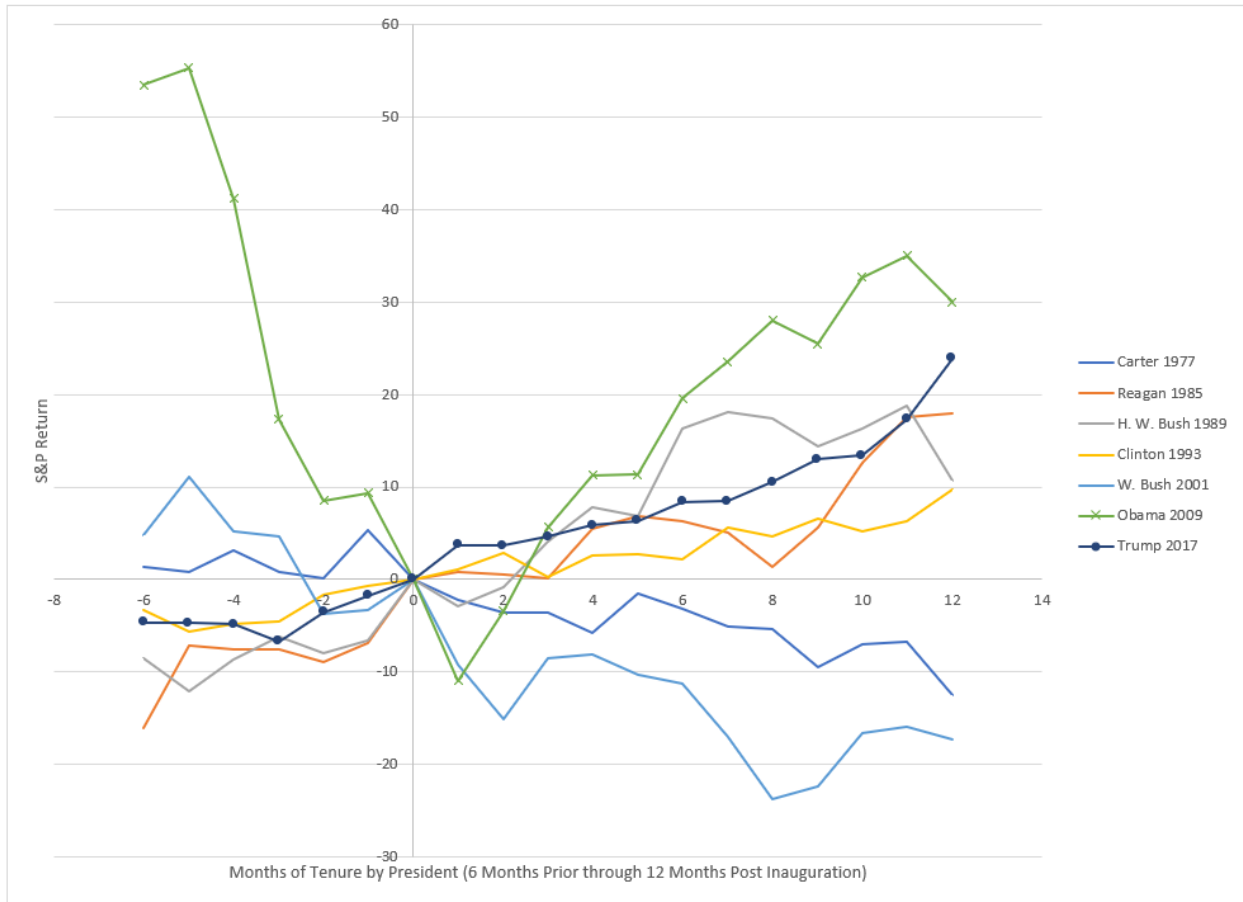
Source: Standard & Poor's

Historically, Presidents have "run with" the S&P trend given to them by their predecessor. The 6-month negative trend for the S&P prior to inauguration for Carter and G. W. Bush became a leading indicator of the trend of the S&P for 12 months after inauguration. Similarly, the positive 6-month trend for the S&P prior to the first-term inaugurations of Reagan, Clinton, G.H.W. Bush and Trump was an indicator of the 12-month trend post inauguration. Only Obama shows a reversal of trends, with a negative 6-month trend prior to his inauguration and a positive 12-month trend post inauguration.

Figure 23: S&P Return for First 12 months in Office

Source: Standard & Poor's

Stepping back to a more abstract view, we offer a portion of the abstract from a research report, published by Alan S. Blinder and Mark W. Watson of Princeton University in 2013, in which the authors state "The U.S. economy has performed better when the President of the United States is a Democrat rather than a Republican, almost regardless of how one measures performance. For many measures, including real GDP growth (on which we concentrate), the performance gap is both large and statistically significant, despite the fact that postwar history includes only 16 presidential terms. … it appears that the Democratic edge stems mainly from more benign oil shocks, superior TFP performance, and more optimistic consumer expectations about the near-term future. Many other potential explanations are examined, but they fail to explain the partisan growth gap."[45]

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[45] See https://www.princeton.edu/~mwatson/papers/Presidents_Blinder_Watson_Nov2013.pdf

F.   US/International Political Landscape

Prospects for 2020 US Federal Elections

The evolution of the COVID-19 pandemic in the US started in the Northeast and Northwest, before spreading widely throughout the nation; as of July 2020, increasing cases of COVID-19 are occurring in the Southeast and Southwest regions of the US. Suffice it to say that the high infection rates of COVID-19, and corresponding high initial unemployment claims, might be a significant hurdle to Donald Trump in his re-election bid. Since 1960, there we've seen a downward relationship between the election margin of the incumbent President (and President's party) and the unemployment rate. We show the relationship between these two variables for elections between 1960 and 2016 and for elections between 1988 and 2016.

Using the most recent elections as a guide for a model, we could forecast the required Republican margin for re-election in November under different prevailing unemployment rates.

Table 13: Incumbent Reelection Margin and Prevailing Unemployment Rate

Incumbent General Election Margin	Unemployment Rate
2.885	5
1.378	6
-0.129	7
-1.636	8
-3.143	9
-4.65	10
-6.157	11
-12.185	15
-19.72	20
-42.325	35
-64.93	50

Using this information to build an appropriate model (Figure 24 and Figure 25), President Trump might be able to win re-election with an electoral college victory if the unemployment rate falls between 6 and 7 percent. However, **the current unemployment rates (see Figure 26) being between 10 and 20 percent**

would almost certainly push the general election and electoral college margin towards former Vice-President Biden. Even if the economy rebounds quickly, **it is likely the unemployment rate will still be above 10% in November 2020**.

Figure 24: Linear Relationship Between Unemployment Rate and Election Margin (Incumbent Party, 1960 – 2016)
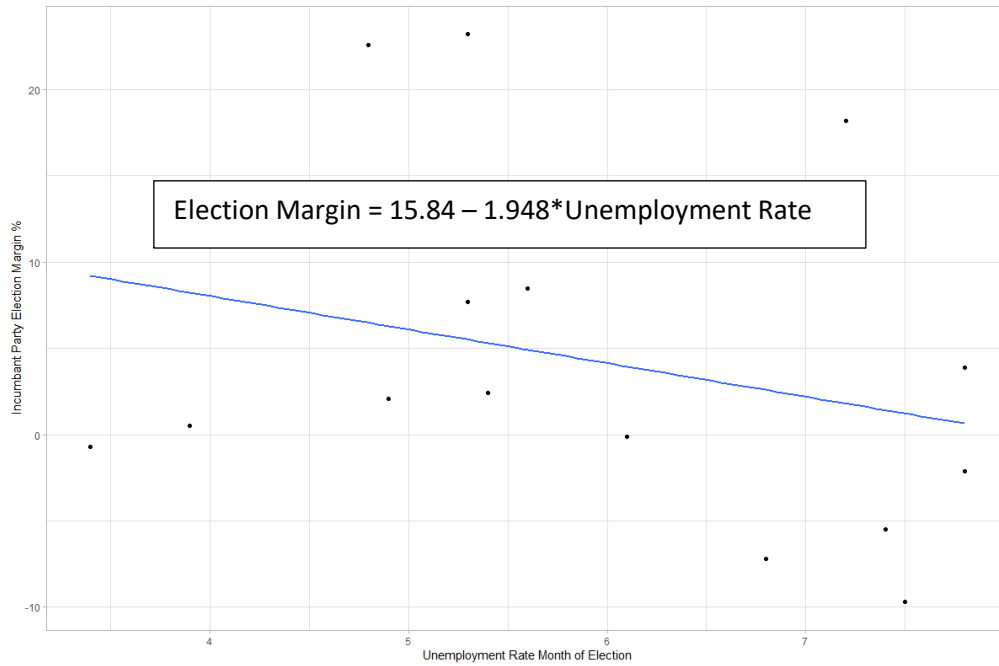
Source: Author's calculation

Current polls have former **Vice President Biden leading President Trump by between 4% and 12% of the Electoral College**.[46,47] A recently projected electoral map, reflecting the perceived "battleground states" is shown in Figure 27. Additionally, after the 2020 federal election, recent predominant polls indicate that the Senate will be controlled by the Democratic Party in 2021, and the House of Representatives will be too evenly split to call a clearly dominating agenda.[48] The impact on the long-term economy of a Biden administration has yet to be determined, particularly knowing that it will initially be saddled with

- the aftermath of the COVID-19 pandemic & recovery;
- recent social upheavals; and
- an agenda including targeting highly liquid companies that may not be considered as contributing appropriately towards their tax burden.[49]

This analysis is not intended to be a commentary on either of the two discussed candidates, nor a statement supporting or opposing any candidate. However, we are focusing on Biden at this point given his currently perceived position in the polls, and based on the fact that the world has had the past 3½

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[46] Also, per https://www.npr.org/2020/07/06/885168480/supreme-court-rules-state-faithless-elector-laws-constitutional, note that the Supreme Court upheld states' rights to punish wayward electors who participate in the Electoral College.

[47] See, e.g., https://www.270towin.com/2020-polls-biden-trump/national/

[48] See https://www.realclearpolitics.com/epolls/2020/president/us/general_election_trump_vs_biden-6247.html.

[49] See, e.g., https://www.barrons.com/articles/how-to-position-your-portfolio-for-a-joe-biden-presidency-51593217473

years of exposure to Trump's policies and practices as President (and, hence, one may better extrapolate from that history to what his future positions might be). In contrast, Biden has been relatively absent from the political landscape for the past three years (despite his previous experience in politics), and how he is positioning his potential administration may not be as easy to infer under the current circumstances.

Figure 25: Linear Relationship Between Unemployment Rate and Election Margin (Incumbent, 1988-2016)
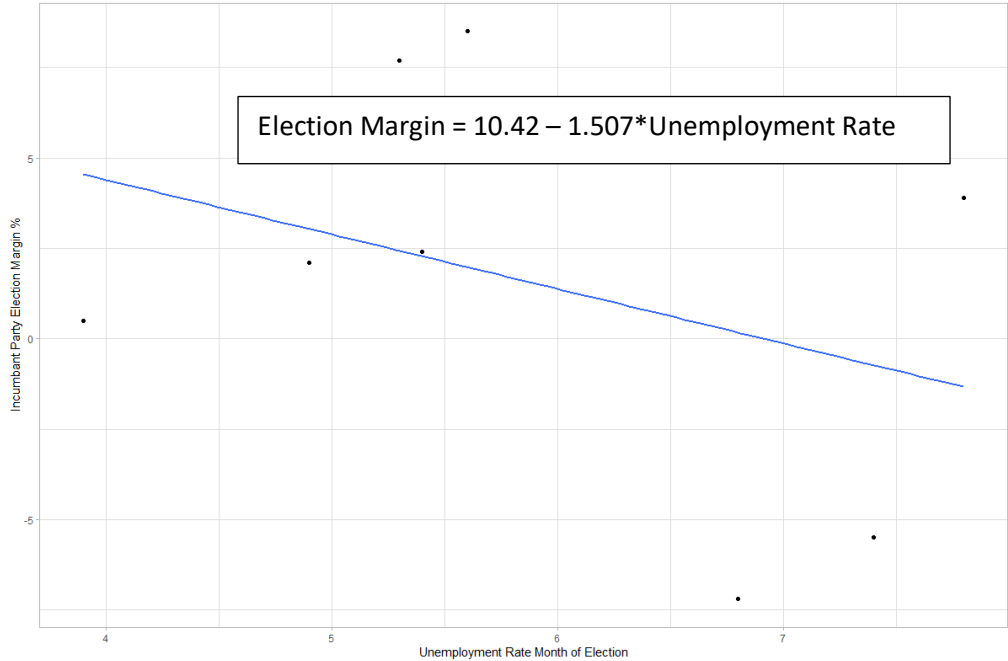
Election Margin = 10.42 – 1.507*Unemployment Rate

Source: Author's calculation

Figure 26: Unemployment Rate by State (May 2020)
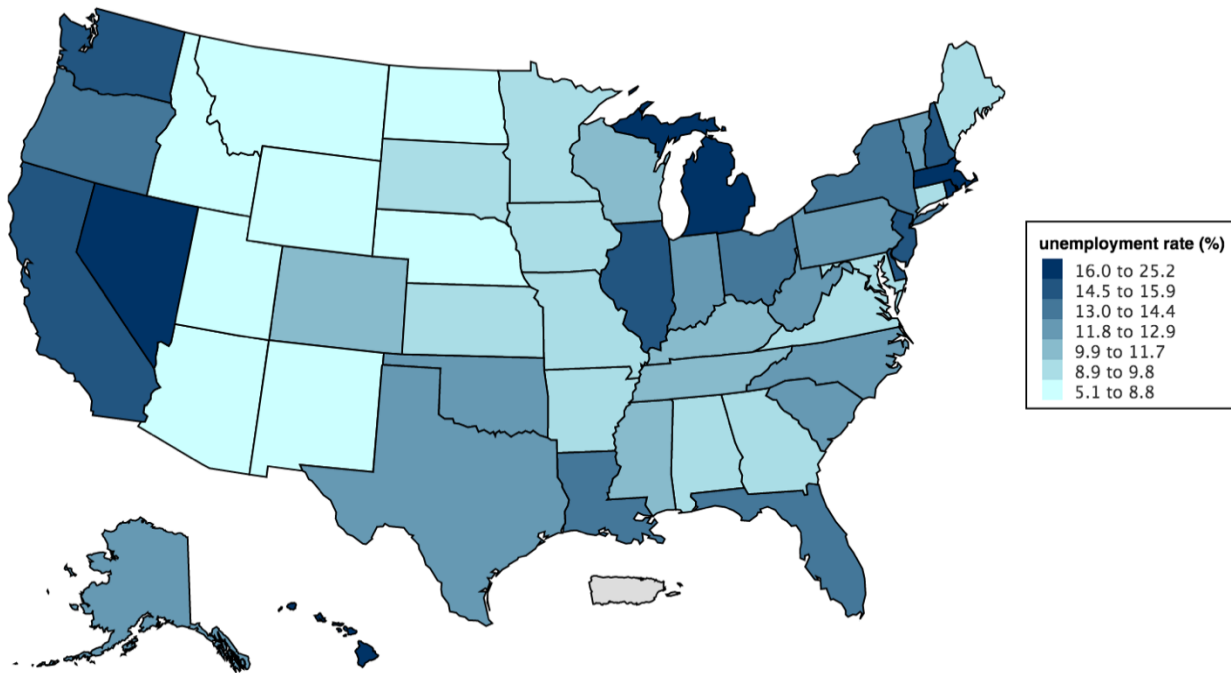
Source: Bureau of Labor Statistics

Figure 27: Current Electoral College Estimates for Trump & Biden election of 2020
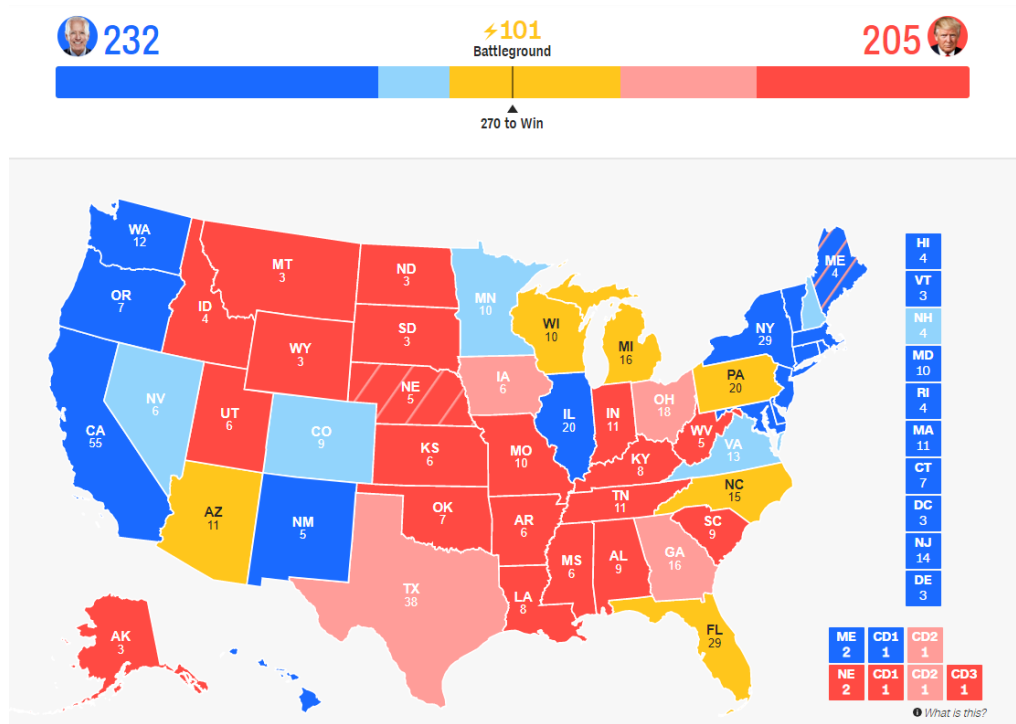
Source: cnn.com

Publicly, Biden is calling for significantly increased spending and support (over that which was allocated as part of The CARES Act) in order to resolve the COVID crisis[50]. He also is calling for government funding to support individuals needing healthcare, and to aggressively build new R&D capabilities domestically, and steer US government steering to domestic products. His **total new spending budget is reported to be over $7 trillion**[51]; per the Martinsville Bulletin, "This will be the largest mobilization of public investments in procurement, infrastructure and (research and development) since World War II," senior adviser Jake Sullivan told The Associated Press, with the campaign promising additionally that Biden would require that effort in domestic markets before negotiating any new international trade deals.[52] There are substantial concerns from Wall Street and abroad about the expected increase in tax burden necessary to deliver on these plans, which would likely cause interest rates to rise precipitously and devalue the dollar globally.[53]

In line with that prioritization, James Freeman wrote in the Wall Street Journal, "One reason stocks haven't tanked as Mr. Biden has built a polling lead over President Donald Trump is a Wall Street consensus that Biden could bring some benefits along with much higher governmental costs. Specifically, the hope has been that while a President Biden would ramp up taxes, spending and regulation, he would also reduce trade tensions and tariffs. It's getting harder to cling to this belief."[54] **Biden's call to "Buy American" is also concerning to global partners**, as it harkens back to President Trump's original trade agenda.[55]

If Biden were to ascend to the White House in January 2021, the US' relationship with Saudi Arabia would likely see some changes. Biden has stated that he believes that Saudi Arabia engineered Jamal Khashoggi's murder, and he has vowed to stop selling arms to Saudi Arabia, and we infer that he (Biden) would work to strengthen Washington-Riyadh relations.[56] **The result of those relationships will not only affect the US' military presence globally, but also global energy prices**.

On the other hand, Biden has agreed with Trump's philosophy regarding China, but not Trump's handling of relations with the country. Biden has framed China's rise as a "serious challenge," criticized its "abusive" trade practices, and warned that China may pull ahead of the United States in new technologies. Biden agrees with Trump that China is breaking international trade rules, unfairly subsidizing Chinese companies, and stealing U.S. companies' intellectual property, but Biden also rejects China's assurances about the coronavirus pandemic. Biden intends to increase the U.S.' naval presence in the Asia-Pacific and improve U.S. ties with countries including Australia, Indonesia, Japan, and South Korea.[57]

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[50] See https://joebiden.com/covid19/

[51] https://www.wsj.com/articles/bidens-bigger-government-11594315921

[52] See https://martinsvillebulletin.com/news/national/biden-proposes-700-billion-plus-buy-american-campaign/article_b28f151a-2e95-53ec-81ed-6b4e8ecfe18b.html

[53] Per https://www.poundsterlinglive.com/usd/13411-pound-to-dollar-forecast-biden-vs-trump

[54] https://www.wsj.com/articles/bidens-bigger-government-11594315921

[55] See https://www.nytimes.com/interactive/2020/us/florida-coronavirus-cases.html

[56] See https://www.youtube.com/watch?v=5_3F2h_FT98

[57] See https://www.cfr.org/election2020/candidate-tracker/joe-biden

Anticipated International Reactions to Current Events

Virtually every country in the world that has been affected by COVID has also been affected by unemployment attributable to "lock down" orders, changes to consumers' spending, and overall lifestyle impacts. As Americans double down on saving (and cut the fat from personal budgets), the root cause of changes in CPI recently have been difficult to track.[58] In the US, significant drops in fuel prices (due to the OPEC+ production dispute and a drop in demand over the past four months) have caused the appearance of deflation, even though the cost of food and similar lifestyle products have actually increased.[59] Britain, for instance, has seen similar issues.[60]

Additionally, travel restrictions for Americans are starting to enter the commonplace, with **travel restrictions being levied for travel into seventeen states and several countries**, **including Canada, Mexico, much of the European Union, and several other countries**[61,62]. Ireland and Great Britain are allowing US citizens (who are not dual citizens, and do not have family or another relationship to a European country) to enter at this time, but are requiring Americans to submit to 14-day quarantines; fines for not doing so are £1,000.[63] Further, travel to China is still limited.[64]

Just as the isolation of "stay-at-home" orders had a chilling effect on economic activity, the hampering travel restrictions internationally cannot be completely mitigated by video calls and electronic communication.

The current COVID-19 pandemic has already significantly hampered domestic output, including international travel, imports & exports, and related industries. We have previously discussed unemployment filings, and recent personal consumption, savings, and retail sales figures, and expect that government stimulus (already passed its planned amounts) will continue to be debated, and some amount will likely be provided during the fall and after the next inauguration.

Finally, we expect **net trade to drop and then very gradually increase given the demand for American food supplies globally**. Mortgage rates have remained extremely low, and are not expected to recover in the near future (i.e., at least 24 months). Given this mixture of factors, we still expect that the **nominal GDP growth rate will be between -5.0% and -8.0%, inflation will rise at a rate of as much as 3.0%, and the real GDP growth rate will be between -2.0% and -5.0% for 2Q2020**. Disposable income and capital investment will shrink severely. We believe that **inflation could still average at or above 4.0% for 2020, and stay above 3.0% through 2021**, with the Federal Funds rate remaining at essentially zero. Inflation will continue to teeter on the edge of dramatic advancement, depending on individual housing/liquidity needs over the next 12 months, as well as government spending. To be honest, the short term implications of another round of government stimulus is extremely concerning, but the alternative does not seem appealing either.

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[58] See https://qz.com/1848393/inflation-numbers-are-meaningless-due-to-covid-19/

[59] See https://www.bls.gov/news.release/pdf/cpi.pdf

[60] See https://www.economist.com/graphic-detail/2020/04/23/are-covid-19-lockdowns-distorting-inflation

[61] See https://www.nytimes.com/article/coronavirus-travel-restrictions.html

[62] Per https://www.iatatravelcentre.com/international-travel-document-news/1580226297.htm

[63] See https://www.nytimes.com/article/eu-travel-ban-explained-usa.html

[64] Ibid.

Figure 28: Countries with Travel Restrictions (as of July 12, 2020)
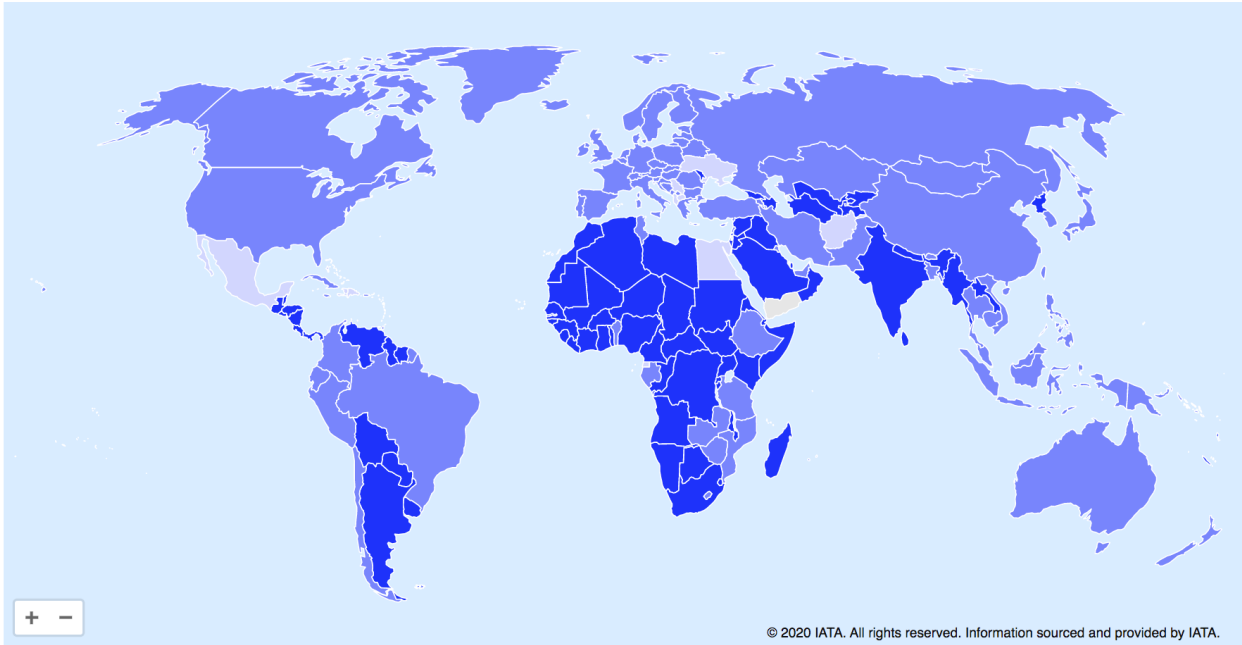
Totally Restrictive
Partially Restrictive
Not Restrictive
Latest updates currently under review

Source: IATA

Data Analysis

As part of the Dodd-Frank Act, larger banking institutions in the United States are required to use government specified variables, and approved proprietary processes, to determine if they are adequately prepared for unexpected "systemic failures". Some banking institutions are also incorporating portions or components of their forecasting processes to estimate future profitability; in order to do so, however, realistic forecasts (as opposed to extremes) are required.

While arguments could be made about the variables included in this study, as stated in Jiang, et al., "… a conclusion that can be made for … US data is that there is little to no improvement in forecast accuracy when the number of predictors is expanded beyond 20-40 variables."

Capitalytics provides the results of a rigorous analysis of every variable that is included in our quarterly macroeconomic study. These variables include the following[65]:

1. Real GDP growth
2. Nominal GDP growth
3. Real disposable income growth
4. Nominal disposable income growth
5. Unemployment rate
6. CPI inflation rate
7. 1-month Treasury yield
8. 3-month Treasury yield
9. 6-month Treasury yield
10. 1-year Treasury yield
11. 3-year Treasury yield
12. 5-year Treasury yield
13. 7-year Treasury yield
14. 10-year Treasury yield
15. 20-year Treasury yield
16. 30-year Treasury yield
17. BBB corporate yield
18. Mortgage rate
19. Prime rate
20. US Average Retail Gasoline Price ($/gal; all grades, all formulations)
21. S&P 500 Stock Price Index
22. Cost of Federal Funds (Primary Credit Rate)
23. Moody's AAA Rate
24. Moody's BAA Rate
25. Dow Jones Total Stock Market Index
26. House Price Index
27. Commercial Real Estate Price Index
28. Market Volatility Index (VIX)

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[65] This study is motivated by the Federal Reserve Board's Dodd-Frank Act, which includes requirements to consider various international factors; however, those factors will not be discussed extensively in this particular report based on the target use and audience of this report.

Our procedure is as follows:

1. Data is collected per the information in Appendix A, "Data sources".
2. Correlations between variables are identified to determine which variables are may be considered as "dependent" (upon other variables, i.e., highly correlated with other variables as part of their nature).
3. Multiple forecast analyses are performed per the procedure in Section I of Appendix B for all variables, with the results of corresponding forecasts aggregated.
4. Regressions are performed per the procedure in Section III of Appendix B for all variables.
5. The rationale for these analyses, modifications, and the conclusions thereto are documented in the following section of this report, "Data Series Conclusions".

Correlations

Part of Capitalytics' analysis of macro-economic variables entails computing the correlation between variables, in order to establish the existence and level of interdependence of variables.

In Appendix C of this document, we document the 140 pairs of variables that showed absolute correlation values greater than or equal to 0.6. As part of this portion of the study, Capitalytics identified the following sets of strong dependencies (correlations with magnitudes greater than 0.95) between variables that were subsequently validated as significant, long-term, recurring correlations as part of the nature of the variables; these pairings of variables are viewed as extremely significant based on the respective definitions of the variables and will be leveraged as discussed in Section I of Appendix B.

Table 14: Variable Dependencies

Regression (Dependent) Variable		Independent Variable[66]
6-month Treasury yield		3-year Treasury yield*
Prime rate		3-month Treasury yield
1-month Treasury yield		1-year Treasury yield
3-year Treasury yield	**… depends on …**	1-year Treasury yield
7-year Treasury yield		3-year Treasury yield*
10-year Treasury yield		5-year Treasury yield
20-year Treasury yield		7-year Treasury yield*

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[66] It should be immediately apparent that some of the variables that are listed as "independent" are, in fact, dependent on other variables; these "independent" variables that actually have dependencies are noted by a trailing "*".

30-year Mortgage rate	5-year Treasury yield[*]
30-year Treasury yield	20-year Treasury yield[*]
S&P 500 Stock Price Index	Dow-Jones Total Index
US Residential Home Price Index	Commercial Real Estate Price index
Primary Credit rate	3-year Treasury yield[*]

Due to the unexpected impact of the COVID pandemic, and the requirements to address the pandemic, the results of many of our quantitative algorithms will not match our reported expectations for what will occur over the next several months and/or years. We will note these deviations where they occur.

Analysis of Variables

Real & Nominal GDP Growth, Real & Nominal Disposable Income Growth, and CPI Inflation Rate

Analysis

Our quantitative algorithm indicated that real GDP growth was to recover from the drop of 1.27% during 1Q2020 to barely eke out 1% growth during 2021, and eventually almost return to 2% annualized growth during late 2023. Given the plans that have been projected by former Vice President Biden, and the expected aid package that President Trump will likely need to institute as part of a recovery should he win the election later this year, we expect that it will be a much harsher and longer path to get to the 2% figure, likely not reaching that level of growth again until 2024 or 2025.

In the interim, we expect that a Biden presidency will generate substantial inflation during 2H2021, '22, and '23, and disposable income will drop notably.

Ordinarily, GDP is driven by several factors:

- Personal consumption;
- Retail sales;
- Government spending;
- Net trade; and
- Mortgage rates.

As we have mentioned, the current COVID emergency is expected to significantly hamper domestic output in the near term, starting with international travel, imports & exports, and related industries. The pandemic has already significantly hampered domestic output and caused a significant number of

bankruptcies. We have previously discussed unemployment filings, and recent personal consumption, savings, and retail sales figures, and expect that government stimulus (already passed its planned amounts) will continue to be debated, and some amount will likely be provided during the fall and after the next inauguration.

Additionally, spending patterns by consumers who are still working have shifted in light of the changes in the culture. With reliance on online infrastructure from an in-home workspace, consumers are needing (in the short term) computing & office supplies; however, these are purchases of (usually reimbursed) durable goods. Other needs for, e.g., professional shirts (and similar items) have been noticed (and continued) given businesses' reliance on laptop-based video-conferences.

Our conclusion is that, while *government spending will likely continue to sporadically increase* based on the ratification of stimulus/public support (as a function of the emergency), we expect *personal consumption and retail sales will continue to remain substantially lower than corresponding levels in 2019*.

Finally, we expect **net trade to drop and then very gradually increase given the demand for American food supplies globally**. Mortgage rates have remained extremely low, and are not expected to recover in the near future (i.e., at least 24 months). Given this mixture of factors, we still expect that the **nominal GDP growth rate will be between -5.0% and -8.0%, inflation will rise at a rate of as much as 3.0%, and the real GDP growth rate will be between -2.0% and -5.0% for 2Q2020**. Disposable income and capital investment will shrink severely. We believe that **inflation could still average at or above 4.0% for 2020, and stay above 3.0% through 2021**, with the Federal Funds rate remaining at essentially zero. Inflation will continue to teeter on the edge of dramatic advancement, depending on individual housing/liquidity needs over the next 12 months, as well as government spending.

Other Commentary

- "Inflation-adjusted gross domestic product (real GDP) is expected to decline by about 12 percent during the second quarter, equivalent to a decline at an annual rate of 40 percent for that quarter." (see https://cbo.gov/publication/56335; Apr 24, 2020)
- "Inflation-adjusted gross domestic product (real GDP) is expected to decline by about 12 percent during the second quarter, equivalent to a decline at an annual rate of 40 percent for that quarter." (see https://www.conference-board.org/research/us-forecast; July 8, 2020)
- "Business reopenings have started. But expect second quarter GDP to still drop by 30% to 40% at an annualized rate. Even with a pretty good rebound in the second half of the year, expect 2020 GDP to decline 5.8%. Full recovery is likely to take until the end of 2021." (see https://www.kiplinger.com/article/business/T019-C000-S010-inflation-rate-forecast.html; May 28, 2020)

Unemployment Rate

Analysis

In our last report, we reported that "the unemployment rate is driven by the size of the employable labor force; the monetary policy of the Federal Reserve (which drives the Federal Funds Rate); and, the fiscal policy of the US (which impacts government spending)." Unfortunately, over the past three months, we have seen how individual states' "stay-at-home" orders have caused enough uncertainty about the future to drive several dozen large companies into bankruptcy.

In our previous reports, in which we compared the COVID pandemic to Hurricane Katrina, we estimated that **unemployment would settle above 15%, and possibly as high as 35%** by YE2021. We posited that:

> "Regions that rely on the hospitality industry (e.g., Hawaii, Florida, Nevada, etc.), energy (e.g., Texas, Louisiana, Missouri, etc.), commercial & residential real estate (i.e., 12 major metro areas, e.g., Miami, San Francisco, etc.), and entertainment (e.g., Nevada, California, etc.) are expected to be the hardest hit; agriculture and conservative markets will be the most resilient, but will still feel the effects of the phenomena. Similarly, the Brookings Institute purports that the smallest and youngest businesses are the most vulnerable at this time, with **extremely young/small retail and construction firms reducing their staff by over 30%**.[67]"

Other Commentary

- The unemployment rate is projected to average 15 percent during the second and third quarters of 2020, up from less than 4 percent in the first quarter." (per https://www.cbo.gov/publication/56335; Apr. 24, 2020)
- "As a result, the GDP growth rate could fall as much as 50%. That's about the depth experienced during the Great Depression, but it shouldn't last as long. Unemployment could be as high as 30%." (per https://www.thebalance.com/us-economic-outlook-3305669; June 10, 2020)

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[67] See https://www.brookings.edu/blog/the-avenue/2020/03/25/what-the-great-recession-can-tell-us-about-the-covid-19-small-business-crisis/

Treasury Yields (1, 3, & 6-month; 1, 3, 5, 7, 10, 20, & 30-year series)

Analysis

Given the current vulnerability of the current economy (in its need to provide stimulus to support the domestic economy today – and likely provide international support in the future), we expect that ***the Fed' will attempt to manage inflation and raise capital by adjusting interest rates on Treasury bonds***. In doing so, we expect that the previous concerns about an inverted yield curve will dissipate, while rates will follow a "hockey-stick" curve over the next few years. The exact shape and timing of the "bend" in the curve will be a function of politics and the availability of a cure/treatment for the COVID cure.

We have previously discussed that we believe ***inflation will average above 4.0% through 2020, and above 3.0% through 2021***. We have also alluded to our conclusion that ***the Federal Funds Rate will stay below 0.5% through at least 2022,*** and will only grow slowly several years after the end of the crisis, once investor confidence returns. Further, based on Vice President Biden's announced platform, we expect that ***the general tax rate on businesses and individuals will likely increase in 2021 under a Biden administration*** (businesses going from 21% to 28%, and the highest individual tax rate going to 39%) and stimulus to be fast-tracked if he is elected with a Democratic Senate.

Other Commentary

- "The 10-year Treasury yield has risen only slightly off its record low of 0.5%. While it is not likely to move lower, it should stay below 1% for a while, given how uncertain the progress of the recovery will be once restrictions are lifted on the economy. Short-term rates will likely stay near zero for even longer." (see https://www.kiplinger.com/economic-forecasts/interest-rates; May 22, 2020)
- "Assuming the economy rebounds in the second half of the year, longer-term yields could move higher. Signs of improving growth combined with an ever-increasing supply of Treasuries will likely result in moderately higher bond yields and a steeper yield curve. With a rising budget deficit, Treasury issuance is increasingly shifting toward longer-dated bonds, adding to the upward pressure on yields and steepening the curve. For the second half of the year, we believe 10-year Treasury yields could drift up to the 1% level." (per https://www.advisorperspectives.com/commentaries/2020/06/18/2020-mid-year-outlook-fixed-income; June 18, 2020)

1 mo T-bill yield (y) vs 1 yr T-bill yield (x)

$y = 0.983x - 0.2711$
$R^2 = 0.9776$

1 mo Treasury yield (y-axis)

1 yr Treasury yield (x-axis)

Source: Author's calculation

3 yr T-bill yield (y) vs 1 yr T-bill yield (x)

$y = 0.9789x + 0.5144$
$R^2 = 0.9802$

3 yr Treasury yield (y-axis)

1 yr Treasury yield (x-axis)

Source: Author's calculation

3 yr T-bill yield (y) vs 1 yr T-bill yield (x)

$y = 0.9789x + 0.5144$
$R^2 = 0.9802$

Source: Author's calculation

7 yr T-bill yield (y) vs 3 yr T-bill yield (x)

$y = 0.9187x + 1.0061$
$R^2 = 0.9869$

Source: Author's calculation

10 yr T-bill yield (y) vs 5 yr T-bill yield (x)

$y = 0.908x + 1.0541$
$R^2 = 0.9898$

Source: Author's calculation

20 yr T-bill yield (y) vs 7 yr T-bill yield (x)

$y = 0.9197x + 0.9945$
$R^2 = 0.9484$

Source: Author's calculation

30 yr T-bill yield (y) vs 20 yr T-bill yield (x)

$y = 0.8648x + 0.6277$
$R^2 = 0.9878$

Source: Author's calculation

30-year Mortgage Rate

Analysis

Prior to the COVID-19 emergency, our models reflected the 30-year fixed mortgage rate stabilizing between 3.8% and 3.9% for the foreseeable future.   Further, our quantitative analysis indicated that there is a strong connection between mortgage rates and the 5-year T-bill.

However, given the current circumstances, rates have dropped further as low as 3%-3.25%, which caused a massive demand for refinancing. That demand has been curbed only by the credit requirements imposed by banks.

Looking forward, though, as unemployment stabilizes at the higher levels that we have quoted earlier, we expect for the frothiness of the retail market to settle and *expect 30-year fixed rate mortgages to be offered as low as 2.5% within the next 12 months* before they rebound. When rates do start to recover, we expect them to recover extremely slowly, much as we saw in 2014.

Other Commentary

- "Average 30-year mortgage rates are likely headed down to around 3% eventually because of the low 10-year Treasury rate. However, they have not fallen as much as would be expected, because of heavy demand for refinancing. Lenders can get higher than normal margins on loans as long as there is heavy demand. Applications to refinance are still more than double last year's level, although the 30-year rate dropped to 3.24% from 3.28% a week earlier as refinancing applications declined 6%." (https://www.kiplinger.com/economic-forecasts/interest-rates; May 22, 2020)

30 yr Mortgage Rate (y) vs 5 yr T-bill yield (x)

$$y = 0.9549x + 2.4153$$
$$R^2 = 0.9779$$
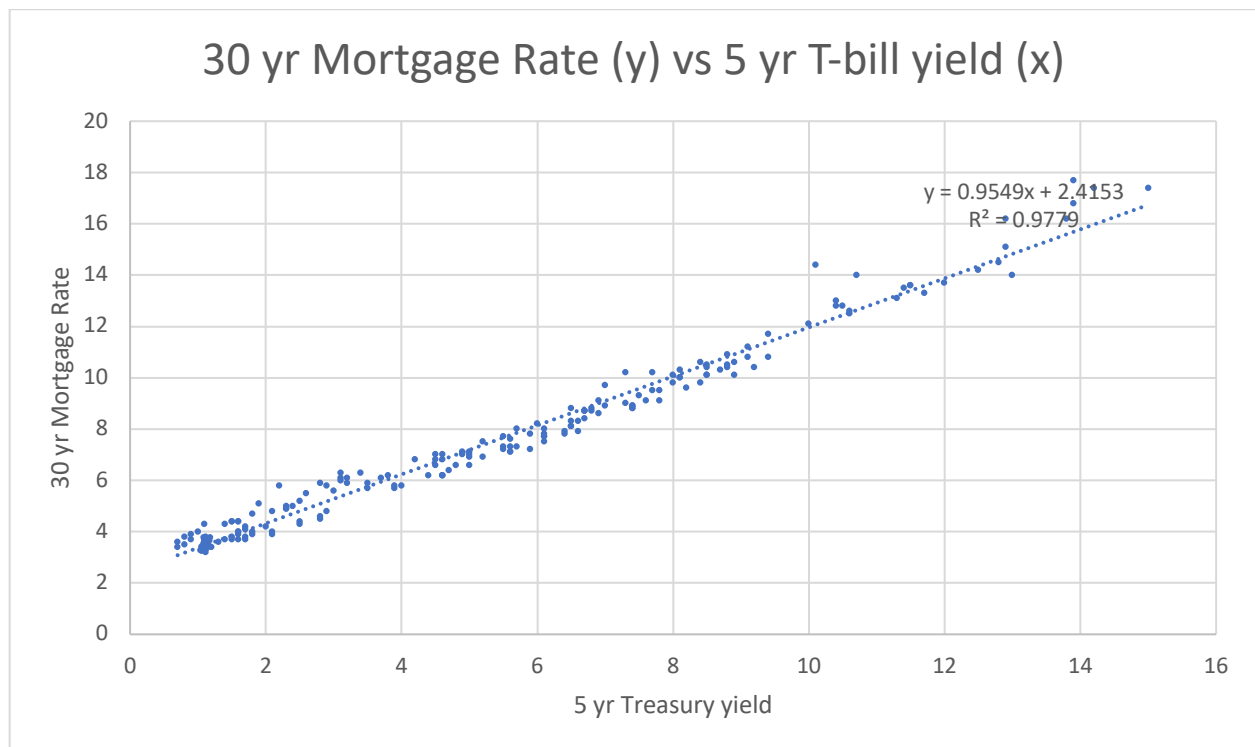
Source: Author's calculation

Moody's AAA & BAA Rates; BofA BBB Corporate Yield; and the Market Volatility Index (VIX)

Analysis

Moody's AAA bond rates tend to track in conjunction with mid-duration T-bill. Moody's BAA rates tend to be higher yield (corresponding to higher risk), and more volatile, than AAA rates. Both were also dependent on consumer/investor confidence in the organizations that were reflected in the securities. The BBB Corporate Yield is generally tied to Moody's indices (particularly the Moody's BAA bond yield), CPI, and the 30-year Mortgage Rate, even though these bonds are generally 10 years in duration. Capitalytics' analysis showed that the VIX was usually tightly coupled to the BBB corporate yield. Over

the past few years, the volume of bonds that are rated generally in the BBB range has grown dramatically, to take up a significant portion of the investment grade market.

Capitalytics' (original) quantitative models saw AAA rates gradually dropping over the next several years (through 2024) from 3.06% (to 3.0% by YE2020) to 2.9% by 2024. These figures continued to show reductions from our previous models. BAA rates were expected to drop from 4.0% to 3.85% over the next 5 years.

At this point, however, there are very few sectors of the US Economy that remain unaffected by the COVID-19 emergency. The most likely significant portion of the market to be affected by this emergency are real estate-heavy operations that are dependent on lease payments (consider CBRE, Simon, and GPG) – and those organizations that lease substantial amounts of real estate (large distributed organizations such as IBM are sure to write down noteworthy losses to break leases -- where possible – as their employees adapt to working from their residences). We have discussed the implications for commercial/retail space landlords, and how they are being manipulated by "credit tenants", and impacted by the COVID pandemic.

We expect the weakest of this group to be able to ride out the situation for 12-18 months, but substantially hindered. While they were dropping very slowly from about 3.0% (as their security was increasingly expected), *we expect these yields to now be forced above 5.0% (and higher) by the end of 2020*. Unfortunately, we also expect a significant number of defaults of bonds that are currently held at *every* risk grade to occur within the next two years as a global slowdown sets in. Along those lines, we now expect *a plethora of these bonds to drop in grade to/ below "junk" status, and many more companies will be pulled into bankruptcy before YE2021 due to depleting cash reserves as "stay-at-home" orders are reinstituted*. This change in the landscape will affect otherwise highly rated bonds as markets potentially start to dry, and *we advise the preservation of any liquidity possible in order to weather the next 24 months*. We have also discussed that the Fed' has been shoring up the economy by purchasing a variety of assets that it finds strategically valuable to the management of the economy and then easing those assets back into the market. We expect that practice to continue for several quarters after a vaccine is generally available.

Market instability due to concerns about the COVID-19 issues and the likelihood of no inoculation for a 12- to 18-month period (and the steps that companies will take to maintain their productivity in the interim) means that the VIX will remain at a heightened level for the near term (currently 30, with recent spikes at 80), and trading policies based on the VIX will continue to be fueled.

The next most likely milestone that will assuage the market's volatility is understanding if a state or major US metropolitan area has the political resolve to truly control its outbreak. Rumors are currently swirling that NYC and other cities will see a peak by the end of April 2020, which, if accurate, will likely send that message. After that point, economists will have a better sense how the uncoordinated control that multiple cities will exert over their own outbreaks will turn out, and how those controls will impact distributed organizations and the economic markets. *Similarly, news of successful preventative measures and/or cures will be an undeniably major step to settling the market; currently, this objective is expected in 12 to 18 months.*

Other Commentary

- "Interest rates on the lowest-rated companies have spiked, rising above their government bond counterparts in a fashion not seen in 15 years. Default rates are expected to climb, and there's fear that the worst could be yet to come amid roiled markets and growing expectations for a global recession." (see https://www.cnbc.com/2020/03/12/bonds-the-credit-markets-are-signaling-that-a-problem-is-afoot.html; Mar. 12, 2020)
- "Looking at corporate debt as a percentage of GDP should give investors pause both in terms of the magnitude of that ratio and the stage of the cycle this implies." (per https://www.osterweis.com/insights/take_a_scalpel; Jan. 13, 2020)
- "Start with the first, volatility. Equity-market instability might feed on itself. The VIX, which measures the expected volatility implied by the price of options on the S&P 500 index, vaulted from around 15 to above 27 in a matter of days … Some investment strategies are particularly sensitive to it. For example, when volatility is low, they allow for a bigger weighting of equities in portfolios. But when it rises and stays high, some investors are forced to unload some of their holdings—creating yet more volatility. Some exchange-traded funds whose value is linked to the VIX saw outflows. It is likely that at least some investors have been betting on continued near-dormant volatility. The resilience of such strategies could be tested." (per https://www.economist.com/finance-and-economics/2020/02/27/markets-wake-up-with-a-jolt-to-the-implications-of-covid-19; Feb. 27, 2020)
- "A surprise rally in riskier corporate bonds is providing much-needed help to some energy companies with lower credit ratings, allowing them to issue new bonds to push back looming repayment dates." (see https://www.wsj.com/articles/energy-companies-seize-the-day-with-bond-refinancings-11579006807; Jan. 14, 2020)

Prime Rate

Analysis

The Prime Rate is historically very tightly coupled to very short-term Treasury Bills (specifically, 3-month yields). Capitalytics models anticipated the Prime Rate remaining very close its current level of 4.8% for the foreseeable future (through 2024). However, given the trajectory of short-term T-bills, *we anticipate the Prime Rate will only be buoyed by competition, and will remain at or below 3.5% through mid-2021*.

The accompanying chart shows the tight relationship that has existed historically between the Prime Rate and the 3-month T-bill yield.

Prime Rate (y) vs 3 mo T-bill yield (x)

$y = 0.994x + 3.0976$
$R^2 = 0.9672$

(scatter plot: Prime Rate on y-axis ranging 0–25, 3 mo Treasury yield on x-axis ranging 0–16)
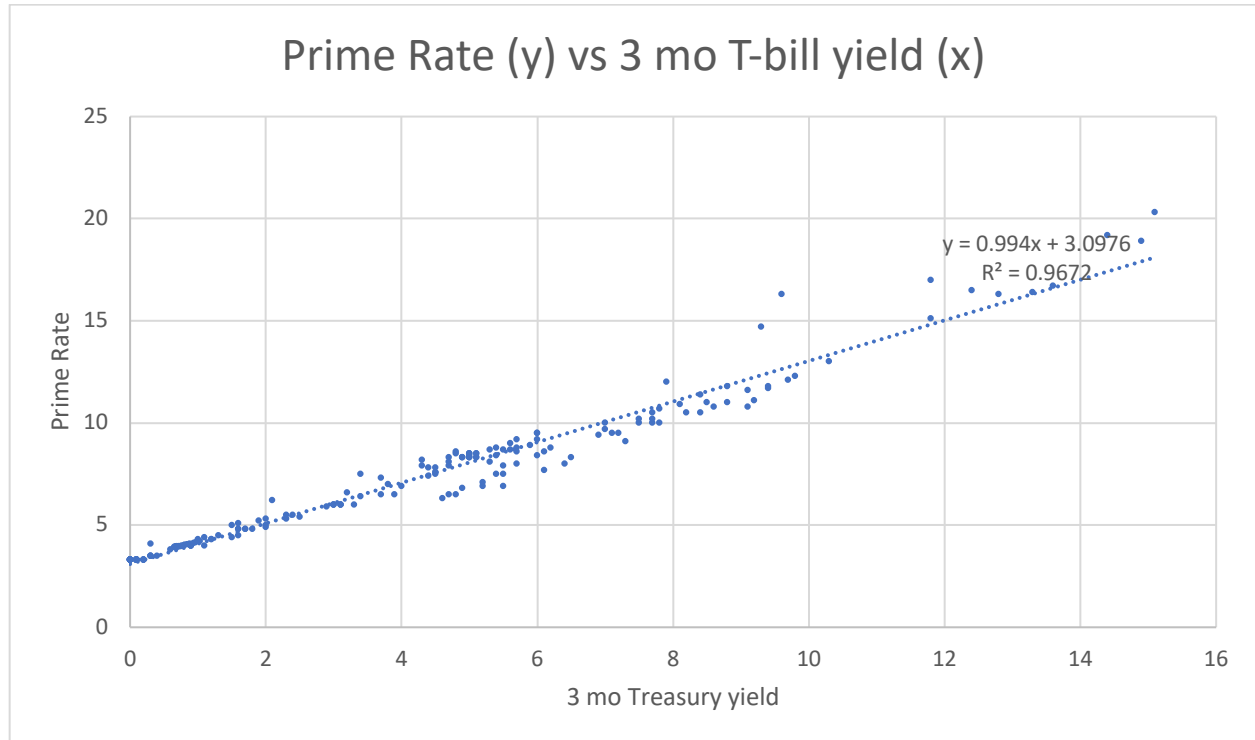
Source: Author's calculation

Other Commentary

- "… the Fed isn't going to do anything with short-term rates any time soon, and is probably going to be on hold into 2022 (only two FOMC members see the Fed raising rates at some point during 2022 …" (see http://primerate.fedprimerate.com/; June 12, 2020)

US Average Retail Gasoline Price

Analysis

While the OPEC+ countries agreed to cut production (and are now planning to release the agreed upon limits), the effects of the Coronavirus on travel have already entrenched themselves. Demand for airplane fuel (approximately 10% of consumption) has been substantially affected for the long-term, and road travel has been impacted.

Fuel prices, though, still appear to be encouraging Americans to take to the road this summer. AAA expects that road travel will be down by approximately 3% from 2019, whereas air travel will be down (expectedly) by 74%, and other forms of travel will be down by 85% since 2019.[68] In line with that forecast (and with the resolution of the Russian-OPEC agreement calling for a 20% reduction in crude oil production), EIA anticipated Brent crude to be approximately $41/barrel during 2H2020 and to reach

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[68] See https://newsroom.aaa.com/2020/06/aaa-forecasts-americans-will-take-700-million-trips-this-summer/

$50/barrel in 2021, translating to their expectation of regular grade **automotive fuel staying near $2/gallon through 2020 and diesel fuel remaining at about $2.50/gallon**[69].

Other Commentary

- "The national average price of regular unleaded rose five cents from a week ago to reach $2.18 per gallon. This spring, when driving plummeted because of the coronavirus pandemic and consumers were buying little gas, the national average price fell to about $1.70. But since then, oil producers have throttled back their output, Americans are getting in their cars again, and pump prices have rebounded. We look for the national average price to be near $2.25 per gallon next weekend, when many people will be traveling for the Independence Day holiday. Considering that a year ago, the national average was $2.72, that doesn't sound too bad. Diesel, now averaging $2.44 per gallon, is little changed from recent weeks, even as gasoline prices climb." (see https://www.kiplinger.com/economic-forecasts/energy; June 30, 2020)
- "Delta, an American carrier, says it may have to trim international schedules by 40%, up from a 25% reduction before the ban. Lufthansa, Europe's biggest carrier, had already cut flights in half for April. As more countries impose travel restrictions, the German airline may need to thin schedules by 90%, reckon analysts at Bernstein, a research firm." (per https://www.economist.com/business/2020/03/15/coronavirus-is-grounding-the-worlds-airlines; Mar 15, 2020)

Federal Funds (Primary Credit) Rate

Analysis

When a depository institution has a shortfall and need for liquidity, it may borrow funds on a short-term basis from the Federal Reserve. The "discount rate" is the interest rate charged to commercial banks and other depository institutions on loans they receive from their regional Federal Reserve Bank's "discount window". The Federal Reserve Banks offer three discount window programs to depository institutions: Primary Credit, Secondary Credit, and Seasonal Credit, each with its own interest rate. Under the Primary Credit program, loans are extended for a very short term (usually overnight) to depository institutions in generally sound financial condition. (Secondary Credit & Seasonal Credit may be available to institutions that do not meet the "sound financial condition" criteria.) The discount rate charged for primary credit (the primary credit rate) is set above the usual level of short-term market interest rates.

Historically, we have seen a tight connection between the Primary Credit rate and the 3-month T-bill; the accompanying chart illustrates that relationship. Prior to the COVID-19 outbreak, the Primary Credit rate for 4Q2019 was 1.65%, and Capitalytics was projecting it to drop dramatically during 2020. We anticipated the cost of funds to fall below 1% by 3Q2020, and below that point thereafter.

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[69] See https://www.eia.gov/outlooks/steo/report/prices.php, as of July 7, 2020

Looking at history, the Federal Funds rate has generally been quick to fall due to recessions, and slow to recover. During the 2001 recession, the rate went from 5.5% to 1.6%, and in the recession of 2008, the rate went from 4.66% to 0.1%. But it took 2 full years (mid-2004 to mid-2006) for the rate to be raised from 1.00% to 5.25%, and it took 2 more years (Oct 2016 to Dec 2018) for the rate to go from 0.4% to 2.4%.

While the duration of the Coronavirus epidemic isn't know, speculation in medical circles is that the world is still 9- to 18-months from a cure being widely available. Based on those numbers, and the announcements of expected stimulus packages that will be considered, ***we now expect the Federal Funds Rate to remain at essentially zero for at least 36-48 months***.

Primary Credit (y) vs 3 mo T-bill yield (x)

$y = 1.0048x - 0.6265$
$R^2 = 0.9375$
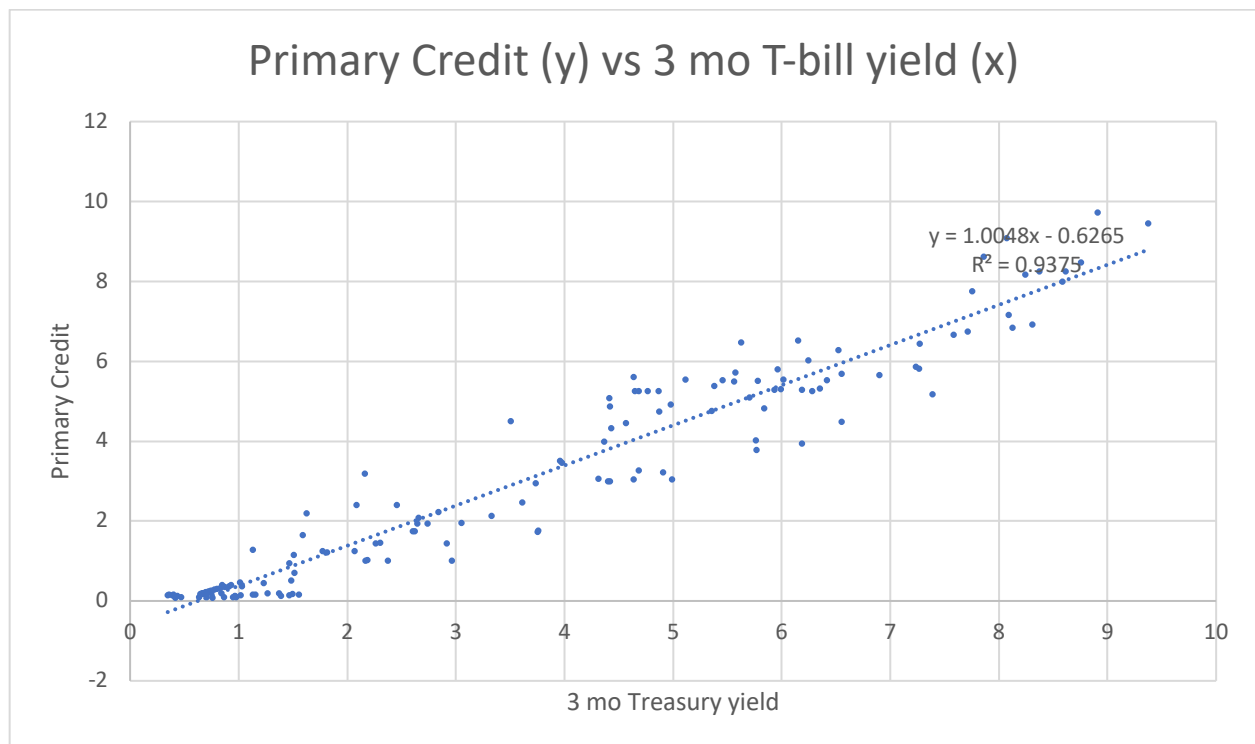
Source: Author's calculation

House and Commercial Real Estate Price Indexes

Analysis

New home-construction and home sales (both new- and existing-home sales) have dropped dramatically since the end of 2018. These trends will be reflected in the Home Real Estate Price Index as it has slowed, but is still to grow by as much as 1% per quarter nationally over the next several quarters (from 211.5 in 4Q2019, to 215.5 at YE2020, to 218 at YE2022), while still being driven by the aforementioned trends. However, growth that was already slowing is now expected to slow even further; while

mortgage rates will bottom out during 2020 and stay through 2021, ***mortgage originators will be <u>very selective</u> of new mortgagees and their employment stability***. Additionally, we expect employee transfers within corporations (that will be conserving capital) will be minimized, further hindering sales and leaving an already significant amount of inventory on the market.

Prior to COVID-19, the Commercial Real Estate Price index was projected to grow at between 0.4% and 1% per quarter, and then grow approximately 1%-2% per quarter over the next 60 months; now, though, our algorithms were seeing this index peaking at the end of 2020 and then receding (from 316 in 4Q2019, to 305.3 at YE2020, to 301 at YE2023). This trend matches our previous recommendation in which we stated that ***we expect this index to falter, growing by no more than 0.2% this year and then dropping as investors look to repurpose assets*** to more stable purposes.

Residential Home Price Index (y) vs Commercial Real Estate Index (x)

$y = 0.7237x + 0.9706$
$R^2 = 0.929$
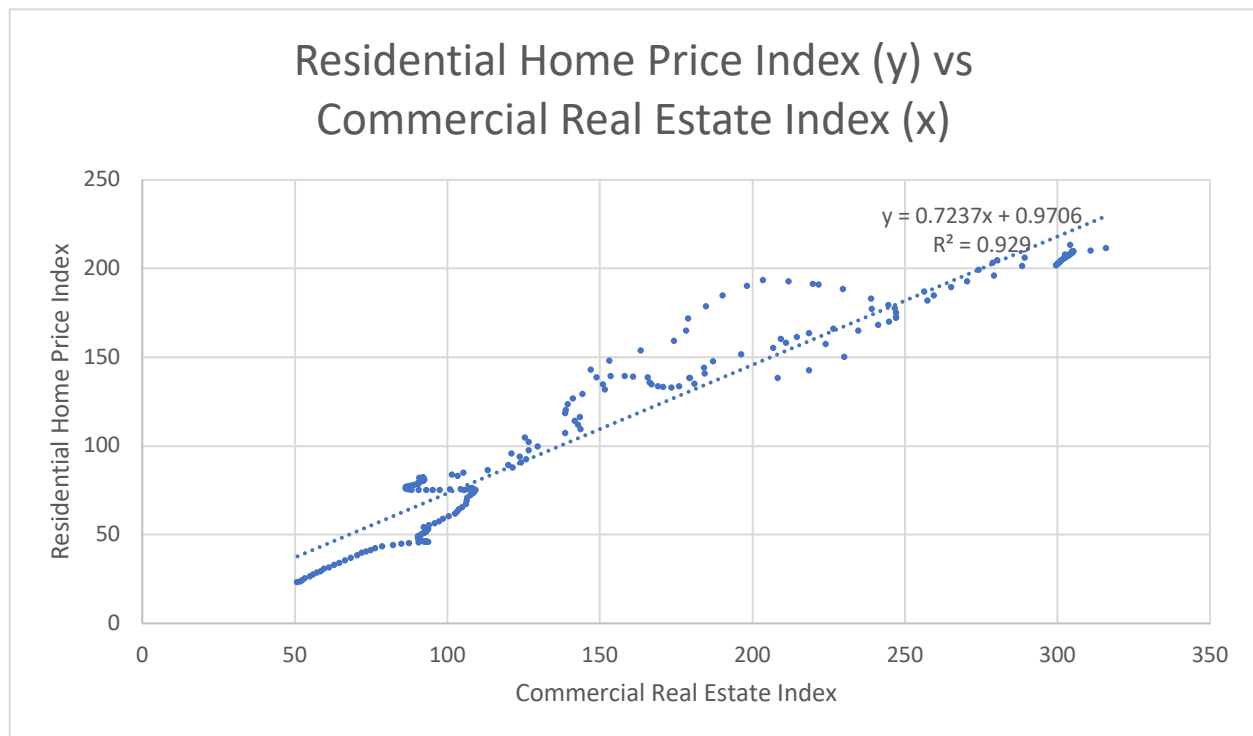
Source: Author's calculation

Other Commentary

- "Listings failed to keep up with sales in December, with the inventory-to-sales ratio for single-family homes declining to 3.0 months. On a year-over-year basis, total inventory was down 8.5% …" (see https://www.kiplinger.com/article/business/T019-C000-S003-housing-market-forecast-housing-starts-home-sales.html; Jan. 30, 2020)

- Per the National Association of Realtors, "… numerous experts have lowered their [housing market predictions for the next 5 years](#) for home prices and appreciation rates. According to [Zillow's Home Price Expectations Survey](#) (which surveyed a panel of over 100 real estate and economic experts), experts forecast that home prices will rise only 2.8% in 2020 nationally." (see https://www.mashvisor.com/blog/us-housing-market-predictions-2020/; Sept 7, 2019)

Dow Jones Total Stock Market Index (end-of-quarter) and S&P 500 (quarterly average)

Analysis

Given the business- and investor-friendly administration that is currently installed in the United States, we expected steady growth during 2020. This trend, however, has been hampered by the COVID-19 crisis: the Dow TSM Index plummeted 7000 points across 1Q2020. In contrast, however, the S&P 500 rose another 100 points across the same quarter.

Our models are showing generally stability over both indexes, with neither significant growth nor erosion. However, the hinge-pin around what will actually occur with these indexes will likely be the outcome of the Presidential and Congressional elections in November. If Trump is elected and can restore investor confidence with his handling of the COVID crisis, we expect to see restored growth of the markets; on the other hand, if Biden is elected, as we have discussed, investors will likely be very concerned about money raised from taxation, and other means.

Beyond that, we can only repeat our previous analysis: given the lack of stability in the market today, we expect growth the be very slow once the economy re-emerges. We believe that, with the different regions that have different infection dates and degrees of infection, recovery will be staged geographically; there is a strong likelihood that aggressive relaxing of quarantine requirements will result in relapses across the county. Hence, the recovery will be "inconsistent and/or erratic", and it will likely not be monotonically improving across the entire nation. The lack of a constantly improving perception will likely cause the markets to remain unstable until the end of the crisis, which will be indicated with the widespread release of a cure and/or inoculation, which is currently projected as being during the Summer of 2021.   As such, ***we expect to see a continuation of the volatility that has been observed over the past 30 days for at least the next year.*** Further, ***it is too soon to determine the trend of the markets during this crisis*** given the volatility that we have seen.

SP500 Total Index (y) vs Dow Jones Total Index(x)

$y = 0.0974x - 127.02$
$R^2 = 0.9456$
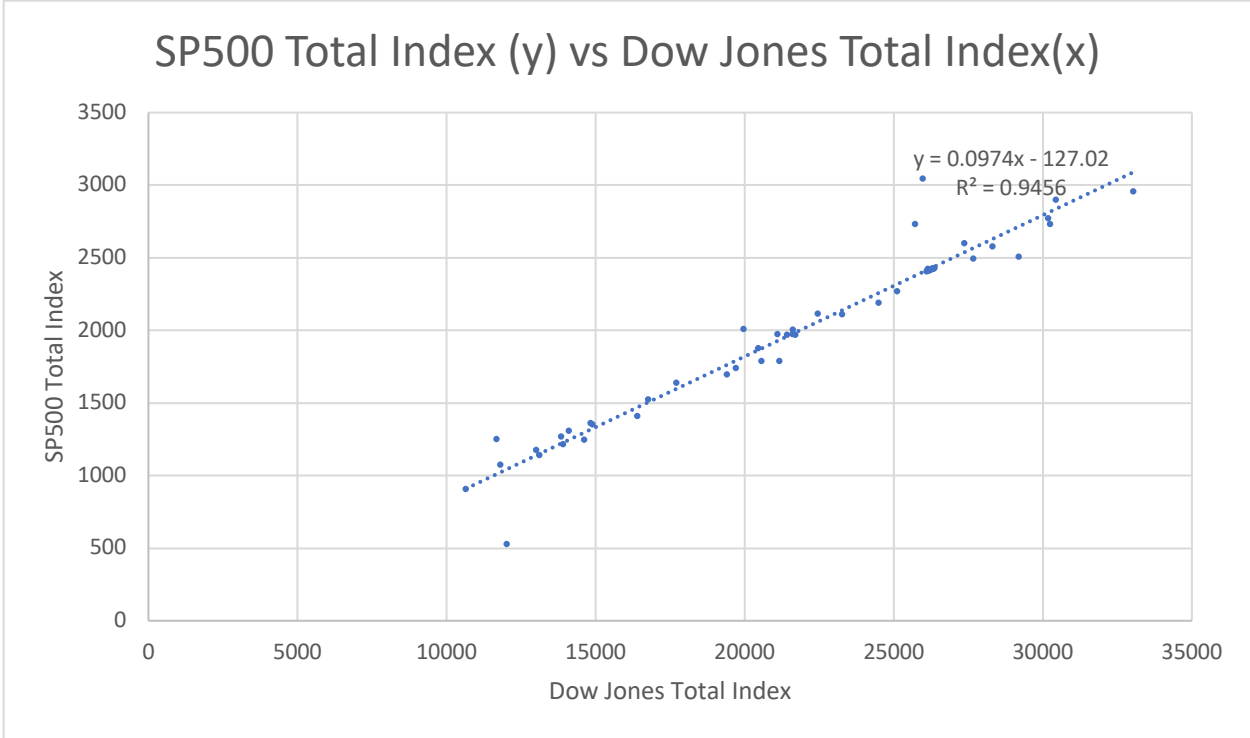
Source: Author's calculation

Other Commentary

- "The S&P 500 suffered its fastest-ever 10% decline from an all-time high. The Dow Jones Industrial Average just had its worst week since the start of the 2008 global financial crisis. Shares of manufacturers, banks and utilities alike have dropped by double digits." (per https://www.wsj.com/articles/the-week-that-wiped-3-4-trillion-off-the-stock-market-11582891223; Feb. 29, 2020)
- "Investors have grown increasingly pessimistic that efforts to stop the spread of the virus will prevent significant damage to the global economy. … American businesses will generate no earnings growth in 2020 if the virus becomes widespread, Goldman Sachs Group's equity analysts warned on Thursday." (from https://www.wsj.com/articles/global-stocks-extend-declines-as-coronavirus-concerns-mount-11582784087; Feb. 27, 2020)

Regression Analyses

The following section document the linear regression coefficients found for each of the aforementioned variables, as a function of other variables (which are not significantly correlated with the control variable). With this report, we have also included the natural log of all variables as experimental (dependent) variables; these variables are denoted by a "LN_" prefix below.

To compare the effectiveness of these regressions, we calculate the percentage error between the forecasted value (based on the given regression, using the values from the immediately preceding quarter) and the actual value for the period between 1Q2006 and 1Q2020, inclusive.

Table 15: Regression Aggregate Errors for 1Q2006 through 1Q2020

Variable	Min Abs. Error	Average Error	Max Abs. Error
Real GDP Growth	131.93%	***	***
Nominal GDP Growth	***	**	***
Real Disposable Income Growth	0.69%	-16.24%	***
Nominal Disposable Income Growth	0.70%	0.51%	509.74%
Inflation	0.00%	-115.33%	***
Unemployment Rate	15.19%	68.88%	653.78%
1-month Treasury Yield	109.59%	**	***
3-month Treasury Yield	0.52%	2.25%	404.58%
6-month Treasury Yield	0.76%	8.27%	127.62%
1-year Treasury Yield	27.81%	**	***
3-year Treasury Yield	9.28%	158.75%	540.90%
5-year Treasury Yield	46.04%	399.95%	968.01%
7-year Treasury Yield	1.28%	-39.64%	186.25%
10-year Treasury Yield	2.91%	-23.83%	124.06%
20-year Treasury Yield	3.77%	-71.62%	126.74%
30-year Treasury Yield	0.00%	10.26%	41.00%
30-year Mortgage Rate	0.01%	-3.29%	48.31%

Moody's AAA Curve	2.59%	-11.85%	24.02%
Moody's BAA Curve	0.77%	-16.93%	66.34%
BBB Corporate Yield	52.16%	-63.47%	79.57%
Prime Rate	0.41%	0.18%	24.22%
US Average Retail Gasoline Price	3.57%	7.12%	218.95%
Cost of Federal Funds	118.48%	**	***
Dow Jones Total Stock Market Index	10.54%	102.68%	282.51%
S&P 500 Stock Price Index	2.34%	-35.46%	117.32%
Commercial Real Estate Price Index	2.54%	44.86%	109.43%
Residential Home Price Index	39.98%	126.74%	203.50%
Market Volatility Index	0.11%	27.02%	236.61%

** The indicated value has a percentage error less than -1000%.
*** The indicated value has a percentage error greater than 1000%.

Real & Nominal GDP Growth, Real & Nominal Disposable Income Growth, and CPI Inflation Rate

REGRESSION FOR REAL GDP GROWTH

	Dependent variable (+/- SE):
	Real GDP growth
Constant	2.150 (+/- 0.317)
	$p = 0.00000$***
LN_1-year Treasury Yield	-0.065 (+/- 0.229)
	$p = 0.779$
Observations	40
R^2	0.002
Adjusted R^2	-0.024
Residual Std. Error	1.579 (df = 38)
F Statistic	0.080 (df = 1; 38)
Note:	*p<0.1; **p<0.05: ***p<0.01

REGRESSION FOR NOMINAL GDP GROWTH

	Dependent variable (+/- SE):
	Nominal GDP growth
Constant	-0.101 (+/- 2.851)
	p = 0.972
US Fed Reserve O-N Loan Rate	25.470 (+/- 8.275)
	p = 0.005[***]
Moody's AAA Curve	-3.102 (+/- 1.057)
	p = 0.007[***]
Unemployment Rate	1.484 (+/- 0.472)
	p = 0.004[***]
20-year Treasury Yield	-12.312 (+/- 3.585)
	p = 0.002[***]
10-year Treasury Yield	15.169 (+/- 3.689)
	p = 0.0003[***]
1-month Treasury Yield	-21.775 (+/- 7.496)
	p = 0.007[***]
LN_1-year Treasury Yield	-3.057 (+/- 0.809)
	p = 0.001[***]
Observations	40
R^2	0.436
Adjusted R^2	0.313

Residual Std. Error	1.512 (df = 32)
F Statistic	3.538^{***} (df = 7; 32)

Note:	*p<0.1; **p<0.05: ***p<0.01

REGRESSION FOR REAL DISPOSABLE INCOME GROWTH

	Dependent variable (+/- SE):
	Real disposable income growth
Constant	-636.505 (+/- 94.586)
	$p = 0.00004^{***}$
US Fed Reserve O-N Loan Rate	353.902 (+/- 38.009)
	$p = 0.00001^{***}$
Moody's AAA Curve	-91.464 (+/- 9.174)
	$p = 0.00000^{***}$
Moody's BAA Curve	78.169 (+/- 8.317)
	$p = 0.00001^{***}$
Real GDP growth	7.710 (+/- 1.167)
	$p = 0.00004^{***}$
Nominal GDP growth	-9.938 (+/- 1.149)
	$p = 0.00001^{***}$
Unemployment Rate	39.250 (+/- 4.817)
	$p = 0.00001^{***}$
BBB corporate yield	-32.346 (+/- 4.062)
	$p = 0.00001^{***}$
30-year Mortgate Rate	40.502 (+/- 5.169)
	$p = 0.00001^{***}$
Dow Total Stock Market Index	0.003 (+/- 0.001)

	$p = 0.0005^{***}$
Home Price Index	-2.280 (+/- 0.251)
	$p = 0.00001^{***}$
Commercial Real Estate Price Index	2.585 (+/- 0.269)
	$p = 0.00001^{***}$
Market Volatility Index	3.183 (+/- 0.337)
	$p = 0.00001^{***}$
LN_Market Volatility Index	-60.942 (+/- 7.217)
	$p = 0.00001^{***}$
30-year Treasury Yield	288.721 (+/- 67.742)
	$p = 0.002^{***}$
LN_30-year Treasury Yield	-502.346 (+/- 144.458)
	$p = 0.006^{***}$
20-year Treasury Yield	-667.461 (+/- 99.125)
	$p = 0.00004^{***}$
LN_20-year Treasury Yield	1,277.565 (+/- 193.484)
	$p = 0.00004^{***}$
10-year Treasury Yield	383.535 (+/- 40.271)
	$p = 0.00001^{***}$
LN_10-year Treasury Yield	-748.715 (+/- 97.051)
	$p = 0.00001^{***}$
1-month Treasury Yield	-378.981 (+/- 40.330)

	$p = 0.00001^{***}$
LN_1-month Treasury Yield	25.285 (+/- 2.455)
	$p = 0.00000^{***}$
7-year Treasury Yield	158.917 (+/- 34.541)
	$p = 0.001^{***}$
5-year Treasury Yield	-162.553 (+/- 20.046)
	$p = 0.00001^{***}$
6-month Treasury Yield	-234.534 (+/- 33.794)
	$p = 0.00003^{***}$
3-year Treasury Yield	-54.555 (+/- 15.050)
	$p = 0.004^{***}$
LN_3-year Treasury Yield	115.843 (+/- 14.241)
	$p = 0.00001^{***}$
1-year Treasury Yield	372.788 (+/- 43.747)
	$p = 0.00001^{***}$
LN_1-year Treasury Yield	-128.733 (+/- 12.125)
	$p = 0.00000^{***}$
Observations	40
R^2	0.965
Adjusted R^2	0.876
Residual Std. Error	1.346 (df = 11)
F Statistic	10.807^{***} (df = 28; 11)

Note: *p<0.1; **p<0.05: ***p<0.01

REGRESSION FOR NOMINAL DISPOSABLE INCOME GROWTH

	Dependent variable (+/- SE):
	Nominal disposable income growth
Constant	-631.243 (+/- 91.170)
	$p = 0.00003^{***}$
US Fed Reserve O-N Loan Rate	365.257 (+/- 36.636)
	$p = 0.00000^{***}$
Moody's AAA Curve	-99.849 (+/- 8.843)
	$p = 0.00000^{***}$
Moody's BAA Curve	84.332 (+/- 8.017)
	$p = 0.00000^{***}$
Real GDP growth	7.532 (+/- 1.125)
	$p = 0.00004^{***}$
Nominal GDP growth	-9.755 (+/- 1.108)
	$p = 0.00001^{***}$
Unemployment Rate	40.190 (+/- 4.643)
	$p = 0.00001^{***}$
BBB corporate yield	-36.071 (+/- 3.915)
	$p = 0.00001^{***}$
30-year Mortgate Rate	44.976 (+/- 4.983)
	$p = 0.00001^{***}$
Dow Total Stock Market Index	0.003 (+/- 0.001)

	$p = 0.0002^{***}$
Home Price Index	-2.437 (+/- 0.242)
	$p = 0.00000^{***}$
Commercial Real Estate Price Index	2.639 (+/- 0.259)
	$p = 0.00000^{***}$
Market Volatility Index	3.450 (+/- 0.325)
	$p = 0.00000^{***}$
LN_Market Volatility Index	-66.584 (+/- 6.956)
	$p = 0.00001^{***}$
30-year Treasury Yield	321.910 (+/- 65.295)
	$p = 0.0005^{***}$
LN_30-year Treasury Yield	-566.212 (+/- 139.240)
	$p = 0.002^{***}$
20-year Treasury Yield	-713.804 (+/- 95.545)
	$p = 0.00002^{***}$
LN_20-year Treasury Yield	1,356.407 (+/- 186.496)
	$p = 0.00002^{***}$
10-year Treasury Yield	395.827 (+/- 38.816)
	$p = 0.00000^{***}$
LN_10-year Treasury Yield	-782.045 (+/- 93.545)
	$p = 0.00001^{***}$
1-month Treasury Yield	-394.021 (+/- 38.874)

	$p = 0.00000^{***}$
LN_1-month Treasury Yield	25.592 (+/- 2.367)
	$p = 0.00000^{***}$
7-year Treasury Yield	180.563 (+/- 33.294)
	$p = 0.0003^{***}$
5-year Treasury Yield	-169.534 (+/- 19.322)
	$p = 0.00001^{***}$
6-month Treasury Yield	-238.336 (+/- 32.573)
	$p = 0.00002^{***}$
3-year Treasury Yield	-69.554 (+/- 14.507)
	$p = 0.001^{***}$
LN_3-year Treasury Yield	120.535 (+/- 13.727)
	$p = 0.00001^{***}$
1-year Treasury Yield	390.752 (+/- 42.167)
	$p = 0.00001^{***}$
LN_1-year Treasury Yield	-132.137 (+/- 11.687)
	$p = 0.00000^{***}$
Observations	40
R^2	0.971
Adjusted R^2	0.897
Residual Std. Error	1.298 (df = 11)
F Statistic	13.134^{***} (df = 28; 11)

Note: *p<0.1; **p<0.05: ***p<0.01

REGRESSION FOR CPI INFLATION RATE

	Dependent variable (+/- SE):
	CPI Inflation Rate
Constant	1,276.342 (+/- 171.509)
	$p = 0.00000$***
Real GDP growth	-13.282 (+/- 3.302)
	$p = 0.0005$***
Nominal GDP growth	12.190 (+/- 2.918)
	$p = 0.0003$***
Unemployment Rate	-41.302 (+/- 7.800)
	$p = 0.00002$***
BBB corporate yield	36.644 (+/- 10.744)
	$p = 0.003$***
Dow Total Stock Market Index	-0.013 (+/- 0.002)
	$p = 0.00001$***
Home Price Index	3.986 (+/- 0.649)
	$p = 0.00001$***
Commercial Real Estate Price Index	-2.868 (+/- 0.512)
	$p = 0.00001$***
Market Volatility Index	-1.225 (+/- 0.368)
	$p = 0.003$***
30-year Treasury Yield	1,874.136 (+/- 213.161)

	$p = 0.000^{***}$
LN_30-year Treasury Yield	-6,368.816 (+/- 596.319)
	$p = 0.000^{***}$
20-year Treasury Yield	-1,486.461 (+/- 189.740)
	$p = 0.00000^{***}$
LN_20-year Treasury Yield	4,511.233 (+/- 472.906)
	$p = 0.000^{***}$
Observations	40
R^2	0.934
Adjusted R^2	0.905
Residual Std. Error	12.519 (df = 27)
F Statistic	31.989^{***} (df = 12; 27)
Note:	$^{*}p<0.1$; $^{**}p<0.05$: $^{***}p<0.01$

Unemployment Rate

REGRESSION FOR UNEMPLOYMENT RATE

	Dependent variable (+/- SE):
	Unemployment Rate
Constant	16.094 (+/- 0.704)
	$p = 0.000^{***}$
US Fed Reserve O-N Loan Rate	-8.823 (+/- 0.442)
	$p = 0.000^{***}$
Moody's AAA Curve	2.375 (+/- 0.137)
	$p = 0.000^{***}$
Moody's BAA Curve	-2.011 (+/- 0.127)
	$p = 0.000^{***}$
Real GDP growth	-0.188 (+/- 0.016)
	$p = 0.00000^{***}$
Nominal GDP growth	0.238 (+/- 0.014)
	$p = 0.000^{***}$
Nominal disposable income growth	0.022 (+/- 0.003)
	$p = 0.00001^{***}$
BBB corporate yield	0.853 (+/- 0.077)
	$p = 0.00000^{***}$
30-year Mortgate Rate	-1.050 (+/- 0.112)
	$p = 0.00001^{***}$

Dow Total Stock Market Index — -0.0001 (+/- 0.00001)

$p = 0.00001^{***}$

Home Price Index — 0.056 (+/- 0.006)

$p = 0.00001^{***}$

Commercial Real Estate Price Index — -0.064 (+/- 0.003)

$p = 0.000^{***}$

Market Volatility Index — -0.081 (+/- 0.006)

$p = 0.00000^{***}$

LN_Market Volatility Index — 1.555 (+/- 0.155)

$p = 0.00000^{***}$

30-year Treasury Yield — -8.282 (+/- 1.073)

$p = 0.00001^{***}$

LN_30-year Treasury Yield — 14.438 (+/- 2.692)

$p = 0.0003^{***}$

20-year Treasury Yield — 17.740 (+/- 1.150)

$p = 0.000^{***}$

LN_20-year Treasury Yield — -33.570 (+/- 2.573)

$p = 0.00000^{***}$

10-year Treasury Yield — -9.398 (+/- 0.688)

$p = 0.00000^{***}$

LN_10-year Treasury Yield — 19.064 (+/- 1.304)

$p = 0.000^{***}$

1-month Treasury Yield	9.475 (+/- 0.523)
	$p = 0.000$[***]
LN_1-month Treasury Yield	-0.604 (+/- 0.045)
	$p = 0.00000$[***]
7-year Treasury Yield	-4.674 (+/- 0.461)
	$p = 0.00000$[***]
5-year Treasury Yield	4.107 (+/- 0.281)
	$p = 0.000$[***]
6-month Treasury Yield	5.775 (+/- 0.573)
	$p = 0.00000$[***]
3-year Treasury Yield	1.695 (+/- 0.300)
	$p = 0.0002$[***]
LN_3-year Treasury Yield	-2.794 (+/- 0.324)
	$p = 0.00001$[***]
1-year Treasury Yield	-9.401 (+/- 0.648)
	$p = 0.00000$[***]
LN_1-year Treasury Yield	3.140 (+/- 0.185)
	$p = 0.000$[***]
Observations	40
R^2	1.000
Adjusted R^2	1.000
Residual Std. Error	0.030 (df = 11)

F Statistic	$6{,}291.816^{***}$ (df = 28; 11)

Note:	*p<0.1; **p<0.05: ***p<0.01

Treasury Yields (1, 3, & 6-month; 1, 3, 5, 7, 10, 20, & 30-year series)

REGRESSION FOR 1-MONTH TREASURY YIELD

	Dependent variable (+/- SE):
	1-month Treasury Yield
Constant	-1.964 (+/- 0.178)
	p = 0.000***
Unemployment Rate	0.011 (+/- 0.003)
	p = 0.001***
Prime Rate	0.576 (+/- 0.053)
	p = 0.000***
3-month Treasury Yield	0.481 (+/- 0.049)
	p = 0.000***
Observations	40
R^2	0.999
Adjusted R^2	0.999
Residual Std. Error	0.027 (df = 36)
F Statistic	11,038.810*** (df = 3; 36)
Note:	*p<0.1; **p<0.05: ***p<0.01

REGRESSION FOR 3-MONTH TREASURY YIELD

	Dependent variable (+/- SE):
	3-month Treasury Yield
Constant	-0.022 (+/- 0.008)
	$p = 0.011^{**}$
1-month Treasury Yield	0.568 (+/- 0.054)
	$p = 0.000^{***}$
6-month Treasury Yield	0.422 (+/- 0.052)
	$p = 0.000^{***}$
Observations	40
R^2	0.998
Adjusted R^2	0.998
Residual Std. Error	0.033 (df = 37)
F Statistic	$10,958.220^{***}$ (df = 2; 37)
Note:	$^{*}p<0.1$; $^{**}p<0.05$: $^{***}p<0.01$

REGRESSION FOR 6-MONTH TREASURY YIELD

	Dependent variable (+/- SE):
	6-month Treasury Yield
Constant	0.195 (+/- 0.059)
	p = 0.003***
30-year Treasury Yield	-0.212 (+/- 0.046)
	p = 0.00005***
10-year Treasury Yield	0.244 (+/- 0.047)
	p = 0.00001***
3-month Treasury Yield	0.961 (+/- 0.018)
	p = 0.000***
Observations	40
R^2	0.996
Adjusted R^2	0.996
Residual Std. Error	0.053 (df = 36)
F Statistic	3,064.968*** (df = 3; 36)
Note:	*p<0.1; **p<0.05: ***p<0.01

REGRESSION FOR 1-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	1-year Treasury Yield
Constant	-19.397 (+/- 2.158)
	$p = 0.000^{***}$
SP500 Stock Price Index	0.001 (+/- 0.0004)
	$p = 0.001^{***}$
Unemployment Rate	0.710 (+/- 0.106)
	$p = 0.00000^{***}$
CPI Inflation Rate	-0.005 (+/- 0.001)
	$p = 0.001^{***}$
BBB corporate yield	0.534 (+/- 0.155)
	$p = 0.002^{***}$
Home Price Index	0.052 (+/- 0.010)
	$p = 0.00002^{***}$
30-year Treasury Yield	-4.429 (+/- 0.945)
	$p = 0.0001^{***}$
LN_30-year Treasury Yield	13.101 (+/- 2.987)
	$p = 0.0002^{***}$
10-year Treasury Yield	3.396 (+/- 1.019)
	$p = 0.003^{***}$
LN_10-year Treasury Yield	-7.879 (+/- 2.390)

	$p = 0.003^{***}$
Observations	40
R^2	0.944
Adjusted R^2	0.927
Residual Std. Error	0.221 (df = 30)
F Statistic	56.010^{***} (df = 9; 30)
Note:	*p<0.1; **p<0.05: ***p<0.01

REGRESSION FOR 3-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	3-year Treasury Yield
Constant	-10.638 (+/- 1.571)
	$p = 0.00000^{***}$
Unemployment Rate	0.250 (+/- 0.091)
	$p = 0.010^{***}$
CPI Inflation Rate	-0.004 (+/- 0.001)
	$p = 0.002^{***}$
BBB corporate yield	0.642 (+/- 0.097)
	$p = 0.00000^{***}$
Home Price Index	0.045 (+/- 0.007)
	$p = 0.00000^{***}$
Observations	40
R^2	0.894
Adjusted R^2	0.882
Residual Std. Error	0.236 (df = 35)
F Statistic	74.081^{***} (df = 4; 35)
Note:	$^{*}p<0.1$; $^{**}p<0.05$: $^{***}p<0.01$

REGRESSION FOR 5-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	5-year Treasury Yield
Constant	0.093 (+/- 0.214)
	p = 0.665
Unemployment Rate	-0.256 (+/- 0.033)
	p = 0.000***
30-year Treasury Yield	0.941 (+/- 0.088)
	p = 0.000***
1-month Treasury Yield	0.270 (+/- 0.065)
	p = 0.0002***
Observations	40
R^2	0.867
Adjusted R^2	0.856
Residual Std. Error	0.217 (df = 36)
F Statistic	78.476*** (df = 3; 36)
Note:	*p<0.1; **p<0.05: ***p<0.01

REGRESSION FOR 7-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	7-year Treasury Yield
Constant	-2.539 (+/- 0.613)
	$p = 0.0002^{***}$
SP500 Stock Price Index	0.001 (+/- 0.0001)
	$p = 0.00000^{***}$
BBB corporate yield	1.126 (+/- 0.114)
	$p = 0.000^{***}$
LN_Market Volatility Index	-0.423 (+/- 0.153)
	$p = 0.010^{***}$
Observations	40
R^2	0.745
Adjusted R^2	0.724
Residual Std. Error	0.272 (df = 36)
F Statistic	35.145^{***} (df = 3; 36)
Note:	$^{*}p<0.1$; $^{**}p<0.05$: $^{***}p<0.01$

REGRESSION FOR 10-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	10-year Treasury Yield
Constant	-1.533 (+/- 0.134)
	p = 0.000***
US Fed Reserve O-N Loan Rate	-0.254 (+/- 0.068)
	p = 0.001***
Real GDP growth	0.029 (+/- 0.007)
	p = 0.0004***
Real disposable income growth	0.040 (+/- 0.010)
	p = 0.0004***
Nominal disposable income growth	-0.028 (+/- 0.009)
	p = 0.006***
CPI Inflation Rate	0.001 (+/- 0.0003)
	p = 0.002***
Dow Total Stock Market Index	0.00003 (+/- 0.00000)
	p = 0.00000***
30-year Treasury Yield	1.030 (+/- 0.027)
	p = 0.000***
LN_6-month Treasury Yield	-0.268 (+/- 0.056)
	p = 0.0001***
1-year Treasury Yield	0.312 (+/- 0.078)

	$p = 0.0005^{***}$
LN_1-year Treasury Yield	0.387 (+/- 0.072)
	$p = 0.00001^{***}$
Observations	40
R^2	0.990
Adjusted R^2	0.987
Residual Std. Error	0.060 (df = 29)
F Statistic	301.156^{***} (df = 10; 29)
Note:	$^{*}p<0.1;\ ^{**}p<0.05:\ ^{***}p<0.01$

REGRESSION FOR 20-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	20-year Treasury Yield
Constant	1.729 (+/- 0.238)
	$p = 0.000^{***}$
Unemployment Rate	0.185 (+/- 0.037)
	$p = 0.00002^{***}$
Observations	40
R^2	0.394
Adjusted R^2	0.378
Residual Std. Error	0.472 (df = 38)
F Statistic	24.712^{***} (df = 1; 38)
Note:	$^{*}p<0.1$; $^{**}p<0.05$: $^{***}p<0.01$

REGRESSION FOR 30-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	30-year Treasury Yield
Constant	0.454 (+/- 0.074)
	$p = 0.00000^{***}$
Nominal GDP growth	-0.016 (+/- 0.006)
	$p = 0.007^{***}$
Real disposable income growth	-0.008 (+/- 0.003)
	$p = 0.006^{***}$
10-year Treasury Yield	1.368 (+/- 0.031)
	$p = 0.000^{***}$
LN_5-year Treasury Yield	-0.638 (+/- 0.081)
	$p = 0.000^{***}$
3-year Treasury Yield	-0.198 (+/- 0.035)
	$p = 0.00001^{***}$
Observations	40
R^2	0.991
Adjusted R^2	0.990
Residual Std. Error	0.060 (df = 34)
F Statistic	742.060^{***} (df = 5; 34)
Note:	$^{*}p<0.1; ^{**}p<0.05: ^{***}p<0.01$

30-year Mortgage Rate

REGRESSION FOR 30-YEAR MORTGATE RATE

	Dependent variable (+/- SE):
	30-year Mortgate Rate
Constant	0.361 (+/- 0.230)
	p = 0.125
SP500 Stock Price Index	0.0005 (+/- 0.00005)
	p = 0.000[***]
Market Volatility Index	0.009 (+/- 0.003)
	p = 0.002[***]
30-year Treasury Yield	0.821 (+/- 0.048)
	p = 0.000[***]
Observations	40
R^2	0.901
Adjusted R^2	0.893
Residual Std. Error	0.132 (df = 36)
F Statistic	109.759[***] (df = 3; 36)
Note:	[*]$p<0.1$; [**]$p<0.05$: [***]$p<0.01$

REGRESSION FOR MOODY'S AAA CURVE

	Dependent variable (+/- SE):
	Moody's AAA Curve
Constant	0.760 (+/- 0.400)
	p = 0.066[*]
Unemployment Rate	0.098 (+/- 0.027)
	p = 0.001[***]
BBB corporate yield	0.640 (+/- 0.110)
	p = 0.00001[***]
Observations	40
R^2	0.725
Adjusted R^2	0.710
Residual Std. Error	0.287 (df = 37)
F Statistic	48.775[***] (df = 2; 37)
Note:	[*]p<0.1; [**]p<0.05: [***]p<0.01

REGRESSION FOR MOODY'S BAA CURVE

	Dependent variable (+/- SE):
	Moody's BAA Curve
Constant	6.604 (+/- 0.332)
	$p = 0.000^{***}$
SP500 Stock Price Index	-0.001 (+/- 0.0001)
	$p = 0.000^{***}$
Prime Rate	0.541 (+/- 0.122)
	$p = 0.0001^{***}$
5-year Treasury Yield	-1.124 (+/- 0.385)
	$p = 0.007^{***}$
LN_5-year Treasury Yield	2.150 (+/- 0.558)
	$p = 0.0005^{***}$
Observations	40
R^2	0.834
Adjusted R^2	0.815
Residual Std. Error	0.247 (df = 35)
F Statistic	43.914^{***} (df = 4; 35)
Note:	$^{*}p<0.1$; $^{**}p<0.05$: $^{***}p<0.01$

REGRESSION FOR BBB CORPORATE YIELD

	Dependent variable (+/- SE):
	BBB corporate yield
Constant	-24.298 (+/- 4.970)
	$p = 0.0001^{***}$
Moody's AAA Curve	-1.543 (+/- 0.241)
	$p = 0.00001^{***}$
Moody's BAA Curve	1.668 (+/- 0.213)
	$p = 0.00000^{***}$
Real GDP growth	0.235 (+/- 0.048)
	$p = 0.0001^{***}$
Nominal GDP growth	-0.228 (+/- 0.043)
	$p = 0.00003^{***}$
Unemployment Rate	0.595 (+/- 0.129)
	$p = 0.0002^{***}$
CPI Inflation Rate	0.003 (+/- 0.001)
	$p = 0.001^{***}$
Prime Rate	3.146 (+/- 0.872)
	$p = 0.002^{***}$
Commercial Real Estate Price Index	0.032 (+/- 0.007)
	$p = 0.0002^{***}$

Market Volatility Index	0.015 (+/- 0.003)
	$p = 0.0003^{***}$
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	0.378 (+/- 0.122)
	$p = 0.006^{***}$
30-year Treasury Yield	-2.072 (+/- 0.699)
	$p = 0.008^{***}$
LN_30-year Treasury Yield	7.426 (+/- 1.935)
	$p = 0.001^{***}$
1-month Treasury Yield	-5.056 (+/- 1.097)
	$p = 0.0002^{***}$
LN_1-month Treasury Yield	0.411 (+/- 0.124)
	$p = 0.004^{***}$
7-year Treasury Yield	0.762 (+/- 0.237)
	$p = 0.004^{***}$
LN_6-month Treasury Yield	-0.791 (+/- 0.215)
	$p = 0.002^{***}$
1-year Treasury Yield	2.073 (+/- 0.432)
	$p = 0.0001^{***}$
Observations	40
R^2	0.967
Adjusted R^2	0.941
Residual Std. Error	0.120 (df = 22)

F Statistic	37.360*** (df = 17; 22)

Note: *p<0.1; **p<0.05: ***p<0.01

Prime Rate

REGRESSION FOR PRIME RATE

	Dependent variable (+/- SE):
	Prime Rate
Constant	3.275 (+/- 0.056)
	p = 0.000***
Moody's AAA Curve	0.077 (+/- 0.024)
	p = 0.003***
Unemployment Rate	-0.026 (+/- 0.006)
	p = 0.0002***
1-month Treasury Yield	0.930 (+/- 0.012)
	p = 0.000***
7-year Treasury Yield	-0.085 (+/- 0.019)
	p = 0.0002***
Observations	40
R^2	0.998
Adjusted R^2	0.997
Residual Std. Error	0.039 (df = 35)

F Statistic	$3{,}539.813^{***}$ (df = 4; 35)

Note:	*p<0.1; **p<0.05: ***p<0.01

REGRESSION FOR US AVG RETAIL GASOLINE PRICE (-GAL; ALL GRADES, ALL FORMULATIONS)

	Dependent variable (+/- SE):
	US Avg Retail Gasoline Price ($-gal; all grades, all formulations)
Constant	0.025 (+/- 0.330)
	p = 0.941
US Fed Reserve O-N Loan Rate	0.709 (+/- 0.093)
	p = 0.000***
Real disposable income growth	-0.160 (+/- 0.028)
	p = 0.00001***
Nominal disposable income growth	0.150 (+/- 0.027)
	p = 0.00001***
7-year Treasury Yield	2.090 (+/- 0.404)
	p = 0.00002***
LN_7-year Treasury Yield	-3.903 (+/- 0.763)
	p = 0.00002***
LN_1-year Treasury Yield	-0.814 (+/- 0.065)
	p = 0.000***
Observations	40
R^2	0.897
Adjusted R^2	0.878

Residual Std. Error	0.187 (df = 33)
F Statistic	47.849^{***} (df = 6; 33)

Note: $^{*}p<0.1;$ $^{**}p<0.05:$ $^{***}p<0.01$

Cost of Federal Funds (Primary Credit Rate)

REGRESSION FOR US FED RESERVE O-N LOAN RATE

	Dependent variable (+/- SE):
	US Fed Reserve O-N Loan Rate
Constant	0.448 (+/- 0.077)
	$p = 0.00001^{***}$
3-month Treasury Yield	1.014 (+/- 0.015)
	$p = 0.000^{***}$
5-year Treasury Yield	-0.371 (+/- 0.077)
	$p = 0.00003^{***}$
LN_5-year Treasury Yield	0.484 (+/- 0.109)
	$p = 0.0001^{***}$
Observations	40
R^2	0.996
Adjusted R^2	0.995
Residual Std. Error	0.052 (df = 36)
F Statistic	$2{,}851.103^{***}$ (df = 3; 36)
Note:	$^{*}p<0.1$; $^{**}p<0.05$: $^{***}p<0.01$

Dow Jones Total Stock Market Index (end-of-quarter) and S&P 500 (quarterly average)

REGRESSION FOR DOW TOTAL STOCK MARKET INDEX

	Dependent variable (+/- SE):
	Dow Total Stock Market Index
Constant	37,764.230 (+/- 1,447.937)
	$p = 0.000^{***}$
Unemployment Rate	-1,959.107 (+/- 126.270)
	$p = 0.000^{***}$
Market Volatility Index	-95.482 (+/- 19.336)
	$p = 0.00003^{***}$
1-month Treasury Yield	2,813.914 (+/- 378.687)
	$p = 0.000^{***}$
5-year Treasury Yield	-4,372.195 (+/- 1,524.945)
	$p = 0.008^{***}$
LN_5-year Treasury Yield	6,870.063 (+/- 2,192.199)
	$p = 0.004^{***}$
Observations	40
R^2	0.978
Adjusted R^2	0.975
Residual Std. Error	970.863 (df = 34)
F Statistic	300.006^{***} (df = 5; 34)

Note: *p<0.1; **p<0.05: ***p<0.01

REGRESSION FOR SP500 STOCK PRICE INDEX

	Dependent variable (+/- SE):
	SP500 Stock Price Index
Constant	2,077.695 (+/- 725.870)
	$p = 0.009^{***}$
Moody's AAA Curve	-211.363 (+/- 40.842)
	$p = 0.00003^{***}$
Real GDP growth	-21.907 (+/- 7.190)
	$p = 0.006^{***}$
BBB corporate yield	-301.087 (+/- 49.249)
	$p = 0.00001^{***}$
30-year Mortgate Rate	358.533 (+/- 126.374)
	$p = 0.010^{***}$
Prime Rate	617.676 (+/- 208.783)
	$p = 0.007^{***}$
LN_30-year Treasury Yield	-1,378.418 (+/- 358.488)
	$p = 0.001^{***}$
10-year Treasury Yield	-1,144.431 (+/- 295.646)
	$p = 0.001^{***}$
LN_1-month Treasury Yield	-196.614 (+/- 49.068)
	$p = 0.001^{***}$
7-year Treasury Yield	2,510.689 (+/- 424.044)

	$p = 0.00001^{***}$
5-year Treasury Yield	-2,238.200 (+/- 254.569)
	$p = 0.000^{***}$
LN_5-year Treasury Yield	1,690.264 (+/- 203.579)
	$p = 0.00000^{***}$
6-month Treasury Yield	-1,766.815 (+/- 545.691)
	$p = 0.004^{***}$
LN_6-month Treasury Yield	864.842 (+/- 166.019)
	$p = 0.00003^{***}$
1-year Treasury Yield	1,879.913 (+/- 426.914)
	$p = 0.0002^{***}$
LN_1-year Treasury Yield	-980.837 (+/- 157.459)
	$p = 0.00001^{***}$
Observations	40
R^2	0.995
Adjusted R^2	0.992
Residual Std. Error	53.595 (df = 24)
F Statistic	318.940*** (df = 15; 24)
Note:	$^{*}p<0.1$; $^{**}p<0.05$: $^{***}p<0.01$

REGRESSION FOR HOME PRICE INDEX

	Dependent variable (+/- SE):
	Home Price Index
Constant	245.981 (+/- 4.328)
	$p = 0.000^{***}$
Unemployment Rate	-11.200 (+/- 0.482)
	$p = 0.000^{***}$
30-year Treasury Yield	38.193 (+/- 6.633)
	$p = 0.00001^{***}$
LN_30-year Treasury Yield	-117.582 (+/- 20.321)
	$p = 0.00001^{***}$
1-month Treasury Yield	7.936 (+/- 0.926)
	$p = 0.000^{***}$
Observations	40
R^2	0.988
Adjusted R^2	0.987
Residual Std. Error	3.063 (df = 35)
F Statistic	751.994^{***} (df = 4; 35)
Note:	$^{*}p<0.1;\ ^{**}p<0.05:\ ^{***}p<0.01$

REGRESSION FOR COMMERCIAL REAL ESTATE PRICE INDEX

	Dependent variable (+/- SE):
	Commercial Real Estate Price Index
Constant	384.644 (+/- 8.057)
	$p = 0.000^{***}$
Unemployment Rate	-19.257 (+/- 0.897)
	$p = 0.000^{***}$
30-year Treasury Yield	70.760 (+/- 12.347)
	$p = 0.00001^{***}$
LN_30-year Treasury Yield	-234.487 (+/- 37.830)
	$p = 0.00000^{***}$
1-month Treasury Yield	11.217 (+/- 1.724)
	$p = 0.00000^{***}$
Observations	40
R^2	0.987
Adjusted R^2	0.985
Residual Std. Error	5.701 (df = 35)
F Statistic	655.553^{***} (df = 4; 35)
Note:	$^{*}p<0.1$; $^{**}p<0.05$: $^{***}p<0.01$

REGRESSION FOR MARKET VOLATILITY INDEX

	Dependent variable (+/- SE):
	Market Volatility Index
Constant	158.009 (+/- 24.205)
	$p = 0.00000^{***}$
Dow Total Stock Market Index	-0.003 (+/- 0.0005)
	$p = 0.00000^{***}$
LN_30-year Treasury Yield	-120.270 (+/- 25.722)
	$p = 0.00005^{***}$
LN_10-year Treasury Yield	75.583 (+/- 17.001)
	$p = 0.0001^{***}$
1-month Treasury Yield	7.343 (+/- 2.191)
	$p = 0.002^{***}$
Observations	40
R^2	0.579
Adjusted R^2	0.530
Residual Std. Error	6.031 (df = 35)
F Statistic	12.016^{***} (df = 4; 35)
Note:	$^{*}p<0.1;$ $^{**}p<0.05:$ $^{***}p<0.01$

Appendix A: Data Sources

The following table lists the attributes provided by Capitalytics as part of its macro-economic forecast service. The sources for data that are defined by the document "2020 Supervisory Scenarios for Annual Stress Tests Required under the Dodd-Frank Act Stress Testing Rules and the Capital Plan Rule" (found at https://www.federalreserve.gov/newsevents/pressreleases/files/bcreg20200206a1.pdf) are listed. Please note that shaded attributes are not discussed within this report.

Table 16: Data Values and Referenced Sources

Attribute	Referenced Source[70]
Real GDP growth	Bureau of Economic Analysis (NIPA table 1.1.6, line 1)
Nominal GDP growth	Bureau of Economic Analysis (NIPA table 1.1.5, line 1)
Real disposable income growth	Bureau of Economic Analysis (NIPA table 2.1, line 27, and NIPA table 1.1.4, line 2)
Nominal disposable income growth	Bureau of Economic Analysis (NIPA table 2.1, line 27)
Unemployment rate	Bureau of Labor Statistics (series LNS14000000)
CPI inflation rate	Bureau of Labor Statistics (series CUSR0000SA0)
3-month Treasury yield	Quarterly average of 3-month Treasury bill secondary market rate on a discount basis, H.15 Release, Selected Interest Rates, Federal Reserve Board (series RIFSGFSM03_N.B)
5-year Treasury yield	Quarterly average of the yield on 5-year U.S. Treasury bonds, constructed for the FRB/U.S. model by Federal Reserve staff based on the Svensson smoothed term structure model; see Lars E. O. Svensson (1995), "Estimating Forward Interest Rates with the Extended Nelson-Siegel Method," Quarterly Review, no. 3, Sveriges Riksbank, pp. 13–26
10-year Treasury yield	Quarterly average of the yield on 10-year U.S. Treasury bonds, constructed for the FRB/U.S. model by Federal

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[70] Per https://www.federalreserve.gov/newsevents/pressreleases/files/bcreg20190213a1.pdf

	Reserve staff based on the Svensson smoothed term structure model; see Lars E. O. Svensson (1995), "Estimating Forward Interest Rates with the Extended Nelson-Siegel Method," Quarterly Review, no. 3, Sveriges Riksbank, pp. 13–26
BBB corporate yield	Merrill Lynch 10-year BBB corporate bond yield, Z.1 Release (Financial Accounts of the United States), Federal Reserve Board (series FL073163013.Q).[71]
Mortgage rate	Quarterly average of weekly series for the interest rate of a conventional, conforming, 30-year fixed-rate mortgage, obtained from the Primary Mortgage Market Survey of the Federal Home Loan Mortgage Corporation.
Prime rate	Quarterly average of monthly series, H.15 Release, Selected Interest Rates, Federal Reserve Board (series RIFSPBLP_N.M).
Dow Jones Total Stock Market Index (end-of-qtr value)	Dow-Jones
House Price Index	Price Index for Owner-Occupied Real Estate, CoreLogic National, Z.1 Release (Financial Accounts of the United States), Federal Reserve Board (series FL075035243.Q).
Commercial Real Estate Price Index	Commercial Real Estate Price Index, Z.1 Release (Financial Accounts of the United States), Federal Reserve Board (series FL075035503.Q divided by 1000).
Market Volatility Index (VIX)	VIX converted to quarterly frequency using the maximum close-of-day value in any quarter, Chicago Board Options Exchange.
Euro Area Real GDP Growth	Percent change in real gross domestic product at an annualized rate, staff calculations based on Statistical Office of the European Communities via Haver, extended back using ECB Area Wide Model dataset (ECB Working Paper series no. 42).
Euro Area Inflation	Percent change in the quarterly average of the harmonized index of consumer prices 16 Federal Reserve Supervisory Scenarios at an annualized rate, staff calculations based on Statistical Office of the European Communities via Haver.

[71] The Merrill Lynch 10-year BBB corporate bond rate is being discontinued from future Z.1 releases as of April 30, 2019 due to licensing restrictions.

Euro Area Bilateral Dollar Exchange Rate (USD/Euro)	End-of-quarter rates from the H.10 Release, Foreign Exchange Rates, Federal Reserve Board.
Developing Asia Real GDP Growth	Percent change in real gross domestic product at an annualized rate, staff calculations based on Bank of Korea via Haver; Chinese National Bureau of Statistics via CEIC; Indian Central Statistical Organization via CEIC; Census and Statistics Department of Hong Kong via CEIC; and Taiwan Directorate-General of Budget, Accounting, and Statistics via CEIC.
Developing Asia Inflation	Percent change in the quarterly average of the consumer price index, or local equivalent, at an annualized rate, staff calculations based on Chinese National Bureau of Statistics via CEIC; Indian Ministry of Statistics and Programme Implementation via Haver; Labour Bureau of India via CEIC; National Statistical Office of Korea via CEIC; Census and Statistic Department of Hong Kong via CEIC; and Taiwan Directorate General of Budget, Accounting, and Statistics via CEIC.
Developing Asia bilateral dollar exchange rate (F/USD, index)	End-of-quarter rates from the H.10 Release, Foreign Exchange Rates, Federal Reserve Board.
Japan Real GDP Growth	Percent change in gross domestic product at an annualized rate, Cabinet Office via Haver.
Japan Inflation	Percent change in the quarterly average of the consumer price index at an annualized rate, staff calculations based on Ministry of Internal Affairs and Communications via Haver.
Japan Bilateral Dollar Exchange Rate (Yen/USD)	End-of-quarter rates from the H.10 Release, Foreign Exchange Rates, Federal Reserve Board.
UK Real GDP Growth	Percent change in gross domestic product at an annualized rate, Office for National Statistics via Haver.
UK Inflation	Percent change in the quarterly average of the consumer price index at an annualized rate, staff calculations based on Office for National Statistics via Haver.
UK Bilateral Dollar Exchange Rate (USD/Pound)	End-of-quarter rates from the H.10 Release, Foreign Exchange Rates, Federal Reserve Board.

The above dataset from the Federal Reserve can be downloaded manually or automatically. Manual downloads are available at https://www.federalreserve.gov/supervisionreg/ccar-2020.htm (shown

below, as of Feb 2020) by clicking the link marked "Historical data (ZIP)". Alternatively, downloading the file at https://www.federalreserve.gov/supervisionreg/files/2020-historical-data.zip using HTTP client software will also download the official dataset.

Decompressing the zip-file will provide two files in CVS format: one containing US domestic data elements on a quarterly basis, and the other containing international data elements on a quarterly basis[72].

Since the CCAR dataset is only released annually (through 4Q2019 as of this writing), and Capitalytics provides quarterly updates to its forecasts, the CCAR dataset is supplemented by the data sources shown below on a quarterly basis. All datasets discussed herein are supplemented with data through (including) 4Q2019.

Table 17: Supplementary Data Sources for Data Attributes

Attribute	Supplementary Data Source
Real GDP growth	Bureau of Economic Analysis (NIPA table 1.1.6, line 1)

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[72] Again, due to the requirements of this client, international data elements are not being discussed in this document.

Nominal GDP growth	Bureau of Economic Analysis (NIPA table 1.1.5, line 1)
Real disposable income growth	Bureau of Economic Analysis (NIPA table 2.1, line 27, and NIPA table 1.1.4, line 2)
Nominal disposable income growth	Bureau of Economic Analysis (NIPA table 2.1, line 27)
Unemployment rate	Bureau of Labor Statistics (series LNS14000000)
CPI inflation rate	Bureau of Labor Statistics (series CUSR0000SA0)
3-month Treasury yield	Quarterly average of 3-month Treasury bill secondary market rate on a discount basis, H.15 Release
5-year Treasury yield	Federal Reserve Economic Research website (https://fred.stlouisfed.org/series/GS5), with "Quarterly" frequency and "Average" aggregation method
10-year Treasury yield	Federal Reserve Economic Research website (https://fred.stlouisfed.org/series/GS10), with "Quarterly" frequency and "Average" aggregation method
BBB corporate yield	Federal Reserve Economic Research website (https://fred.stlouisfed.org/series/BAMLC0A4CBBBEY), with "Quarterly" frequency and "Average" aggregation method
Mortgage rate	Federal Reserve Economic Research website (https://fred.stlouisfed.org/series/MORTGAGE30US), with "Quarterly" frequency and "Average" aggregation method
Prime rate	Federal Reserve Economic Research website (https://fred.stlouisfed.org/series/MPRIME), with "Quarterly" frequency and "Average" aggregation method
Dow Jones Total Stock Market Index (end-of-qtr value)	Dow-Jones as provided by the Wall Street Journal (https://quotes.wsj.com/index/DWCF/advanced-chart)
House Price Index	CoreLogic, index level (end-of-quarter)
Commercial Real Estate Price Index	From the Financial Accounts of the United States, Federal Reserve Board (Z.1 release); the series corresponds to the data for price indexes: Commercial Real Estate Price Index (series FL075035503.Q, divided by 1000). Series FL075035503.Q is also available at https://www.quandl.com/data/FED/FL075035503_Q-Interest-rates-and-price-indexes-commercial-real-estate-price-index-Quarterly-Levels-NSA

Market Volatility Index (VIX)	Federal Reserve Economic Research website (https://fred.stlouisfed.org/series/VIXCLS), with "Quarterly" frequency and "Average" aggregation method
Euro Area Real GDP Growth	Quarterly series for "European Union GDP Annual Growth Rate" per tradingeconomics.com
Euro Area Inflation	Quarterly average of monthly series for "European Union Inflation Rate" per tradingeconomics.com
Euro Area Bilateral Dollar Exchange Rate (USD/Euro)	End-of-quarter rates from the H.10 Release, Foreign Exchange Rates, Federal Reserve Board.
Developing Asia Real GDP Growth	The nominal GDP-weighted aggregate of the Real GDP growth for China, India, South Korea, Hong Kong Special Administrative Region, and Taiwan per OECD
Developing Asia Inflation	The nominal GDP-weighted aggregate of the inflation rate for China, India, South Korea, Hong Kong Special Administrative Region, and Taiwan per OECD
Developing Asia bilateral dollar exchange rate (F/USD, index)	End-of-quarter rates from the H.10 Release, Foreign Exchange Rates, Federal Reserve Board.
Japan Real GDP Growth	Quarterly average of monthly series for "Japan GDP Growth Rate" per tradingeconomics.com
Japan Inflation	Quarterly average of monthly series for "Japan Inflation Rate" per tradingeconomics.com
Japan Bilateral Dollar Exchange Rate (Yen/USD)	End-of-quarter rates from the H.10 Release, Foreign Exchange Rates, Federal Reserve Board.
UK Real GDP Growth	Quarterly average of monthly series for "United Kingdom GDP Growth Rate" per tradingeconomics.com
UK Inflation	Quarterly average of monthly series for "United Kingdom Inflation Rate" per tradingeconomics.com
UK Bilateral Dollar Exchange Rate (USD/Pound)	End-of-quarter rates from the H.10 Release, Foreign Exchange Rates, Federal Reserve Board.

While all data that is required for the Annual Stress Tests is available from https://www.federalreserve.gov/supervisoryreg/files/2020-historical-data.zip, Capitalytics provides 13 additional metrics per the information in the following table. These values are available from the point at which they are collected (which varies from metric to metric) through (and including) 4Q2019.

Table 17: Supplementary Data Attributes and Sources

Attribute	Capitalytics Source
1-month Treasury yield	https://fred.stlouisfed.org/series/dgs1mo
6-month Treasury yield	https://fred.stlouisfed.org/series/dgs6mo
1-year Treasury yield	https://fred.stlouisfed.org/series/dgs1
3-year Treasury yield	https://fred.stlouisfed.org/series/dgs3
7-year Treasury yield	https://fred.stlouisfed.org/series/dgs7
20-year Treasury yield	https://fred.stlouisfed.org/series/dgs20
30-year Treasury yield	https://fred.stlouisfed.org/series/dgs30
US Average Retail Gasoline Price ($/gal; all grades, all formulations)	https://fred.stlouisfed.org/series/gasallm
S&P 500 Stock Price Index	https://fred.stlouisfed.org/series/S&P 500 Stock Price Index
Primary Credit	https://fred.stlouisfed.org/series/FEDFUNDS
Moody's AAA Rate	https://fred.stlouisfed.org/series/aaa
Moody's BAA Rate	https://fred.stlouisfed.org/series/baa
Dow Jones Total Industrial Average	https://fred.stlouisfed.org/series/djia

Appendix B: Methodologies

Capitalytics uses non-structured macroeconomic forecasting techniques in order to prepare its clients for what trends and relationships drive certain metrics, and what values those metrics may take on in the coming months.

Section I: General Forecasting Methodology

Generally, the most effective overall forecasting techniques have been found to be a hybridization of multiple other techniques. Capitalytics uses several forecasting schemes, and aggregates the results, as part of its analysis methodology. This section describes the process that is executed for generating these results.

For each metric, four distinct forecasts are produced.

1. The first forecast uses the full quarterly history of the metric as an input to an additive exponential smoothing representation. The process that is executed is that provided by R's[73] "forecast" package[74]; specifically, the "ets" function (see p.39 of https://cran.r-project.org/web/packages/forecast/forecast.pdf)[75] is designed to automatically determine the best fitting representation out of the "Generic 'ETS' Methodology" (discussed later in this section), including optimal parameters thereto, given a sequence of values. In our work, we have restricted our study to only "additive" forms (i.e., we set "additive.only=TRUE" in our calls), and our optimization criteria is set to the mean of absolute residuals (i.e., "opt.crit=mae"). Therefore, calls to generate our estimates through this procedure look something like the following command, where "s" is an appropriately populated array, vector, time series, or similar object.

   ```
   > m<-ets(s, model='ZZZ', opt.crit=c('mae'), additive.only=TRUE)
   ```

   The results of this call are shown above each dataset, including the representation type returned (as described later this section), the initial values that are used by the software, the optimal smoothing parameters estimated, and the $n+1^{st}$ forecasted value given the first n values of the metric's sequence (the "fitted" values)[76], and the determined parameters. While fitting forecasts to previous values,

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[73] As of this writing, v.3.6.2 of the "R" language is available at https://cran.r-project.org/.

[74] As of this writing, v.8.11 of the forecast package is available at https://CRAN.R-project.org/package=forecast.

[75] It should be noted that Microsoft's Excel software includes a FORECAST.ETS function which is documented as potentially producing comparable results; however, we have not been able to re-create its output independently, and, given the documentation, flexibility, and source availability of the R packages, Capitalytics has decided that it is a preferable option at this time.

[76] While this procedure does generate fitted values for intermediate samples within a sequence -- and allow for generating a forecasted set of samples to extend a sequence – according to the identified parameter set, it does not directly provide for determining the optimal parameter set of a sub-sequence. Capitalytics is currently codifying the process herein so that we may prescribe a "most likely" long term representation for each forecast, and determine the likely effects of errors in the forecasts by estimating the "recent term" values of dy/dx_i (where y is the metric being estimated and x_i is each of the parameters within the representation) and then compensating for recent quantified errors. We can

- "forecast error" is defined as being actual values less forecasted values,
- "% error" is defined as forecast error divided by actual value, and
- "score" is defined as mean absolute forecast error over an appropriate range (generally the duration of the collected past values, less the first two to four years of collected values)[77].

2. The second forecast uses the differences between successive quarterly values in order to forecast the future quarterly differences. It should be noted that these sequences are (obviously) one data-point shorter than those in the preceding procedure. These values are forecasted using the same procedure as described in the first section, with forecasted values for the actual metric being built using the last known value for the metric and forecasts of incremental changes to the metric provided.

An edited example for loading the SP500 end-of quarter values, and the differences between successive quarterly values, is shown below.

```
> sp<–c(130.659129, 1250.520109, 998.4076848, 812.047, 799.5264066, 927.5045326,
1041.372826, … )

> sp_ts<-ts(sp,freq=4,end=c(2017,4))

> sp_ts

      Qtr1      Qtr2      Qtr3      Qtr4

2008            130.6591 1250.5201  998.4077

2009  812.0470  799.5264  927.5045 1041.3728

    …


> m<–ets(sp_ts,model='ZZZ',opt.crit=c('mae'),additive.only=TRUE)

> dsp_ts<–diff(sp_ts)

> dsp_ts

        Qtr1        Qtr2        Qtr3        Qtr4

2008                     1119.860980 –252.112424

2009 –186.360685  –12.520593  127.978126  113.868293

    …
```

---

also consider how "finite" a window to account for in building a set of parameters; these representations are theoretically using all history in building a forecast, but the values for alpha, beta, etc. implicitly give an indication of how much history of a metric is truly impacting a specific value.

[77] It bears noting that a lower value for the "score" indicates better accuracy of an algorithm.

```
> m<-ets(dsp_ts,model='ZZZ',opt.crit=c('mae'),additive.only=TRUE
```

3. The third forecast uses the sequence of numbers from the second forecast, but partitions the dataset based on the quarter in which they are incurred. Assuming that the differences between quarters are associated with the ending points of each quarter (i.e., the difference between third and fourth quarter values are associated with a date of December 31st), four sequences of numbers are now created, with annual forecasts now being produced for each sequence using the same procedures as previously outlined. The final sequence appropriately interleaves the forecasted data-points.

4. The fourth forecast builds three sequences of values based the history of the metric to an observed point:

   - the slope of the "best fitting" line (based on minimizing the total absolute error) using the immediately preceding 2 years of values[78];
   - the same slope using the immediately preceding 4 years of values; and,
   - the same slope using the immediately preceding 8 years of values.

   While two years of data would provide for a relatively responsive change in aggregate values to be reflected given a change in the economic conditions, eight years of data (a not unreasonable estimate for an "economic cycle") would allow for a much more slowly moving change in average window for a counterbalance.

   Using these datasets independently, we are able to use our previous procedure to generate forecasts for each slope, and then average the results on a quarterly basis. Multiplying the average slope by the duration of the following quarter (in days) provides an estimate for the change in the metric's value during that following quarter, just as in our second forecast.

   Obviously, this technique requires at least eight years of data to pass before being able to produce any data. However, in order to err on the side of conservatism, we generally allow a sequence to "mature" for two to four years before believing that its initial transience has become less significant and its results are trustworthy. If a dataset does not have enough data to complete one of these analyses, the analysis is dropped. In other words, if the metric does not have +/-11 years of data available, the 8-year slopes cannot be reliably calculated, and the average slope is only based on the 2- & 4-year slopes[79].

5. In some cases, we may find variables with extremely tight cross-connections that can be justified as part of their nature (treasury bill yield rates, for example, with a magnitude or correlation greater than ~0.95). In these cases, we are able to additionally enhance our forecast by building a forecast that expresses one variable (the "dependent" variable, *y(t)*) in terms of another (the "independent" variable, *x(t)*) with a coefficient of determination (R^2), such that

---

[78] The value for this slope is calculated using Microsoft Excel's SLOPE function, with the first argument being the appropriate number of preceding values for the metric, and the second argument being the same number of corresponding "end-of-quarter" dates.
[79] See the SP500 metric's analysis.

$$y(t) = m(t) * x(t) + b(t) \, .$$

Notice that the "slope" and "intercept" terms in this expression are time varying expressions that are re-evaluated with each data-point, not simply constants.

By averaging the results of these distinct forecasts in order to provide an aggregate forecast, the error for which can be characterized and measured, Capitalytics aims to provide a robust dataset that can be used for future business decisions.

It was stated earlier that Capitalytics uses each metric's complete history in order to generate a matching representation and forecast. It should be recognized that we also perform the same analyses for periods starting no more than 100, 80, 60, and 40 quarters prior to the forecasted period. However, we have found the results of all of these analyses are more reactionary and less coherent than that already presented within this report.

Section II: Exponentially Smoothed State Space Representations & Generic "ETS" Methodology

Exponential smoothing was proposed in the late 1950s (Brown 1959, Holt 1957 and Winters 1960 are key pioneering works) and has motivated some of the most successful forecasting methods. Forecasts produced using exponential smoothing methods are weighted averages of past observations, with the weights decaying exponentially as the observations get older. In other words, the more recent the observation the higher the associated weight. (See the following equation for one example of this type of equation which requires $0 \leq \alpha \leq 1$, and estimates future values of $\hat{y}$ given a history of values denoted as y_t. The ε_{T+1} term denotes an error term, the *residual*, which determines the value of the forecasting function.) This framework generates reliable forecasts quickly and for a wide spectrum of time series.

$$\hat{y}_{T+1|T} = \alpha y_T + \alpha(1-\alpha)y_{T-1} + \alpha(1-\alpha)^2 y_{T-2} + \cdots + \varepsilon_{T+1}$$

In this study, the relevance of quarterly samples more than 3 years old is eliminated by setting the number of terms in this type of expression to no more than 13.

The challenge with these forecasting techniques is to estimate the value of α such that some criteria is optimized, e.g., minimizing the sum of squared errors (SSE), across all values of a set of historical values.

There are other forms of exponential smoothing methods that may account for any combination of forecasting *levels* (as in the Theta method), *trends* (for which a metric may, for instance, be growing or lessening according to a linear or higher order function), and *seasonality* (for which a metric may have engrained "cycles" on, e.g., a monthly, quarterly, or annual basis).

By considering variations in the combination of the trend and seasonal components, fifteen exponential smoothing methods are possible. Each method is labelled by a pair of letters (T,S) defining the type of 'Trend' and 'Seasonal' components. For example, (A,M) is the method with an additive trend and multiplicative seasonality; (M,N) is the method with multiplicative trend and no seasonality; and so on. Per Section 7.6 of Hyndman & Athanasopoulos, some of these methods are well known per the following table.

Table 18: Mathematical Methods Associated with Trend & Seasonal Components

Trend & Seasonal Components	Method
(N,N)	simple exponential smoothing
(A,N)	Holts linear method
(M,N)	Exponential trend method
(A_d,N)	additive damped trend method
(M_d,N)	multiplicative damped trend method
(A,A)	additive Holt-Winters method
(A,M)	multiplicative Holt-Winters method
(A_d,M)	Holt-Winters damped method

Additionally, the following table (again from Section 7.6 of Hyndman & Athanasopoulos) gives the recursive formulae for applying all possible fifteen exponential smoothing methods. Each cell includes the forecast equation for generating h-step-ahead forecasts and the smoothing equations for applying the method. By recursively applying the appropriate expressions to generate consecutive forecasts, this framework can be an extremely powerful tool.

Section III: Regression Construction

Capitalytics also generates a regression to estimate future values of the variables that we track in terms of current-day values. By using R's "lm" function, we estimate the next quarter's values for each variable in terms of the preceding set of variables' values. These regressions are built using the immediately preceding 57 sets of variables' values.

Each output variable is considered in turn as the response variable, with all other variables as possibilities for the control (independent) variables *excluding* any variables that have an 80% correlation with the response variable. Successive linear regressions are built; if any of the control variables' p-values exceed 5%, or if the model's p-value exceeds 5% and the number of considered control variables is greater than one, the most offensive control variable is dropped, and the regression is re-run.

Trend	Seasonal		
	N	**A**	**M**
N	$\hat{y}_{t+h\|t} = \ell_t$ $\ell_t = \alpha y_t + (1-\alpha)\ell_{t-1}$	$\hat{y}_{t+h\|t} = \ell_t + s_{t-m+h_m^+}$ $\ell_t = \alpha(y_t - s_{t-m}) + (1-\alpha)\ell_{t-1}$ $s_t = \gamma(y_t - \ell_{t-1}) + (1-\gamma)s_{t-m}$	$\hat{y}_{t+h\|t} = \ell_t s_{t-m+h_m^+}$ $\ell_t = \alpha(y_t/s_{t-m}) + (1-\alpha)\ell_{t-1}$ $s_t = \gamma(y_t/\ell_{t-1}) + (1-\gamma)s_{t-m}$
A	$\hat{y}_{t+h\|t} = \ell_t + h b_t$ $\ell_t = \alpha y_t + (1-\alpha)(\ell_{t-1} + b_{t-1})$ $b_t = \beta^*(\ell_t - \ell_{t-1}) + (1-\beta^*)b_{t-1}$	$\hat{y}_{t+h\|t} = \ell_t + h b_t + s_{t-m+h_m^+}$ $\ell_t = \alpha(y_t - s_{t-m}) + (1-\alpha)(\ell_{t-1} + b_{t-1})$ $b_t = \beta^*(\ell_t - \ell_{t-1}) + (1-\beta^*)b_{t-1}$ $s_t = \gamma(y_t - \ell_{t-1} - b_{t-1}) + (1-\gamma)s_{t-m}$	$\hat{y}_{t+h\|t} = (\ell_t + h b_t)s_{t-m+h_m^+}$ $\ell_t = \alpha(y_t/s_{t-m}) + (1-\alpha)(\ell_{t-1} + b_{t-1})$ $b_t = \beta^*(\ell_t - \ell_{t-1}) + (1-\beta^*)b_{t-1}$ $s_t = \gamma(y_t/(\ell_{t-1} + b_{t-1})) + (1-\gamma)s_{t-m}$
A$_d$	$\hat{y}_{t+h\|t} = \ell_t + \phi_h b_t$ $\ell_t = \alpha y_t + (1-\alpha)(\ell_{t-1} + \phi b_{t-1})$ $b_t = \beta^*(\ell_t - \ell_{t-1}) + (1-\beta^*)\phi b_{t-1}$	$\hat{y}_{t+h\|t} = \ell_t + \phi_h b_t + s_{t-m+h_m^+}$ $\ell_t = \alpha(y_t - s_{t-m}) + (1-\alpha)(\ell_{t-1} + \phi b_{t-1})$ $b_t = \beta^*(\ell_t - \ell_{t-1}) + (1-\beta^*)\phi b_{t-1}$ $s_t = \gamma(y_t - \ell_{t-1} - \phi b_{t-1}) + (1-\gamma)s_{t-m}$	$\hat{y}_{t+h\|t} = (\ell_t + \phi_h b_t)s_{t-m+h_m^+}$ $\ell_t = \alpha(y_t/s_{t-m}) + (1-\alpha)(\ell_{t-1} + \phi b_{t-1})$ $b_t = \beta^*(\ell_t - \ell_{t-1}) + (1-\beta^*)\phi b_{t-1}$ $s_t = \gamma(y_t/(\ell_{t-1} + \phi b_{t-1})) + (1-\gamma)s_{t-m}$
M	$\hat{y}_{t+h\|t} = \ell_t b_t^h$ $\ell_t = \alpha y_t + (1-\alpha)\ell_{t-1} b_{t-1}$ $b_t = \beta^*(\ell_t/\ell_{t-1}) + (1-\beta^*)b_{t-1}$	$\hat{y}_{t+h\|t} = \ell_t b_t^h + s_{t-m+h_m^+}$ $\ell_t = \alpha(y_t - s_{t-m}) + (1-\alpha)\ell_{t-1} b_{t-1}$ $b_t = \beta^*(\ell_t/\ell_{t-1}) + (1-\beta^*)b_{t-1}$ $s_t = \gamma(y_t - \ell_{t-1}b_{t-1}) + (1-\gamma)s_{t-m}$	$\hat{y}_{t+h\|t} = \ell_t b_t^h s_{t-m+h_m^+}$ $\ell_t = \alpha(y_t/s_{t-m}) + (1-\alpha)\ell_{t-1} b_{t-1}$ $b_t = \beta^*(\ell_t/\ell_{t-1}) + (1-\beta^*)b_{t-1}$ $s_t = \gamma(y_t/(\ell_{t-1}b_{t-1})) + (1-\gamma)s_{t-m}$
M$_d$	$\hat{y}_{t+h\|t} = \ell_t b_t^{\phi_h}$ $\ell_t = \alpha y_t + (1-\alpha)\ell_{t-1} b_{t-1}^{\phi}$ $b_t = \beta^*(\ell_t/\ell_{t-1}) + (1-\beta^*)b_{t-1}^{\phi}$	$\hat{y}_{t+h\|t} = \ell_t b_t^{\phi_h} + s_{t-m+h_m^+}$ $\ell_t = \alpha(y_t - s_{t-m}) + (1-\alpha)\ell_{t-1} b_{t-1}^{\phi}$ $b_t = \beta^*(\ell_t/\ell_{t-1}) + (1-\beta^*)b_{t-1}^{\phi}$ $s_t = \gamma(y_t - \ell_{t-1} b_{t-1}^{\phi}) + (1-\gamma)s_{t-m}$	$\hat{y}_{t+h\|t} = \ell_t b_t^{\phi_h} s_{t-m+h_m^+}$ $\ell_t = \alpha(y_t/s_{t-m}) + (1-\alpha)\ell_{t-1} b_{t-1}^{\phi}$ $b_t = \beta^*(\ell_t/\ell_{t-1}) + (1-\beta^*)b_{t-1}^{\phi}$ $s_t = \gamma(y_t/(\ell_{t-1} b_{t-1}^{\phi})) + (1-\gamma)s_{t-m}$

Appendix C: Variable Correlations

The following table shows the correlation factors between all of the listed variables for which the absolute value of the correlation is greater than 0.6, indicating a noteworthy degree of correlation. As is discussed in Appendix B of this report, correlations greater than 0.95 warrant further investigation as the relationship between variables may be useful for our research.

Table 19: Correlation Factors found as of 1Q2020

Variable 1	Variable 2	Correlation
S&P 500 Stock Price Index	Primary Credit	0.802782
S&P 500 Stock Price Index	**Unemployment Rate**	**0.9594**
S&P 500 Stock Price Index	BBB Corporate Yield	0.614243
S&P 500 Stock Price Index	Prime Rate	-0.756798
S&P 500 Stock Price Index	**Dow Jones Total Stock Market Index**	**-0.953126**
S&P 500 Stock Price Index	**Home Price Index**	**-0.966509**
S&P 500 Stock Price Index	**Commercial Real Estate Price Index**	**-0.967288**
S&P 500 Stock Price Index	30-year Treasury yield	-0.702138
S&P 500 Stock Price Index	20-year Treasury yield	-0.613214
S&P 500 Stock Price Index	1-month Treasury yield	0.78691
S&P 500 Stock Price Index	3-month Treasury yield	-0.743055
S&P 500 Stock Price Index	6-month Treasury yield	0.792056
S&P 500 Stock Price Index	3-year Treasury yield	0.676012
S&P 500 Stock Price Index	1-year Treasury yield	0.783123
Primary Credit	BBB Corporate Yield	-0.613634
Primary Credit	30-year Mortgage Rate	-0.754135
Primary Credit	Prime Rate	-0.802362
Primary Credit	Home Price Index	0.613556

Primary Credit	Commercial Real Estate Price Index	0.636696
Primary Credit	US Average Retail Gasoline Price	-0.629955
Primary Credit	20-year Treasury yield	0.784173
Primary Credit	10-year Treasury yield	-0.757098
Primary Credit	**1-month Treasury yield**	**0.992833**
Primary Credit	7-year Treasury yield	0.890304
Primary Credit	3-month Treasury yield	-0.791524
Primary Credit	5-year Treasury yield	-0.795811
Primary Credit	**6-month Treasury yield**	**0.993968**
Primary Credit	**3-year Treasury yield**	**0.954061**
Primary Credit	**1-year Treasury yield**	**0.987166**
Real GDP Growth	Nominal GDP Growth	0.933873
Real Disposable Income Growth	Nominal Disposable Income Growth	0.908822
BBB Corporate Yield	30-year Mortgage Rate	0.932349
BBB Corporate Yield	Prime Rate	0.728385
BBB Corporate Yield	Dow Jones Total Stock Market Index	-0.798827
BBB Corporate Yield	Home Price Index	-0.77041
BBB Corporate Yield	Commercial Real Estate Price Index	-0.732771
BBB Corporate Yield	US Average Retail Gasoline Price	0.71561
BBB Corporate Yield	20-year Treasury yield	-0.815962
BBB Corporate Yield	10-year Treasury yield	0.914481
BBB Corporate Yield	7-year Treasury yield	-0.773187
BBB Corporate Yield	3-month Treasury yield	0.749454
BBB Corporate Yield	5-year Treasury yield	0.872798
BBB Corporate Yield	6-month Treasury yield	-0.641531
BBB Corporate Yield	3-year Treasury yield	-0.721908

BBB Corporate Yield	1-year Treasury yield	-0.662727
30-year Mortgage Rate	Prime Rate	0.849147
30-year Mortgage Rate	Dow Jones Total Stock Market Index	-0.788309
30-year Mortgage Rate	Home Price Index	-0.792443
30-year Mortgage Rate	Commercial Real Estate Price Index	-0.790463
30-year Mortgage Rate	US Average Retail Gasoline Price	0.799229
30-year Mortgage Rate	30-year Treasury yield	-0.610323
30-year Mortgage Rate	20-year Treasury yield	-0.879058
30-year Mortgage Rate	**10-year Treasury yield**	**0.9937**
30-year Mortgage Rate	7-year Treasury yield	-0.873538
30-year Mortgage Rate	3-month Treasury yield	0.875562
30-year Mortgage Rate	**5-year Treasury yield**	**0.979658**
30-year Mortgage Rate	6-month Treasury yield	-0.770004
30-year Mortgage Rate	3-year Treasury yield	-0.835392
30-year Mortgage Rate	1-year Treasury yield	-0.786181
Prime Rate	US Average Retail Gasoline Price	0.686255
Prime Rate	20-year Treasury yield	-0.655683
Prime Rate	10-year Treasury yield	0.831861
Prime Rate	7-year Treasury yield	-0.775831
Prime Rate	**3-month Treasury yield**	**0.991847**
Prime Rate	5-year Treasury yield	0.904671
Prime Rate	6-month Treasury yield	-0.811826
Prime Rate	3-year Treasury yield	-0.815096
Prime Rate	1-year Treasury yield	-0.818878
Dow Jones Total Stock Market Index	Home Price Index	0.849384
Dow Jones Total Stock Market Index	Commercial Real Estate Price Index	0.912825

Dow Jones Total Stock Market Index	US Average Retail Gasoline Price	-0.642806
Dow Jones Total Stock Market Index	30-year Treasury yield	0.834889
Dow Jones Total Stock Market Index	20-year Treasury yield	0.861459
Dow Jones Total Stock Market Index	10-year Treasury yield	-0.799533
Dow Jones Total Stock Market Index	7-year Treasury yield	0.823472
Dow Jones Total Stock Market Index	5-year Treasury yield	-0.699003
Dow Jones Total Stock Market Index	6-month Treasury yield	0.602881
Dow Jones Total Stock Market Index	3-year Treasury yield	0.7193
Dow Jones Total Stock Market Index	1-year Treasury yield	0.623859
Home Price Index	**Commercial Real Estate Price Index**	**0.953999**
Home Price Index	30-year Treasury yield	0.620867
Home Price Index	20-year Treasury yield	0.857193
Home Price Index	10-year Treasury yield	-0.807167
Home Price Index	7-year Treasury yield	0.817951
Home Price Index	5-year Treasury yield	-0.736299
Home Price Index	6-month Treasury yield	0.633722
Home Price Index	3-year Treasury yield	0.736723
Home Price Index	1-year Treasury yield	0.653356
Commercial Real Estate Price Index	US Average Retail Gasoline Price	-0.647628
Commercial Real Estate Price Index	30-year Treasury yield	0.756032
Commercial Real Estate Price Index	20-year Treasury yield	0.899629
Commercial Real Estate Price Index	10-year Treasury yield	-0.815161
Commercial Real Estate Price Index	7-year Treasury yield	0.8511
Commercial Real Estate Price Index	5-year Treasury yield	-0.735907
Commercial Real Estate Price Index	6-month Treasury yield	0.65379
Commercial Real Estate Price Index	3-year Treasury yield	0.763855

Commercial Real Estate Price Index	1-year Treasury yield	0.674101
US Average Retail Gasoline Price	20-year Treasury yield	-0.746871
US Average Retail Gasoline Price	10-year Treasury yield	0.767731
US Average Retail Gasoline Price	7-year Treasury yield	-0.780761
US Average Retail Gasoline Price	3-month Treasury yield	0.693425
US Average Retail Gasoline Price	5-year Treasury yield	0.752
US Average Retail Gasoline Price	6-month Treasury yield	-0.65358
US Average Retail Gasoline Price	3-year Treasury yield	-0.747627
US Average Retail Gasoline Price	1-year Treasury yield	-0.677484
30-year Treasury yield	**20-year Treasury yield**	**0.989195**
30-year Treasury yield	10-year Treasury yield	-0.664959
30-year Treasury yield	7-year Treasury yield	0.841969
20-year Treasury yield	10-year Treasury yield	-0.881139
20-year Treasury yield	**7-year Treasury yield**	**0.969212**
20-year Treasury yield	3-month Treasury yield	-0.664072
20-year Treasury yield	5-year Treasury yield	-0.817481
20-year Treasury yield	6-month Treasury yield	0.804837
20-year Treasury yield	3-year Treasury yield	0.898207
20-year Treasury yield	1-year Treasury yield	0.828961
10-year Treasury yield	7-year Treasury yield	-0.881687
10-year Treasury yield	3-month Treasury yield	0.862601
10-year Treasury yield	**5-year Treasury yield**	**0.981364**
10-year Treasury yield	6-month Treasury yield	-0.77023
10-year Treasury yield	3-year Treasury yield	-0.838633
10-year Treasury yield	1-year Treasury yield	-0.786599
1-month Treasury yield	7-year Treasury yield	0.75932

1-month Treasury yield	**6-month Treasury yield**	**0.995149**
1-month Treasury yield	3-year Treasury yield	0.928329
1-month Treasury yield	**1-year Treasury yield**	**0.988087**
7-year Treasury yield	3-month Treasury yield	-0.78512
7-year Treasury yield	5-year Treasury yield	-0.866763
7-year Treasury yield	6-month Treasury yield	0.910828
7-year Treasury yield	**3-year Treasury yield**	**0.977044**
7-year Treasury yield	1-year Treasury yield	0.92708
3-month Treasury yield	5-year Treasury yield	0.932219
3-month Treasury yield	6-month Treasury yield	-0.799811
3-month Treasury yield	3-year Treasury yield	-0.811995
3-month Treasury yield	1-year Treasury yield	-0.808468
5-year Treasury yield	6-month Treasury yield	-0.80472
5-year Treasury yield	3-year Treasury yield	-0.850512
5-year Treasury yield	1-year Treasury yield	-0.817623
6-month Treasury yield	**3-year Treasury yield**	**0.972781**
6-month Treasury yield	**1-year Treasury yield**	**0.998012**
3-year Treasury yield	**1-year Treasury yield**	**0.983225**

References

Fiorucci, Jose A., Tiago R. Pellegrini, Francisco Louzada, Fotios Petropoulos, Anne B. Koehler, "Models for optimising the theta method and their relationship to state space models", In International Journal of Forecasting, Volume 32, Issue 4, 2016, Pages 1151-1161, ISSN 0169-2070, https://doi.org/10.1016/j.ijforecast.2016.02.005.

(http://www.sciencedirect.com/science/article/pii/S0169207016300243)

De Livera, Alysha M. "Automatic forecasting with a modified exponential smoothing state space framework." Monash Econometrics and Business Statistics Working Papers 10, no. 10 (2010).

De Livera, Alysha M., Rob J Hyndman, Ralph D Snyder, "Forecasting time series with complex seasonal patterns using exponential smoothing", Journal of the American Statistical Association, Volume 106, Number 496, pp 1513-1527, (2011)

Hyndman, R.J. and Athanasopoulos, G, Forecasting: principles and practice. OTexts: Melbourne, Australia. http://otexts.org/fpp/. Accessed on December 23, 2017 (2013)

Hyndman, Rob J., Baki Billah, "Unmasking the Theta method", In International Journal of Forecasting, Volume 19, Issue 2, 2003, Pages 287-290, ISSN 0169-2070, https://doi.org/10.1016/S0169-2070(01)00143-1. (http://www.sciencedirect.com/science/article/pii/S0169207001001431)

Jiang, Bin, George Athanasopoulos, Rob J Hyndman, Anastasios Panagiotelis, Farshid Vahid, "Macroeconomic forecasting for Australia using a large number of predictors", Unpublished working paper, http://business.monash.edu/econometrics-and-business-statistics/research/publications/ebs/wp02-17.pdf. Accessed on December 27, 2017 (2017)