Macroeconomic Forecasts, 4Q2020
Domestic Metrics

Prepared by: Capitalytics, LLC
P. O. Box 381162
Birmingham, AL 35242

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Summary

The economic condition of the United States has changed significantly in the last 12 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 December, 2020) approximately 17.5 million confirmed cases, with over 300,000 deaths[1]. The nation is currently grappling with massive societal, economic, and political issues.

As we do come to grips with the way in which we live, several new aspects of the changing economy are coming into play. First, given the current path of discussions between President Trump and Congressional representatives, it is not clear that any federal aid will be flowing down to individuals or businesses until after the inauguration of President-Elect Biden in January of 2021; President Trump has been notably absent from any reports of financial aid, and all discussions that have been publicly reported have been amongst Congressional representatives[2]. Further, the 116th Congress is scheduled to adjourn on December 18th, 2020; while it is not unprecedented for Congress to reconvene around the holidays and in January, the likelihood of an agreement being struck and then ratified by Trump (or, in the case of the worst timing, having a Congress override a pocket veto) seems diminishingly small. The case for aid to flow to the lower leg of the (previously described) "K" in the current "K"-recovery is very strong, particularly amount women and people of color, and it is affecting many different portions of the US on many different fronts: financial support, food availability, housing, and health care, to name a few.

On the other hand, we do anticipate an assistance package coming from the recently elected Biden administration, (quite literally) as soon as it is able to be installed. We expect either executive orders (likely preferred for their expediency), or fast-tracked legislation (depending on the Congressional make-up after a run-off election in Georgia), that will free up $2T-$3T of support being passed before the end of January 2021. Even if Congress and the Senate can agree on a package, it would likely include fewer remedies that a newly inaugurated President Biden would like to see. As such, even if a fiscal package is passed between now and Christmas, President Biden will likely push another fiscal bill at the end of January, 2021.

While the Federal Reserve (through Chairman Powell) has supported the markets in the form of debt and equity purchases of many reputable companies' through two programs, discussions have started that seem to indicate that this program will end soon. Through this effort, many companies (such as Ford and Heinz) have received the support that was critical to their survival, despite the bankruptcies of dozens of other large companies, and the loss of employment by their constituents.

Bringing it all full circle, the lynch-pin in all of this is the availability of a vaccine/treatment for COVID. Without the medication from one of (as of this writing) three sources, it is apparent that societal norms, including our economy, will not be able to resume "normally" until widespread immunization occurs. That feat is not expected until late second quarter of 2021, at best, despite the "chest-beating" of many politicians, both outgoing and incoming.

[1] https://www.worldometers.info/coronavirus/country/us/

[2] Currently, there might be a fiscal package that Congress and the Senate can agree on around $900 billion. https://www.cnn.com/politics/live-news/second-stimulus-check-congress-12-17-2020/h_b03177c5a02c8444a5e4c013630d8891

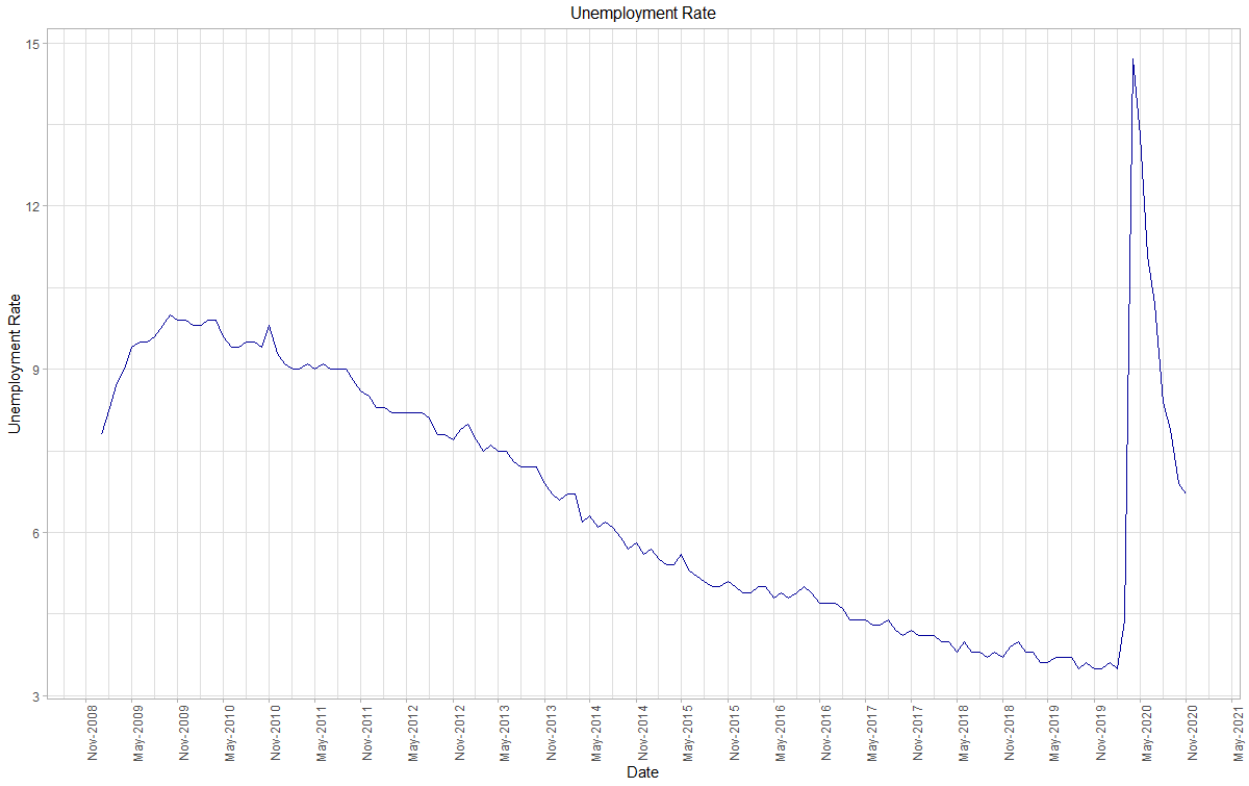
In the following, we discuss the most significant domestic economic issues with a view towards the impact on local economies, industries, and prospects over the next 3 to 60 months. We also provide short and long-term forecasts for several critical measures of economic success in the county, and examine how they will affect different areas of industry and society. We invite and welcome feedback and constructive discussion on all points of this paper in the hopes that we can all benefit from as much discussion and critical reasoning as may be useful in this endeavor.

State of Affairs

At the risk of sounding like a broken record, the economy is suffering a serious recession that is revealing itself in significant unemployment and new unemployment claims, closures of small businesses, failures of restaurants and bars, and a decrease in productivity and output. Many of the metrics we are using to track the recession focus on the people/labor aspect of the recession because, unlike the housing recession of 2008, this is not an industry driven failure.

Employment

Figure 1: US National Unemployment Rate



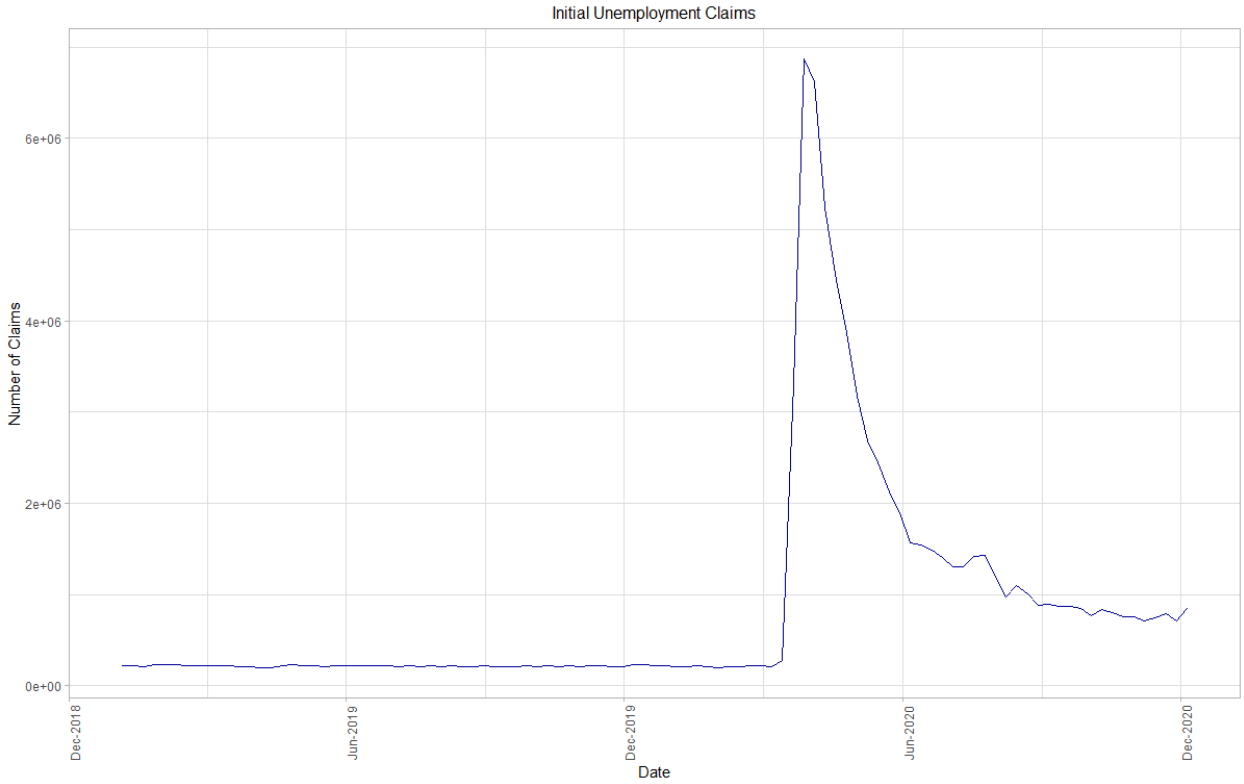
Source: FRED St. Louis

As seen in Figure 1, the national unemployment rate continues to be quite high. Although it is declining from the high of nearly 14% in April, 2020, it appears that a portion of the decline in the unemployment rate is due to the number of people who have left and not returned to the labor market. The economy

only added 245,000[3] jobs in November. Given the millions of people still without jobs, the number of jobs added is much weaker than is necessary to build back a strong economy.

Prior to the pandemic, the weekly number of people filing initial unemployment claims hovered around 250,000. The current number of initial unemployment claimants is bouncing between 700,000 and 900,000. (See Figure 2.) The number of new claimants has increased in 4 of the last 5 weeks. It is not clear if the small upward trend in the last three weeks predicts a longer-run trend suggesting a growth in the number of newly unemployed. Regardless, the pressures on the economy, particularly on the state level, are become unsustainable at this level of continued unemployment.

Figure 2: Initial Unemployment Claims

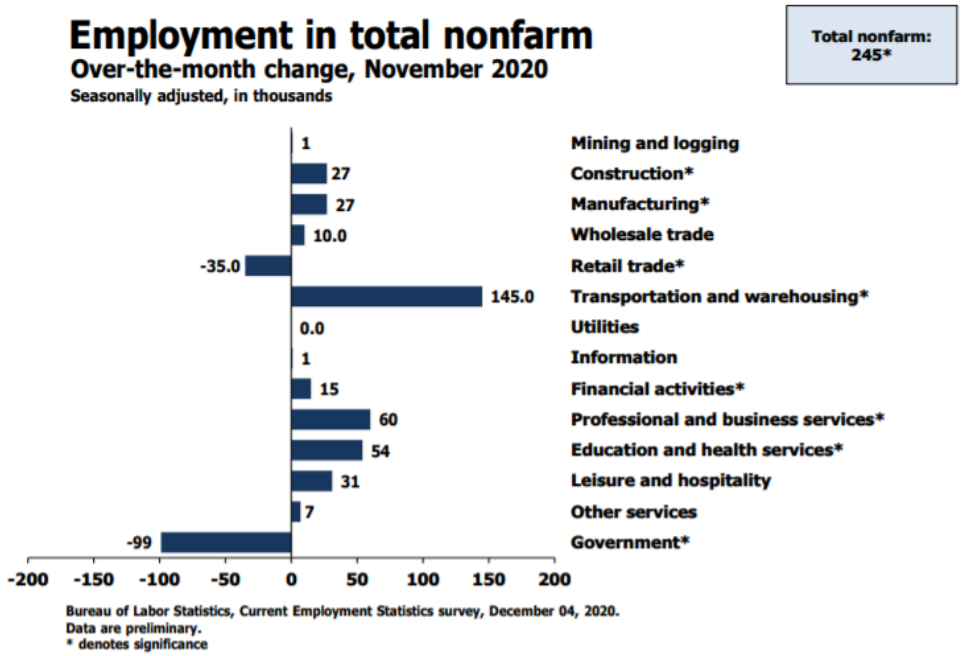


Source: FRED St. Louis

As referenced earlier, the economy gained roughly 245,000 jobs between October and November, 2020. Not all sectors gained workers. Retail trade and the government lost workers as other sectors gained significant employees. The transportation and warehousing sector saw substantial gains – nearly 145,000 employees between October and November. (See Figure 3.)

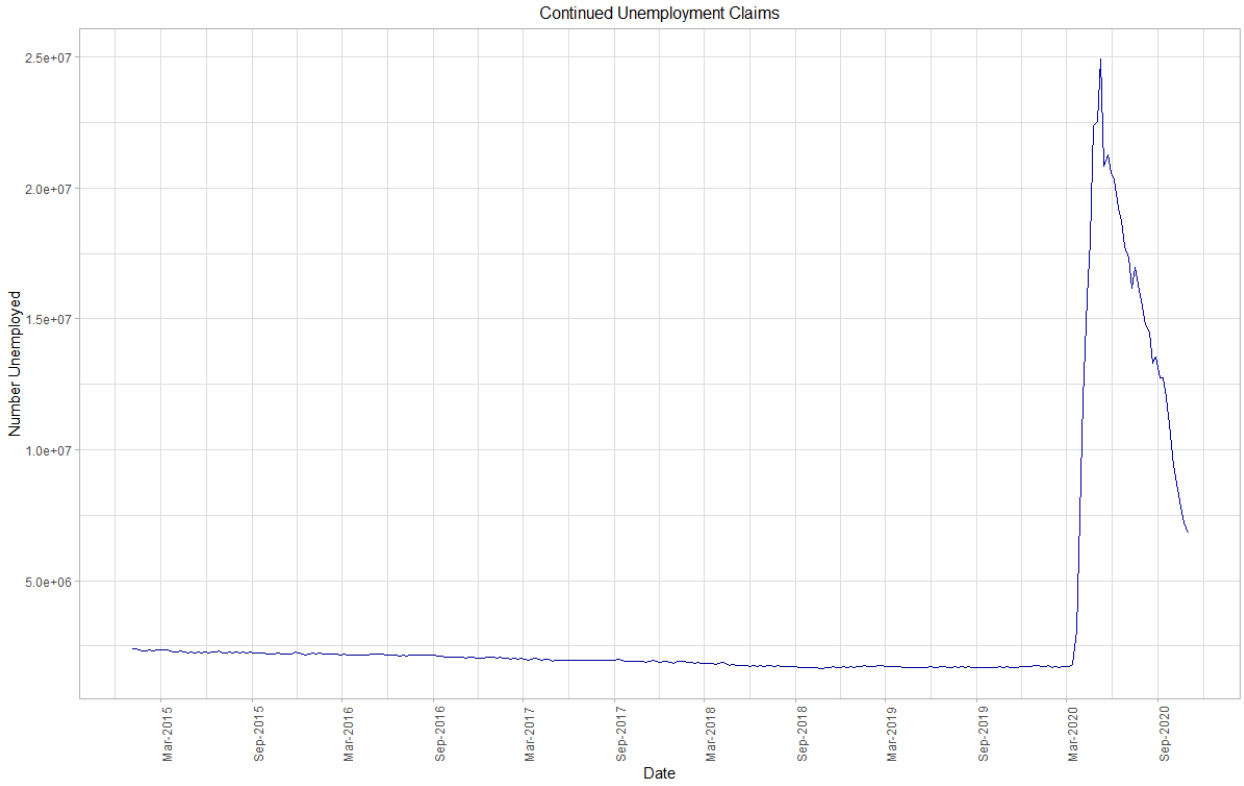
[3] https://www.bls.gov/web/empsit/ceshighlights.pdf

Figure 3: Job Gains and Losses by Sector: October - November 2020



Source: https://www.bls.gov/web/empsit/ceshighlights.pdf

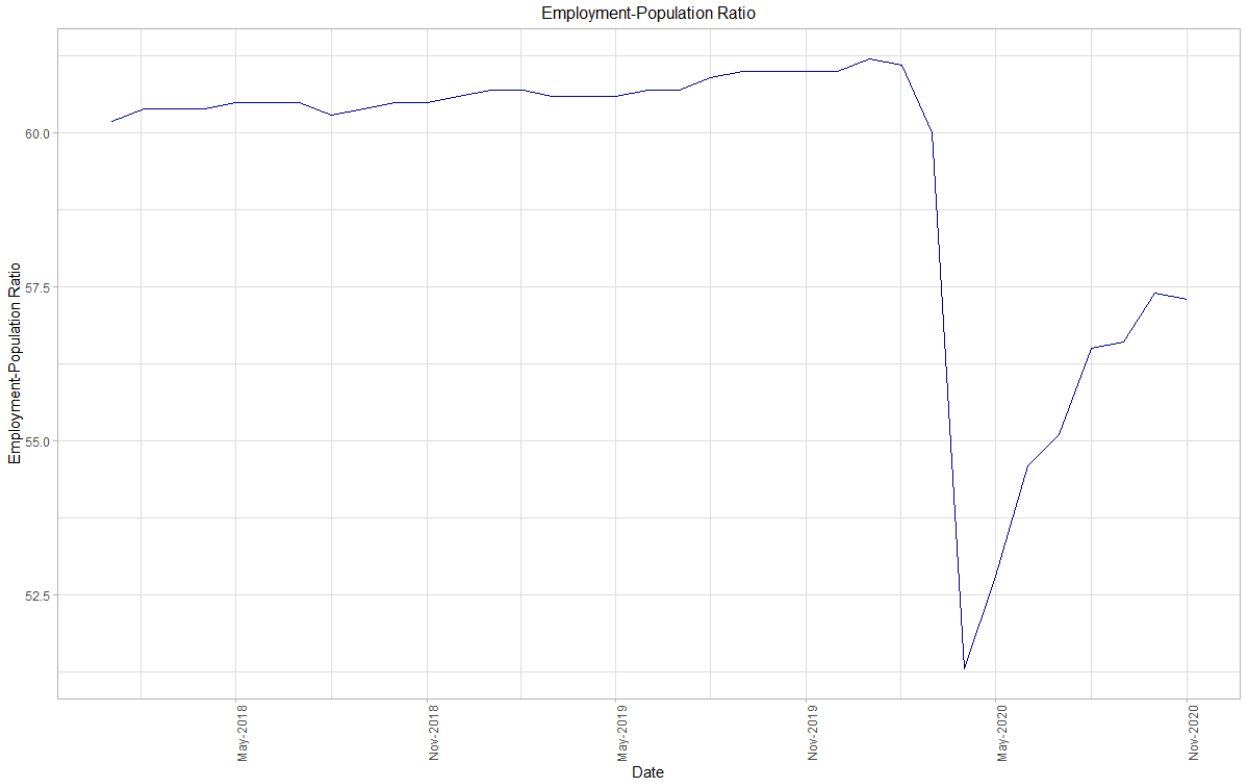
Figure 4: Continued Unemployment Claims



Source: FRED St. Louis

As shown in Figure 4, the continued unemployment claims shows that there are still more than 7 million people identifying as unemployed. Given that the economy only added 245,000 jobs, it will take more than 20 months to gain back 5 million jobs. We suspect, however, that once the vaccine starts a full roll-out, the economy is going to pick-up speed. Unfortunately, the delivery of the vaccine to the population will take months[4] and come in phases that will initially include persons who would not be rejoining the workforce (65 years and older or persons with considerable underlying health conditions). As a result, the recent slow recovery process will likely continue through Q3 of 2021.

Figure 5: Employment-Population Ratio

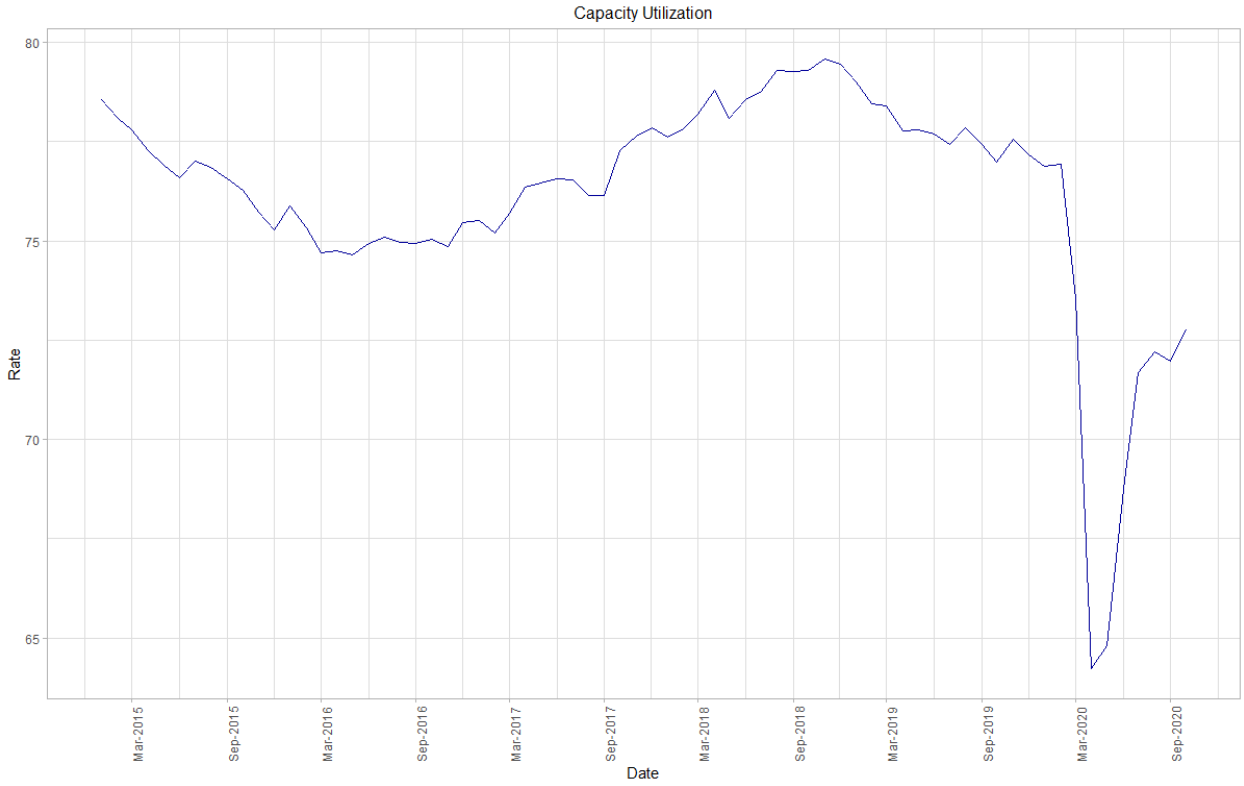


Source: FRED St. Louis

Another indication of an increasingly weak economy is the trend in the employment to population ratio. (See Figure 5.) Prior to the lock-down the employment-population ratio was over 60%. The pandemic pushed the ratio to below 52%. The ratio has been increasing steadily during the last 6 months. However, the recent trend has been a small downward movement in this ratio. Again, it is not clear that this movement suggests a longer-run trend. But, the movement of this trend in a downward direction suggests that former workers are not able to rejoin the labor market. This could have long-run impacts in weakening the recovery.

[4] See https://www.cnn.com/2020/12/13/health/covid-vaccine-rollout-messy/index.html, and https://www.cnn.com/2020/12/14/health/covid-vaccine-timeline/index.html

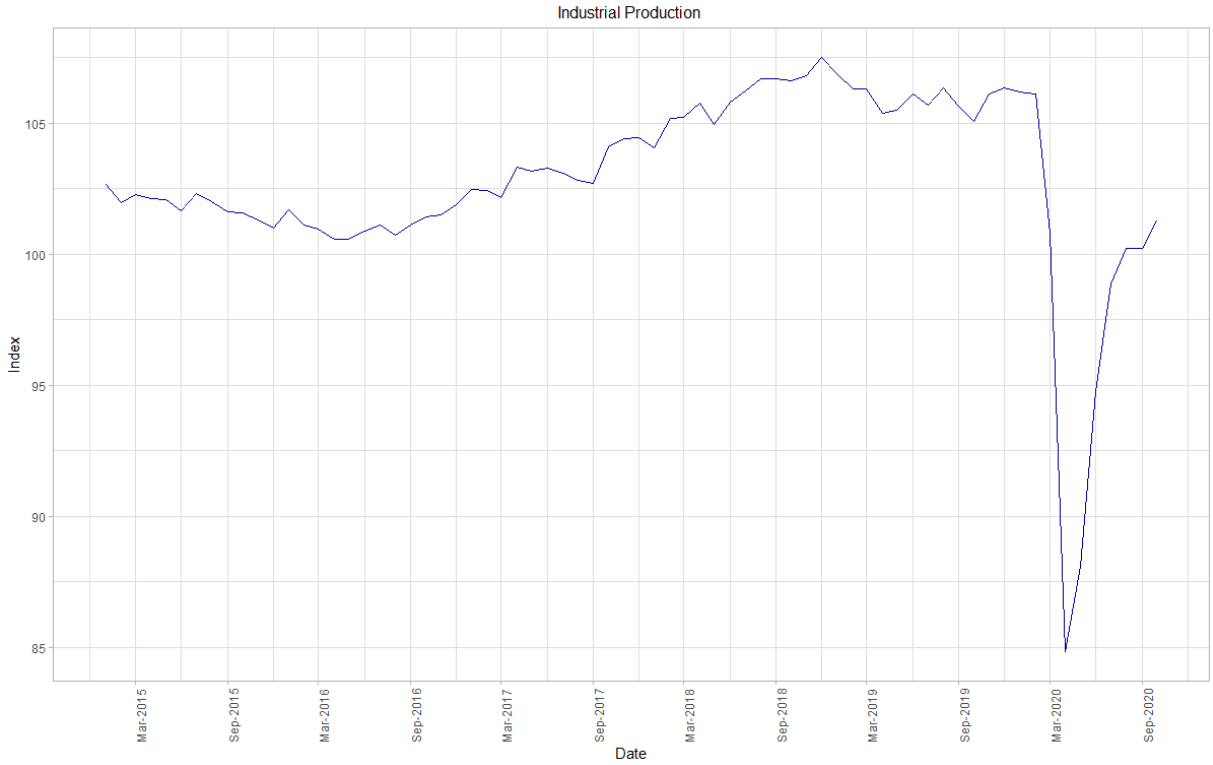
Figure 6: Capacity Utilization



Source: FRED St. Louis

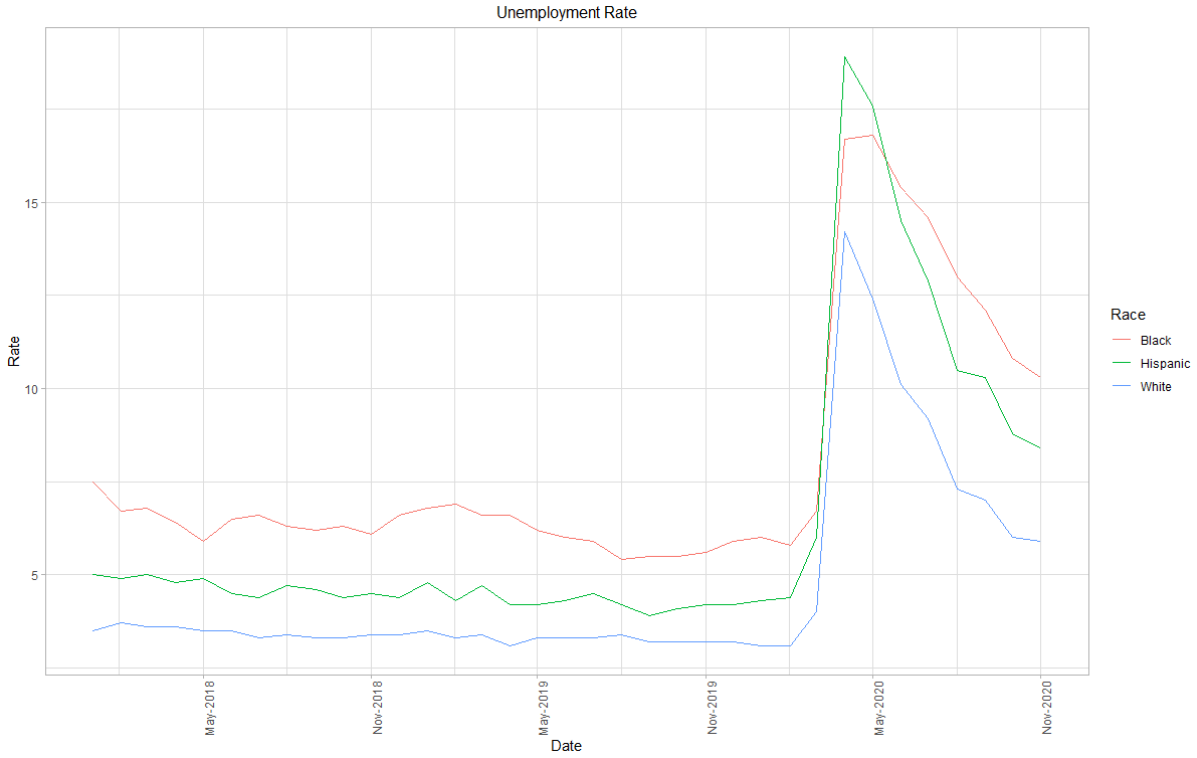
Per Figure 6 and Figure 7, the capacity utilization and the industrial production index both show similar trends. The decrease in capacity utilization and industrial production indicate the manufacturers are modifying output in response to soft consumer demand. The upward trend in both these indicators in the last 6 months suggests a positive response by manufacturers to increased demand (perhaps as a response to the return to pre-pandemic consumer spending or a bolstered by the $1,200 rebate checks). The rate of increase has become more shallow the last three months, suggesting that consumer spending is waning. The V-shaped recovery seen in the first three months following the lockdown were promising but have given way to a much less dramatic recovery.

Figure 7: Industrial Production



Source: FRED St. Louis

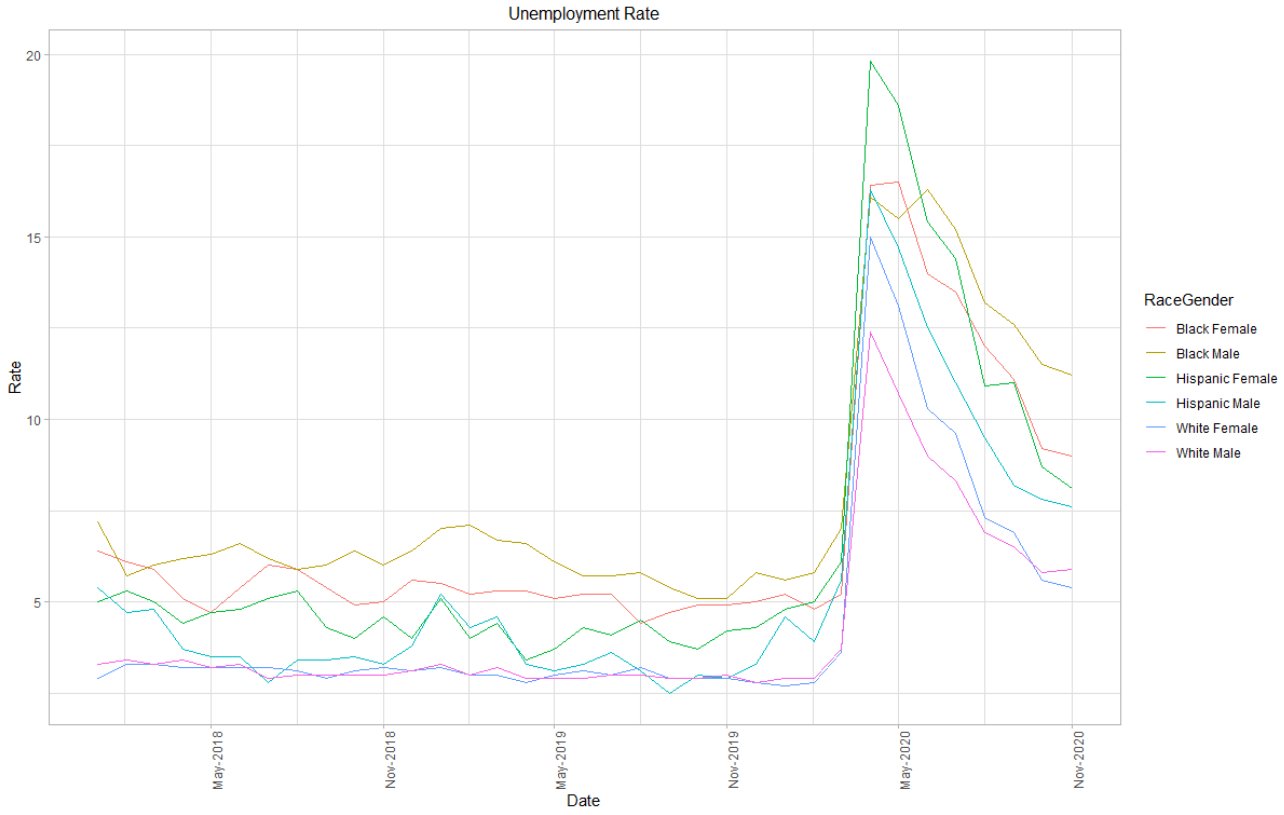
Figure 8: Unemployment Rate by Race



Source: FRED St. Louis

We've described the recent trend as being a "K-shaped" recovery with different agents/actors in the economy being impacted in different ways. One of trends we've seen is the differentiation of the unemployment rate by race. (See Figure 8.) The unemployment rate for Blacks and Hispanics reached over 15% back in April and have not recovered at the same pace as unemployment for Whites. When examining these rates by race and gender (see Figure 9), we see that under-represented minorities and women have had the slowest recovery with respect to the unemployment rate. We also see that women and women of color are entering back into the labor force at lower rates then men of color and white men. Some economists have started calling this down-turn the "she-cession"[5] because of the disparity of impacts between men and women.

Figure 9: Unemployment Rate Race and Gender

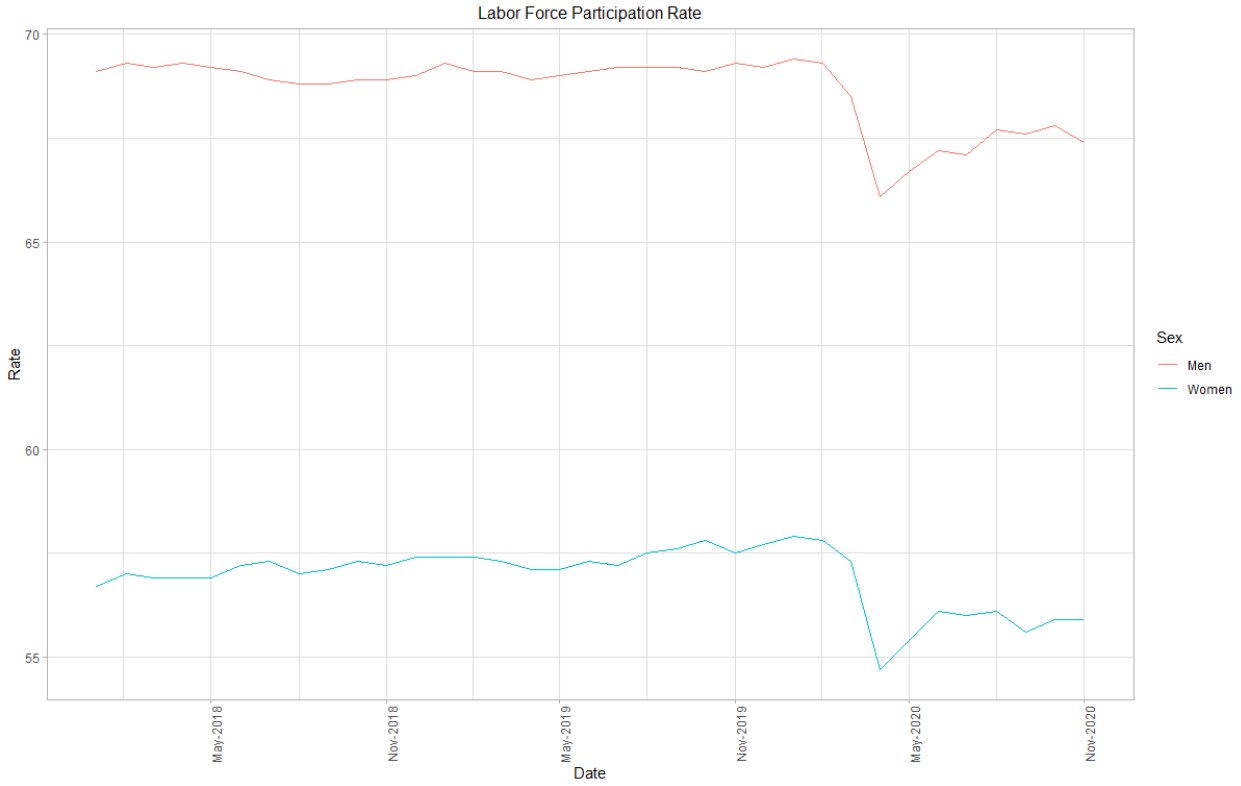


Source: FRED St. Louis

White males have had the fastest recovery with respect to the unemployment rate relative to black and Hispanic males and black and Hispanic women. In November, white women started showing a little more recovery relative to white males but the differences are not statistically significant. The lack of recovery for underrepresented minority men and women adds to the K-shaped narrative – different groups are seeing different patterns of recovery.

[5] https://www.forbes.com/sites/christianweller/2020/11/01/in-the-she-cession-the-focus-should-not-be-on-husbands/?sh=64f9718a31b5

Figure 10: Labor Force Participation Rate by Gender

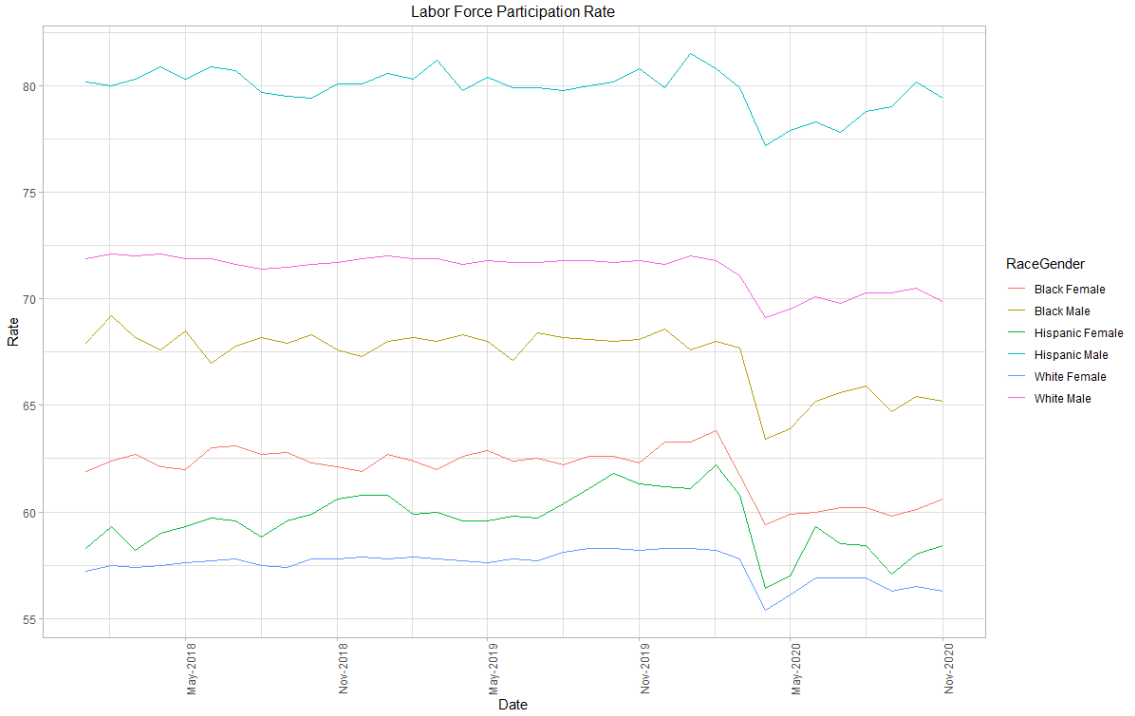


Source: FRED St. Louis

The economy is showing signs that workers are discouraged from entering back into the labor force. The labor force participation rate for women (per Figure 10) has not increased substantially since June and the labor force participation rate of men has seen a slight drop between October and November. Long run trends for women being discouraged with respect to entering back into the labor market (or perhaps unable to enter back into the labor force due to at-home schooling constraints) does not bode well for skill development. For most professions – all those requiring firm specific or labor market specific human capital skills – the lack of labor market activity will result in an atrophy of skills and a long-run depression of wages. When professional women enter back into the labor market, it is expected that they will see lower initial wages and a flatter wage trajectory.

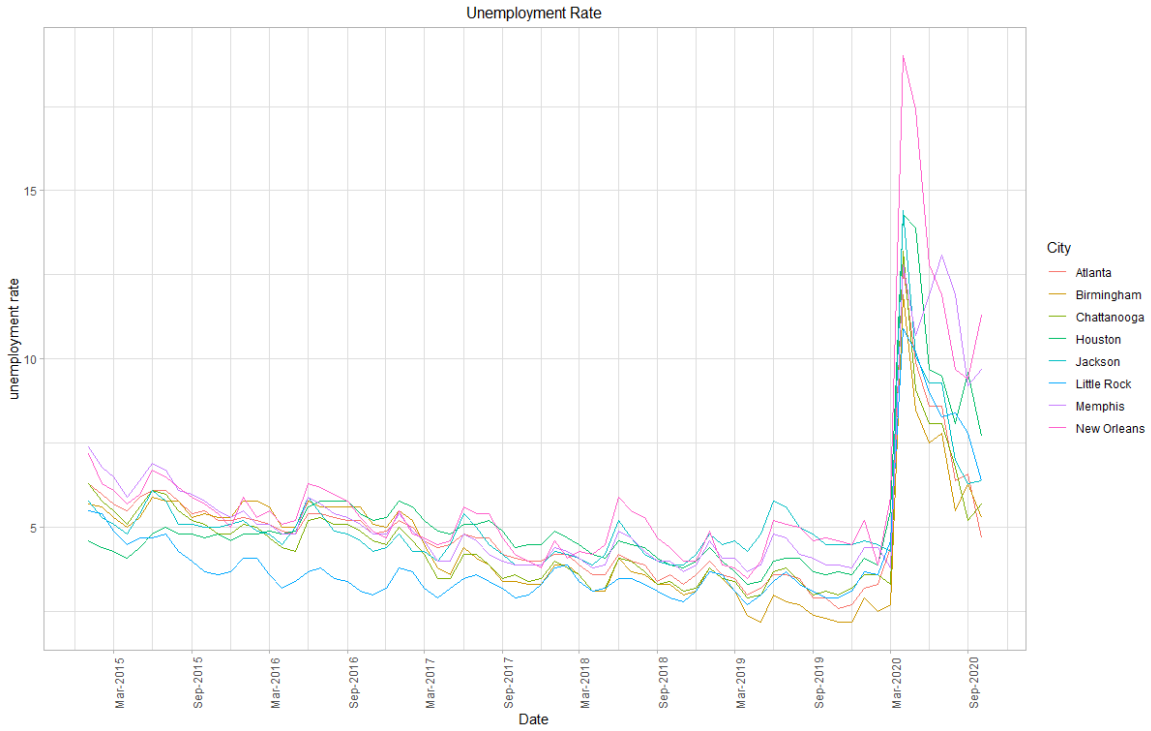
It is troubling to see the consistent 'flattening' of the labor force participation rates for nearly every group except for White males and black females. (See Figure 11.) The trend shown in this figure suggest that the workforce is at a standstill. With nearly 750,000 initial unemployment claims per week and the economy only adding 245,000, a flat labor force participation trend suggests that former workers are in a holding pattern and the productive capacity of the economy is moving in a downward direction.

Figure 11: Labor Force Participation Rate by Race and Gender



Source: FRED St. Louis

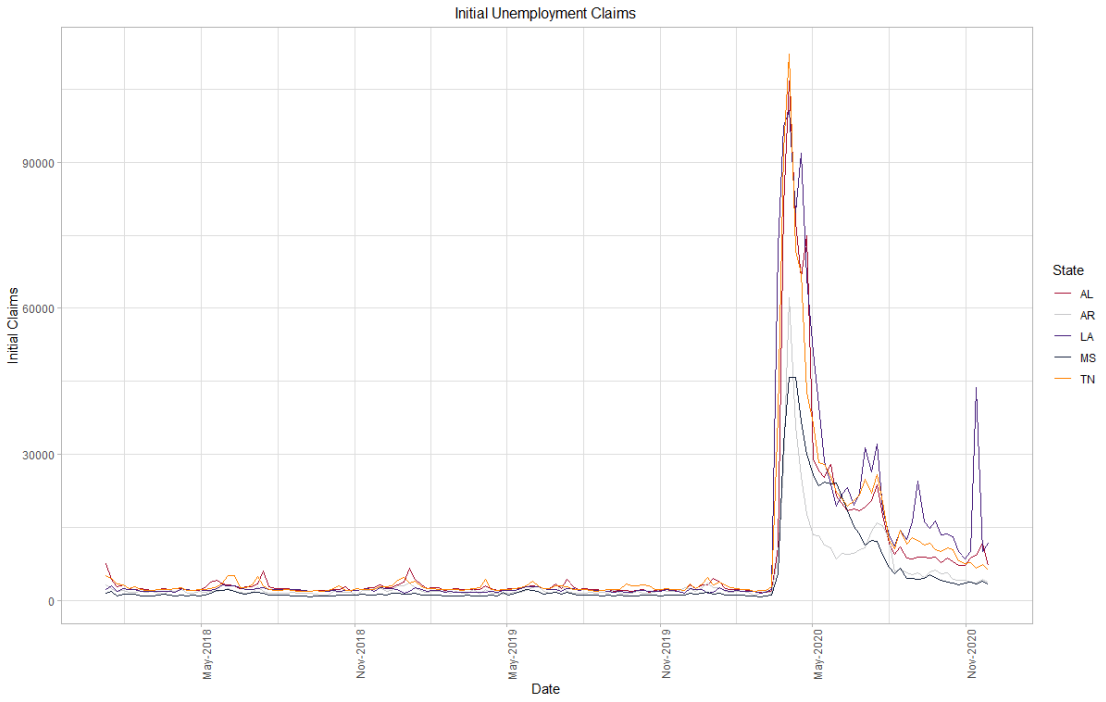
Figure 12: Unemployment Rate by MSA



Source: FRED St. Louis

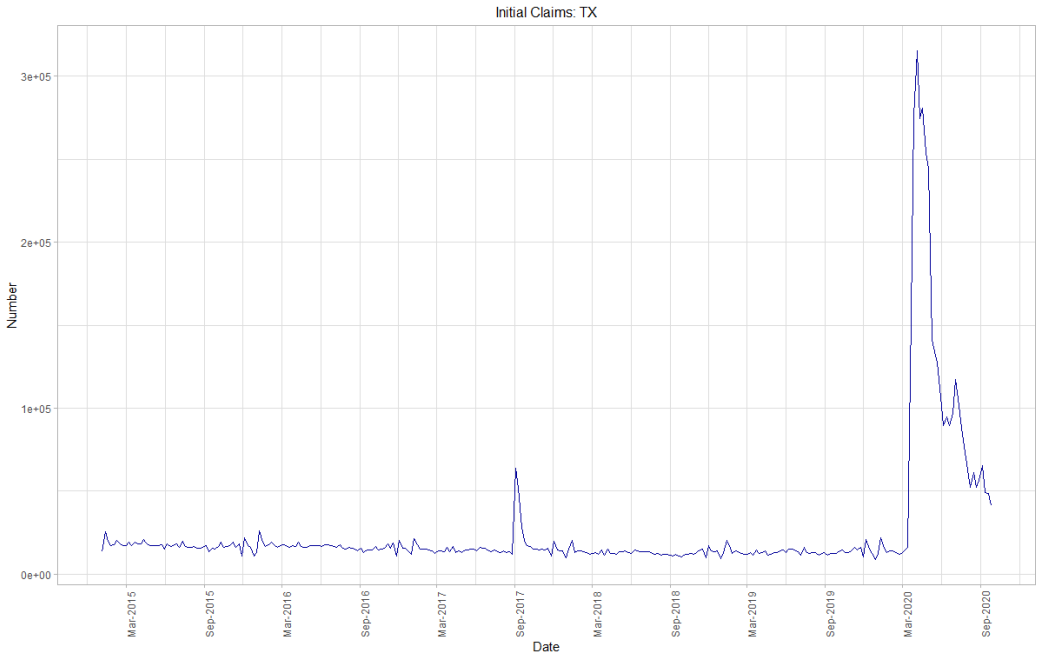
When examining the unemployment trends by MSA (Figure 12), we see that nearly all the major cities we've analyzed are seeing a decrease in the unemployment rates. New Orleans, LA, saw the highest spike in unemployment and is seeing a small up-tick in unemployment rates between October and November. This increase in unemployment rate and spike in initial unemployment claims (see Figure 13) correspond to an increase in COVID-19 cases in New Orleans. Figure 13, Figure 14, Figure 15, and Figure 16 show the initial and continued unemployment claims for several southeastern states.

Figure 13: Initial Unemployment Claims: AL, AR, LA, MS, TN



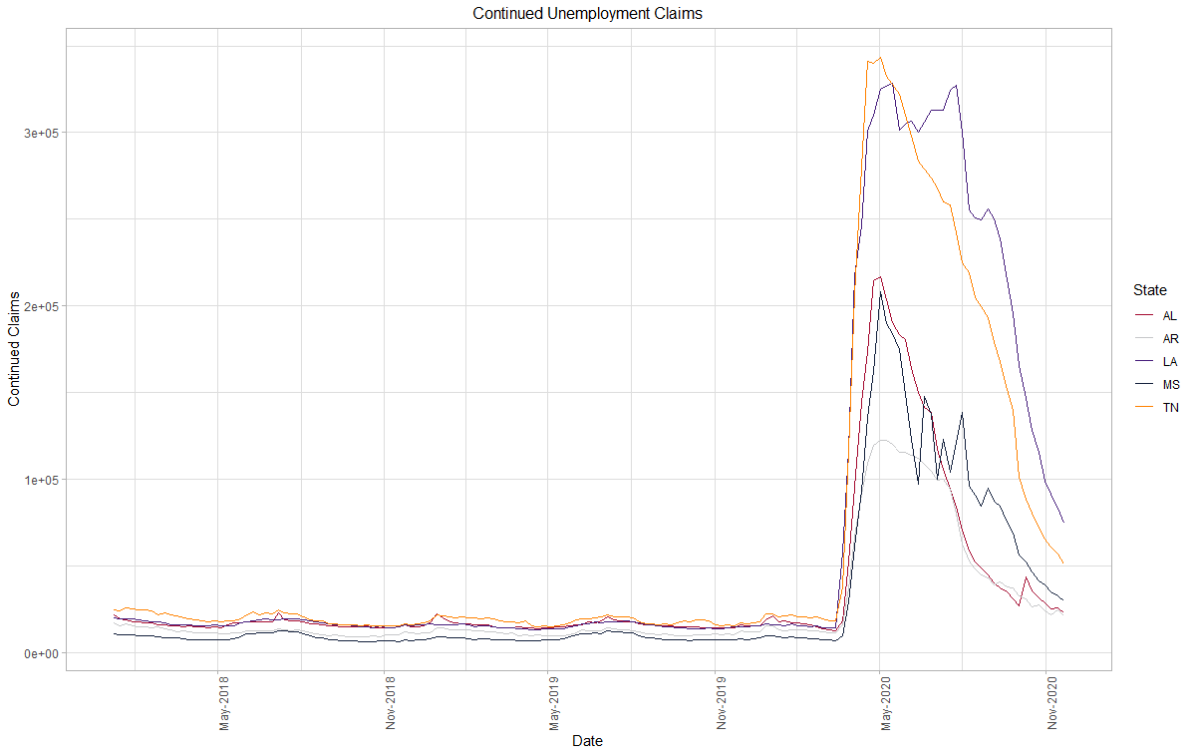
Source: FRED St. Louis

Figure 14: Initial Unemployment Claims TX



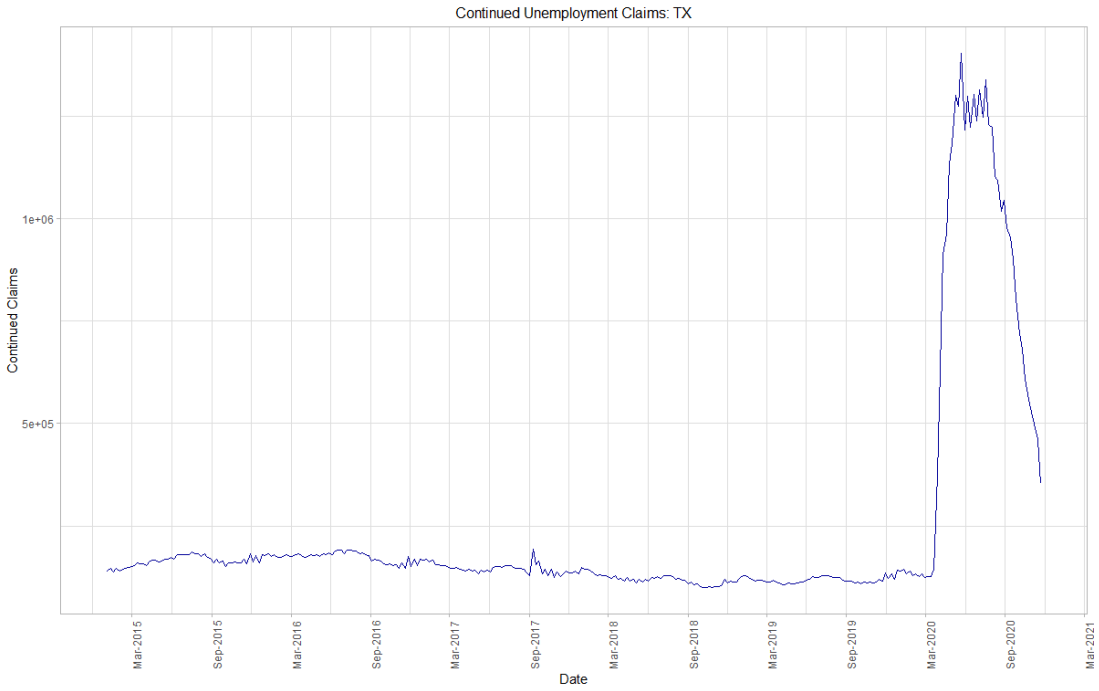
Source: FRED St. Louis

Figure 15: Continued Unemployment Claims: AL, AR, LA, MS, TN



Source: FRED St. Louis

Figure 16: Continued Unemployment: TX



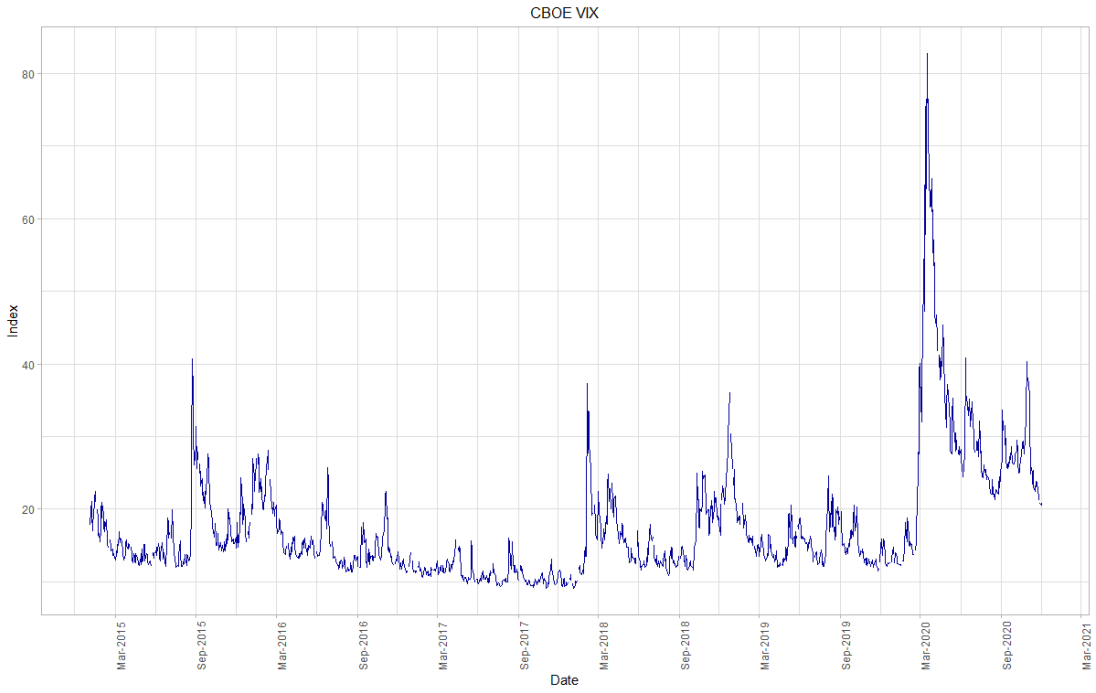
Source: FRED St. Louis

Financial Markets & Industry

Financial Positions

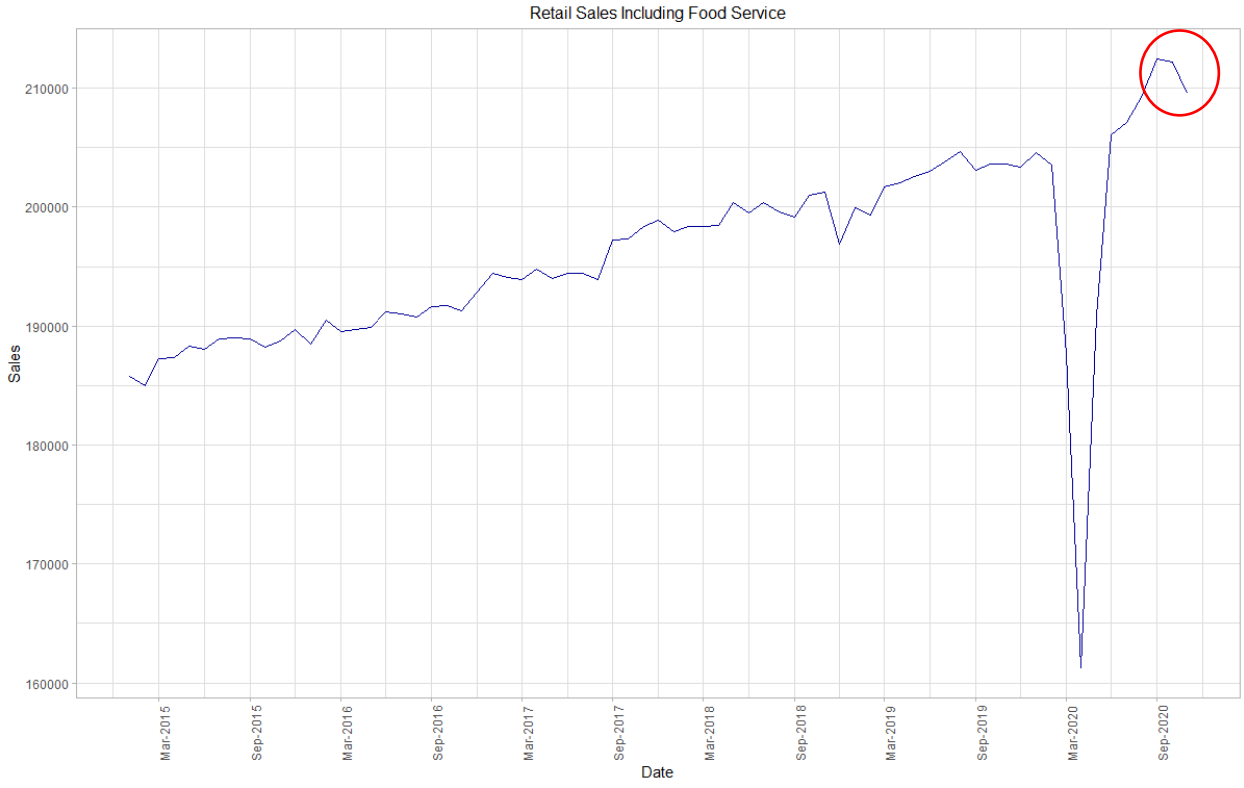
The CBOE VIX index measures the level of insecurity or volatility that consumers and investors feel exists in the market; a higher VIX identifies that consumers and investors are more anxious/stressed/fearful about volatility in the market. Although the VIX has settled quite substantially since the start of the pandemic (per **Error! Not a valid bookmark self-reference.**), it is still bouncing between 20 and 40 – nearly double the average level of anxiety prior to the COVID-19 outbreak. Inkeeping with the point of the VIX reflecting an aspect of investor confidence, the DJIA and the S&P 500 have shown tremendous gains in the last quarter, but there is also still a sense of instability in the markets.

Figure 17: CBOE VIX



Source: FRED St. Louis

Figure 18: Retail Sales, including Food Service



Source: FRED St. Louis

The volume of retail sales, shown in

Figure 18, rebounded almost immediately after the initial pandemic shut-down. The growth in sales since June has been robust until November, where sales volume started declining again. The downward tilt in sales – highlighted above – is consistent with the significant loss in jobs in the retail and sales market (ref. Figure 3). The losses in this sector point to a weak holiday shopping season. It is likely that a fair number of retailers that were hoping that a robust holiday season (i.e., Q4 sales) would pull them out of potential bankruptcy. However, ***the combination of (i) weakening sales and (ii) significant loss of jobs is signaling a significant failure in this market***. The likely outcome of this combination will be more bankruptcies and additional job losses expected during 1H2021. In short, the retail sector is in distress.

Restaurants & Food Service

While the deployment vaccines have been announced, the fact that it will require 6-18 months to have widespread vaccination of the population means that states are not yet at a point to relax their COVID-driven ordinances. Using the US' most densely populated areas as bellweathers, the recent policy changes in California and New York have had a substantial impact on the restaurant and bar industry in those states, and are seen as a precursor to similar moves in many other portions of the country. California (specifically Los Angeles County) issued new rules on 12/11/2020 that closed the outdoor seating that were temporarily allowed after indoor dining was closed due to COVID. With indoor and outdoor dining eliminated, restaurants are limited to take-out or drive thru service exclusively.

Figure 19: California's Recent Policies regarding Restaurants

Recent Updates: (Changes highlighted in yellow)

12/11/20:

- Temporary outdoor seating areas at restaurants, breweries and wineries are closed to the public.
- Employees must wear a face covering at all times except for when eating or drinking. Employees may eat or drink only during break times and in designated break areas, preferably outdoors. When eating or drinking employees must keep a 6-foot physical distance from others.

11/25/20: Restaurants, breweries and wineries may only offer food and beverage via take-out, drive thru or delivery. Wineries and breweries may continue retail sales operations. These limitations are effective November 25 – until further notice.

11/10/20: Workers are enlisted and supported as peer educators, reinforcing instructions around physical distancing and infection control.

Source: http://publichealth.lacounty.gov/media/coronavirus/docs/protocols/Reopening_Restaurants.pdf

Following a new health release that indicates that 1.4% of all COVID cases are due to exposure during indoor dining[6], Governor Cuomo announced that indoor dining in New York city were prohibited until

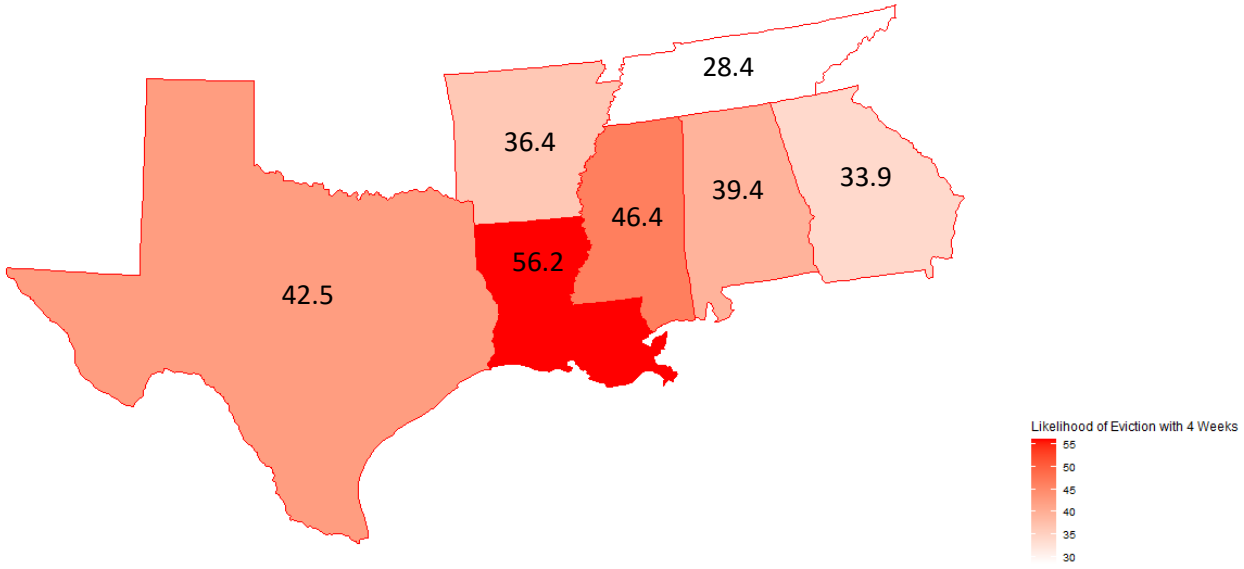
[6] https://ny.eater.com/2020/12/11/22169841/restaurants-and-bars-coronavirus-spread-data-new-york

the infection rates of COVID decreased[7]. The New York Restaurant association predicted that restrictions put in place last Spring have likely put 1,000 New York restaurants out of business[8].

In July, 2020, data collected through Yelp[9] indicated that at least 16,000 restaurants had permanently closed as a result of the pandemic. As of September, 2020, the National Restaurant Association suggested that 100,000 restaurants have permanently shuttered[10]. ***The increase in the number of cases and the increase in restrictions are only going to continue to cause restaurants in more vulnerable financial positions to close; the loss of jobs in the food and retail sector will likely increase in the next few months.*** Even after the vaccine is widely distributed (which might not be until 2Q2021 or beyond[11]) it is likely that the changes in consumer habits (dining in and ordering take-out) will negatively impact the restaurant industry for years.

Housing & Evictions

Figure 20: Percentage of Respondents -- Very Likely or Somewhat Likely to Be Evicted within 4 Weeks (Week Ending 11/23/2020)



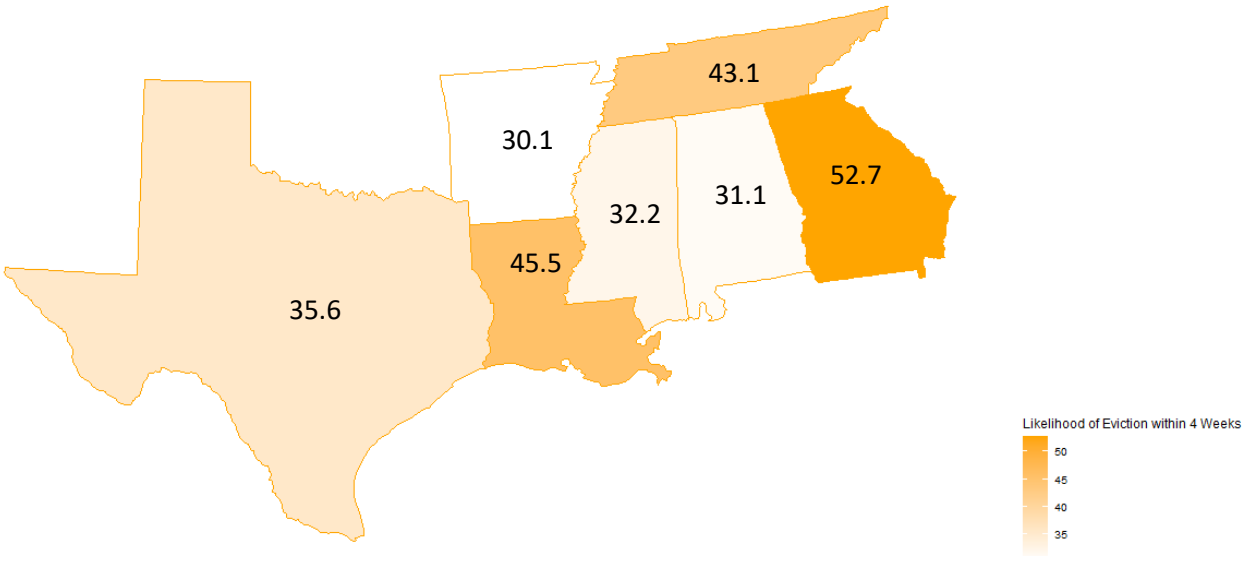
Source: Census Pulse Survey

Figure 20 and Figure 21 show housing insecurity in southeastern US; the maps show the percentage of the respondents from the Census Pulse Survey[12] that identify that they are very likely or somewhat likely to be evicted within the next 4 weeks. While respondents in Tennessee and Georgia identified that they were more likely to be evicted, the likelihood of eviction decreased for respondents in Alabama,

[7] https://ny.eater.com/2020/12/11/21564393/nyc-indoor-dining-coronavirus-ban
[8] https://ny.eater.com/2020/9/3/21408479/nyc-restaurant-closings-coronavirus-september
[9] https://www.qsrmagazine.com/consumer-trends/yelp-nearly-16000-restaurants-have-permanently-closed-due-covid
[10] https://www.qsrmagazine.com/finance/100000-restaurant-closures-expected-2020
[11] https://abcnews.go.com/Health/covid-19-vaccine-months-americans/story?id=74324596
[12] https://www.census.gov/programs-surveys/household-pulse-survey/data.html

Arkansas, Louisiana, Mississippi, and Texas. The trend, although encouraging, doesn't fully capture how challenging this situation is for residents of these states or the long-run consequences of being without a home. The trend for Louisiana, for example, is moving in the right direction but still shows that more than 45% of the Pulse Survey respondents are very or somewhat likely to be evicted.

Figure 21: Percentage of Respondents -- Very Likely or Somewhat Likely to Be Evicted within 4 Weeks (Week Ending 12/7/2020)

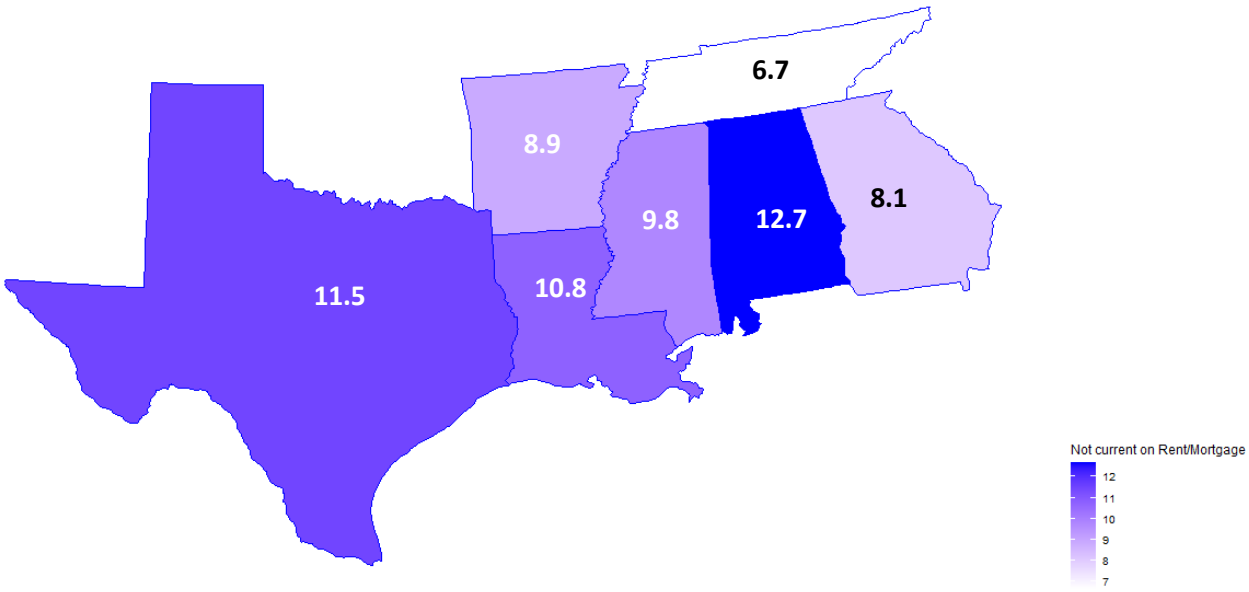


Source: Census Pulse Survey

Mortgage Delinquency

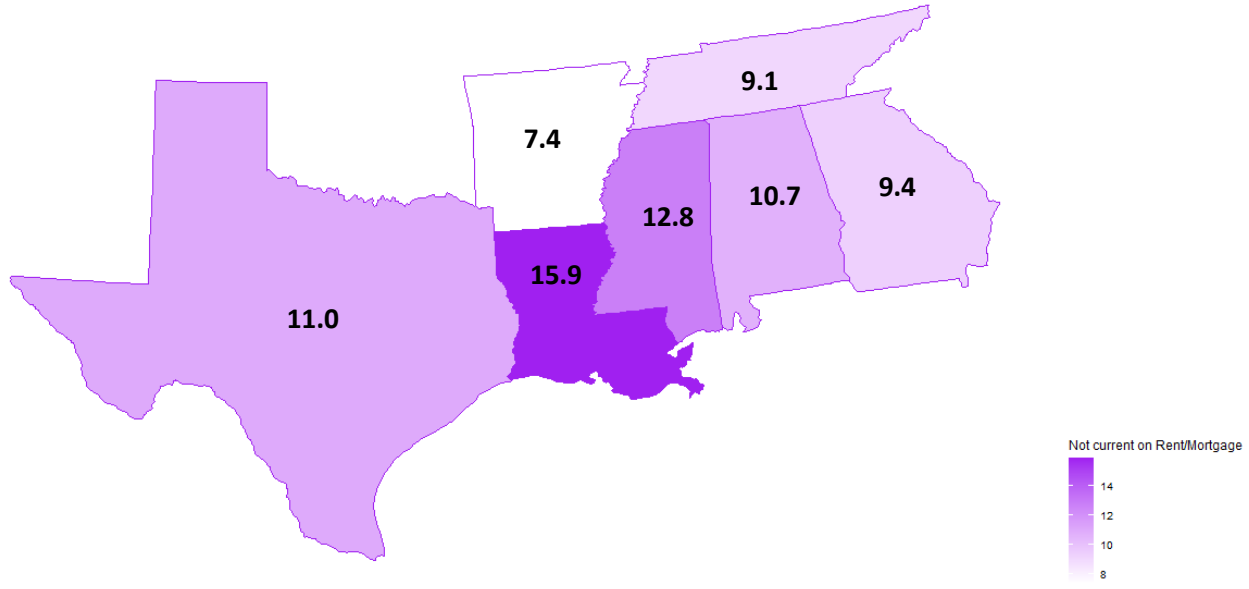
The pattern of mortgage delinquency is mixed, but concerning. (See Figure 22 and Figure 23.) The percentage of households from the Pulse Survey that were non-current on their mortgages averaged 9.7% for the last week of November, 2020. The percentage of households in the Southeastern US that identified as non-current during the first week of December, 2020, rose to about 10.9%. Although three states saw a small decrease in mortgage delinquency – Texas fell from 11.5% to 11.0%, Alabama fell from 12.7% to 10.7% and Arkansas fell from 8.9% to 7.4% -- the other states saw increases in households reporting mortgage delinquencies. Table 1 through Table 5 show the mortgage delinquency rates for the MSAs in several southeastern states of interest, separated by the degree of delinquency and the number of dwelling units per mortgage.

Figure 22: Percentage of Respondents Who are Non-Current on Mortgages/Rents (Week Ending 11/23/2020)



Source: Census Pulse Survey

Figure 23: Percentage of Respondents Who are Non-Current on Mortgages/Rents (Week Ending 12/07/2020)



Source: Census Pulse Survey

Table 1: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30 + dpd) as of June 2020: Alabama & SMSAs

MSA	# Units	Total	Current	30-59 dpd	60-89 dpd	90-119 dpd	120+ dpd	% 30dpd	% >30 dpd	% >= 30 dpd
Anniston-Oxford, AL	1 unit	979	941	11	4	1	22	1.124%	2.758%	3.882%
	2 units	2	2	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	4	4	0	0	0	0	0.0%	0.0%	0.0%
Auburn-Opelika, AL	1 unit	3696	3604	19	12	6	55	0.514%	1.975%	2.489%
	2 units	23	22	0	0	0	1	0.0%	4.348%	4.348%
	3+ units	1	1	0	0	0	0	0.0%	0.0%	0.0%
Birmingham-Hoover, AL	1 unit	24443	23791	175	73	50	354	0.716%	1.951%	2.667%
	2 units	17	17	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	10	10	0	0	0	0	0.0%	0.0%	0.0%
Columbus, GA-AL	1 unit	293	280	2	1	3	7	0.683%	3.754%	4.437%
	2 units	5	5	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	0	0	0	0	0	0	0.0%	0.0%	0.0%
Daphne-Fairhope-Foley, AL	1 unit	5985	5807	71	15	13	79	1.186%	1.788%	2.974%
	2 units	11	11	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	3	3	0	0	0	0	0.0%	0.0%	0.0%

Decatur, AL	1 unit	1767	1728	14	2	3	20	0.792%	1.415%	2.207%
	2 units	4	4	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	5	5	0	0	0	0	0.0%	0.0%	0.0%
Dothan, AL	1 unit	1732	1691	14	5	6	16	0.808%	1.559%	2.367%
	2 units	1	1	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	2	2	0	0	0	0	0.0%	0.0%	0.0%
Florence-Muscle Shoals, AL	1 unit	2243	2183	22	4	6	28	0.981%	1.694%	2.675%
	2 units	3	3	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	0	0	0	0	0	0	0.0%	0.0%	0.0%
Gadsden, AL	1 unit	1045	992	9	6	5	33	0.861%	4.211%	5.072%
	2 units	1	1	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	0	0	0	0	0	0	0.0%	0.0%	0.0%
Huntsville, AL	1 unit	11115	10908	72	16	15	104	0.648%	1.215%	1.862%
	2 units	14	14	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	31	30	1	0	0	0	3.226%	0.0%	3.226%
Mobile, AL	1 unit	4501	4348	50	14	8	81	1.111%	2.288%	3.399%
	2 units	11	11	0	0	0	0	0.0%	0.0%	0.0%

	3+ units	4	4	0	0	0	0	0.0%	0.0%	0.0%
Montgomery, AL	1 unit	5003	4884	31	4	8	76	0.62%	1.759%	2.379%
	2 units	14	14	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	7	7	0	0	0	0	0.0%	0.0%	0.0%
Tuscaloosa, AL	1 unit	4065	3973	37	7	6	42	0.91%	1.353%	2.263%
	2 units	4	4	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	0	0	0	0	0	0	0.0%	0.0%	0.0%
Outside all MSAs	1 unit	8787	8493	110	29	24	131	1.252%	2.094%	3.346%
	2 units	39	36	0	0	0	3	0.0%	7.692%	7.692%
	3+ units	8	8	0	0	0	0	0.0%	0.0%	0.0%

Data: STACR Freddie Mac

Table 2: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30 + dpd) as of Nov. 2020: Florida & SMSAs

MSA	# Units	Total	Current	30-59 dpd	60-89 dpd	90-119 dpd	120+ dpd	% 30dpd	% >30 dpd	% >= 30 dpd
Cape Coral-Fort Myers, FL	1 unit	21412	20741	156	66	40	409	0.729%	2.405%	3.134%
	2 units	275	252	6	2	1	14	2.182%	6.182%	8.364%
	3+ units	34	32	1	0	0	1	2.941%	2.941%	5.882%
Crestview-Fort Walton Beach-Destin, FL	1 unit	5672	5491	32	18	12	119	0.564%	2.627%	3.191%
	2 units	13	13	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	17	17	0	0	0	0	0.0%	0.0%	0.0%
Deltona-Daytona Beach-Ormond Beach, FL	1 unit	14880	14449	111	41	49	230	0.746%	2.151%	2.897%
	2 units	118	107	0	0	0	11	0.0%	9.322%	9.322%
	3+ units	39	35	2	0	0	2	5.128%	5.128%	10.256%
Gainesville, FL	1 unit	4769	4678	15	10	6	60	0.315%	1.594%	1.908%
	2 units	18	18	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	13	11	0	0	0	2	0.0%	15.385%	15.385%
Homosassa Springs, FL	1 unit	2488	2448	16	5	3	16	0.643%	0.965%	1.608%

	2 units	17	17	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	3	3	0	0	0	0	0.0%	0.0%	0.0%
Jacksonville, FL	1 unit	31711	30809	201	92	74	535	0.634%	2.211%	2.844%
	2 units	149	140	0	3	1	5	0.0%	6.04%	6.04%
	3+ units	87	82	0	0	0	5	0.0%	5.747%	5.747%
Lakeland-Winter Haven, FL	1 unit	12062	11630	102	41	42	247	0.846%	2.736%	3.581%
	2 units	77	73	0	1	0	3	0.0%	5.195%	5.195%
	3+ units	27	25	0	0	0	2	0.0%	7.407%	7.407%
Naples-Marco Island, FL	1 unit	10104	9758	83	28	29	206	0.821%	2.603%	3.424%
	2 units	36	34	0	0	0	2	0.0%	5.556%	5.556%
	3+ units	14	14	0	0	0	0	0.0%	0.0%	0.0%
North Port-Bradenton-Sarasota, FL	1 unit	25032	24288	156	76	41	471	0.623%	2.349%	2.972%
	2 units	145	139	2	0	0	4	1.379%	2.759%	4.138%
	3+ units	23	22	0	0	1	0	0.0%	4.348%	4.348%
Ocala, FL	1 unit	6181	6025	46	22	8	80	0.744%	1.78%	2.524%

	2 units	17	17	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	14	11	0	0	0	3	0.0%	21.429%	21.429%
Orlando-Kissimmee-Sanford, FL	1 unit	58080	55384	447	234	224	1791	0.77%	3.872%	4.642%
	2 units	252	247	0	0	0	5	0.0%	1.984%	1.984%
	3+ units	82	78	0	0	0	4	0.0%	4.878%	4.878%
Palm Bay-Melbourne-Titusville, FL	1 unit	15371	14943	114	34	35	245	0.742%	2.043%	2.784%
	2 units	39	36	0	0	0	3	0.0%	7.692%	7.692%
	3+ units	21	19	0	0	0	2	0.0%	9.524%	9.524%
Palm Coast, FL	1 unit	182	178	1	2	0	1	0.549%	1.648%	2.198%
	2 units	4	4	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	0	0	0	0	0	0	0.0%	0.0%	0.0%
Panama City-Lynn Haven-Panama City Beach, FL	1 unit	3761	3654	43	9	9	46	1.143%	1.702%	2.845%
	2 units	33	33	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	12	12	0	0	0	0	0.0%	0.0%	0.0%
Pensacola-Ferry Pass-Brent, FL	1 unit	7747	7504	70	20	19	134	0.904%	2.233%	3.137%

	2 units	59	59	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	37	34	1	0	0	2	2.703%	5.405%	8.108%
Port St. Lucie, FL	1 unit	12399	11948	101	43	30	277	0.815%	2.823%	3.637%
	2 units	47	44	0	0	1	2	0.0%	6.383%	6.383%
	3+ units	13	11	1	0	0	1	7.692%	7.692%	15.385%
Punta Gorda, FL	1 unit	5858	5715	29	17	9	88	0.495%	1.946%	2.441%
	2 units	21	20	1	0	0	0	4.762%	0.0%	4.762%
	3+ units	5	5	0	0	0	0	0.0%	0.0%	0.0%
Sebastian-Vero Beach, FL	1 unit	4607	4489	22	13	9	74	0.478%	2.084%	2.561%
	2 units	12	11	0	0	0	1	0.0%	8.333%	8.333%
	3+ units	4	4	0	0	0	0	0.0%	0.0%	0.0%
Sebring, FL	1 unit	1534	1488	11	7	6	22	0.717%	2.282%	2.999%
	2 units	10	9	1	0	0	0	10.0%	0.0%	10.0%
	3+ units	3	3	0	0	0	0	0.0%	0.0%	0.0%
Tallahassee, FL	1 unit	7431	7251	52	19	15	94	0.7%	1.723%	2.422%
	2 units	43	43	0	0	0	0	0.0%	0.0%	0.0%

	3+ units	29	29	0	0	0	0	0.0%	0.0%	0.0%
Tampa-St. Petersburg-Clearwater, FL	1 unit	73598	71038	524	231	206	1599	0.712%	2.766%	3.478%
	2 units	389	375	1	3	0	10	0.257%	3.342%	3.599%
	3+ units	218	206	2	0	1	9	0.917%	4.587%	5.505%
The Villages, FL	1 unit	1997	1967	5	3	5	17	0.25%	1.252%	1.502%
	2 units	0	0	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	0	0	0	0	0	0	0.0%	0.0%	0.0%
Outside all MSAs	1 unit	7892	7639	46	27	30	150	0.583%	2.623%	3.206%
	2 units	326	306	5	2	0	13	1.534%	4.601%	6.135%
	3+ units	49	47	1	0	0	1	2.041%	2.041%	4.082%

Data: STACR Freddie Mac

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

MSA	# Units	Total	Current	30-59 dpd	60-89 dpd	90-119 dpd	120+ dpd	% 30dpd	% >30 dpd	% >= 30 dpd
Alexandria, LA	1 unit	1313	1272	10	7	0	24	0.762%	2.361%	3.123%
	2 units	0	0	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	0	0	0	0	0	0	0.0%	0.0%	0.0%
Baton Rouge, LA	1 unit	16444	15872	136	63	61	312	0.827%	2.651%	3.478%
	2 units	48	46	1	0	0	1	2.083%	2.083%	4.167%
	3+ units	55	50	0	0	0	5	0.0%	9.091%	9.091%
Hammond, LA	1 unit	1593	1532	17	12	8	24	1.067%	2.762%	3.829%
	2 units	10	9	0	0	0	1	0.0%	10.0%	10.0%
	3+ units	4	2	2	0	0	0	50.0%	0.0%	50.0%
Houma-Bayou Cane-Thibodaux, LA	1 unit	2817	2709	29	15	8	56	1.029%	2.804%	3.834%
	2 units	5	5	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	4	4	0	0	0	0	0.0%	0.0%	0.0%
Lafayette, LA	1 unit	6979	6655	73	44	19	188	1.046%	3.597%	4.642%
	2 units	9	9	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	23	17	2	0	0	4	8.696%	17.391%	26.087%

Lake Charles, LA	1 unit	3002	2730	88	71	24	89	2.931%	6.129%	9.061%
	2 units	11	11	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	7	7	0	0	0	0	0.0%	0.0%	0.0%
Monroe, LA	1 unit	1990	1903	23	8	8	48	1.156%	3.216%	4.372%
	2 units	2	2	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	0	0	0	0	0	0	0.0%	0.0%	0.0%
New Orleans-Metairie-Kenner, LA	1 unit	21697	20620	243	93	97	644	1.12%	3.844%	4.964%
	2 units	1134	1062	8	5	5	54	0.705%	5.644%	6.349%
	3+ units	305	278	1	0	0	26	0.328%	8.525%	8.852%
Shreveport-Bossier City, LA	1 unit	5453	5208	60	18	19	148	1.1%	3.393%	4.493%
	2 units	4	4	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	7	7	0	0	0	0	0.0%	0.0%	0.0%
Outside all MSAs	1 unit	4687	4436	84	28	21	118	1.792%	3.563%	5.355%
	2 units	459	425	2	1	0	31	0.436%	6.972%	7.407%
	3+ units	96	94	0	0	0	2	0.0%	2.083%	2.083%

Data: STACR Freddie Mac

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

MSA	# Units	Total	Current	30-59 dpd	60-89 dpd	90-119 dpd	120+ dpd	% 30dpd	% >30 dpd	% >= 30 dpd
Gulfport-Biloxi, MS	1 unit	3247	3133	26	9	13	66	0.801%	2.71%	3.511%
	2 units	23	23	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	9	9	0	0	0	0	0.0%	0.0%	0.0%
Hattiesburg, MS	1 unit	1683	1616	23	8	4	32	1.367%	2.614%	3.981%
	2 units	3	3	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	1	1	0	0	0	0	0.0%	0.0%	0.0%
Jackson, MS	1 unit	6524	6296	38	23	15	152	0.582%	2.912%	3.495%
	2 units	6	6	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	3	3	0	0	0	0	0.0%	0.0%	0.0%
Memphis, TN-MS-AR	1 unit	3967	3852	36	14	9	56	0.907%	1.991%	2.899%
	2 units	2	2	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	0	0	0	0	0	0	0.0%	0.0%	0.0%
Pascagoula, MS	1 unit	78	72	1	0	1	4	1.282%	6.41%	7.692%
	2 units	1	1	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	0	0	0	0	0	0	0.0%	0.0%	0.0%

Outside all MSAs	1 unit	7975	7658	77	46	28	166	0.966%	3.009%	3.975%
	2 units	10	10	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	2	2	0	0	0	0	0.0%	0.0%	0.0%

Data: STACR Freddie Mac

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

MSA	# Units	Total	Current	30-59 dpd	60-89 dpd	90-119 dpd	120+ dpd	% 30dpd	% >30 dpd	% >= 30 dpd
Abilene, TX	1 unit	2883	2804	22	8	3	46	0.763%	1.977%	2.74%
	2 units	13	13	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	2	2	0	0	0	0	0.0%	0.0%	0.0%
Amarillo, TX	1 unit	3313	3203	22	5	14	69	0.664%	2.656%	3.32%
	2 units	10	10	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	2	2	0	0	0	0	0.0%	0.0%	0.0%
Austin-Round Rock-San Marcos, TX	1 unit	71867	69832	418	188	188	1241	0.582%	2.25%	2.832%
	2 units	882	860	3	1	1	17	0.34%	2.154%	2.494%
	3+ units	176	169	2	1	0	4	1.136%	2.841%	3.977%
Beaumont-Port Arthur, TX	1 unit	4199	4040	39	28	12	80	0.929%	2.858%	3.787%
	2 units	1	1	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	6	6	0	0	0	0	0.0%	0.0%	0.0%
Brownsville-Harlingen, TX	1 unit	1968	1861	26	12	11	58	1.321%	4.116%	5.437%
	2 units	29	29	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	25	24	0	0	0	1	0.0%	4.0%	4.0%

College Station-Bryan, TX	1 unit	5200	5044	42	8	16	90	0.808%	2.192%	3.0%
	2 units	77	74	2	0	0	1	2.597%	1.299%	3.896%
	3+ units	49	44	0	1	0	4	0.0%	10.204%	10.204%
Corpus Christi, TX	1 unit	5363	5160	52	31	18	102	0.97%	2.816%	3.785%
	2 units	8	8	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	13	13	0	0	0	0	0.0%	0.0%	0.0%
El Paso, TX	1 unit	4623	4401	42	29	13	138	0.909%	3.894%	4.802%
	2 units	56	55	0	0	0	1	0.0%	1.786%	1.786%
	3+ units	25	25	0	0	0	0	0.0%	0.0%	0.0%
Houston-Sugar Land-Baytown, TX	1 unit	139926	133553	1232	606	577	3958	0.88%	3.674%	4.555%
	2 units	234	225	2	1	0	6	0.855%	2.991%	3.846%
	3+ units	201	190	3	1	0	7	1.493%	3.98%	5.473%
Killeen-Temple-Fort Hood, TX	1 unit	4710	4562	57	10	11	70	1.21%	1.932%	3.142%
	2 units	167	167	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	145	144	1	0	0	0	0.69%	0.0%	0.69%
Laredo, TX	1 unit	1388	1319	16	5	5	43	1.153%	3.818%	4.971%

	2 units	3	2	1	0	0	0	33.333%	0.0%	33.333%
	3+ units	7	7	0	0	0	0	0.0%	0.0%	0.0%
Longview, TX	1 unit	1973	1897	20	12	7	37	1.014%	2.838%	3.852%
	2 units	9	9	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	2	1	0	1	0	0	0.0%	50.0%	50.0%
Lubbock, TX	1 unit	6093	5907	48	17	20	101	0.788%	2.265%	3.053%
	2 units	63	63	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	11	11	0	0	0	0	0.0%	0.0%	0.0%
McAllen-Edinburg-Mission, TX	1 unit	3161	2958	41	16	15	131	1.297%	5.125%	6.422%
	2 units	16	10	0	1	2	3	0.0%	37.5%	37.5%
	3+ units	122	114	3	1	0	4	2.459%	4.098%	6.557%
Midland, TX	1 unit	4602	4375	40	18	24	145	0.869%	4.063%	4.933%
	2 units	13	13	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	2	1	0	0	0	1	0.0%	50.0%	50.0%
Odessa, TX	1 unit	1693	1574	24	17	12	66	1.418%	5.611%	7.029%
	2 units	3	3	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	0	0	0	0	0	0	0.0%	0.0%	0.0%

San Angelo, TX	1 unit	1864	1791	26	11	6	30	1.395%	2.521%	3.916%
	2 units	5	5	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	3	3	0	0	0	0	0.0%	0.0%	0.0%
San Antonio-New Braunfels, TX	1 unit	39651	38239	302	135	140	835	0.762%	2.799%	3.561%
	2 units	277	269	3	0	1	4	1.083%	1.805%	2.888%
	3+ units	167	159	0	2	1	5	0.0%	4.79%	4.79%
Sherman-Denison, TX	1 unit	3300	3215	24	7	9	45	0.727%	1.848%	2.576%
	2 units	26	26	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	0	0	0	0	0	0	0.0%	0.0%	0.0%
Texarkana, TX-Texarkana, AR	1 unit	914	892	6	6	1	9	0.656%	1.751%	2.407%
	2 units	6	6	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	4	4	0	0	0	0	0.0%	0.0%	0.0%
Tyler, TX	1 unit	3383	3270	31	11	8	63	0.916%	2.424%	3.34%
	2 units	7	7	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	1	1	0	0	0	0	0.0%	0.0%	0.0%
Victoria, TX	1 unit	828	787	12	4	6	19	1.449%	3.502%	4.952%

	2 units	2	2	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	0	0	0	0	0	0	0.0%	0.0%	0.0%
Waco, TX	1 unit	3654	3537	53	12	8	44	1.45%	1.752%	3.202%
	2 units	38	38	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	1	1	0	0	0	0	0.0%	0.0%	0.0%
Wichita Falls, TX	1 unit	1054	1016	11	2	6	19	1.044%	2.562%	3.605%
	2 units	5	5	0	0	0	0	0.0%	0.0%	0.0%
	3+ units	2	2	0	0	0	0	0.0%	0.0%	0.0%
Outside all MSAs	1 unit	26818	25836	256	108	101	517	0.955%	2.707%	3.662%
	2 units	450	442	0	1	0	7	0.0%	1.778%	1.778%
	3+ units	56	54	2	0	0	0	3.571%	0.0%	3.571%

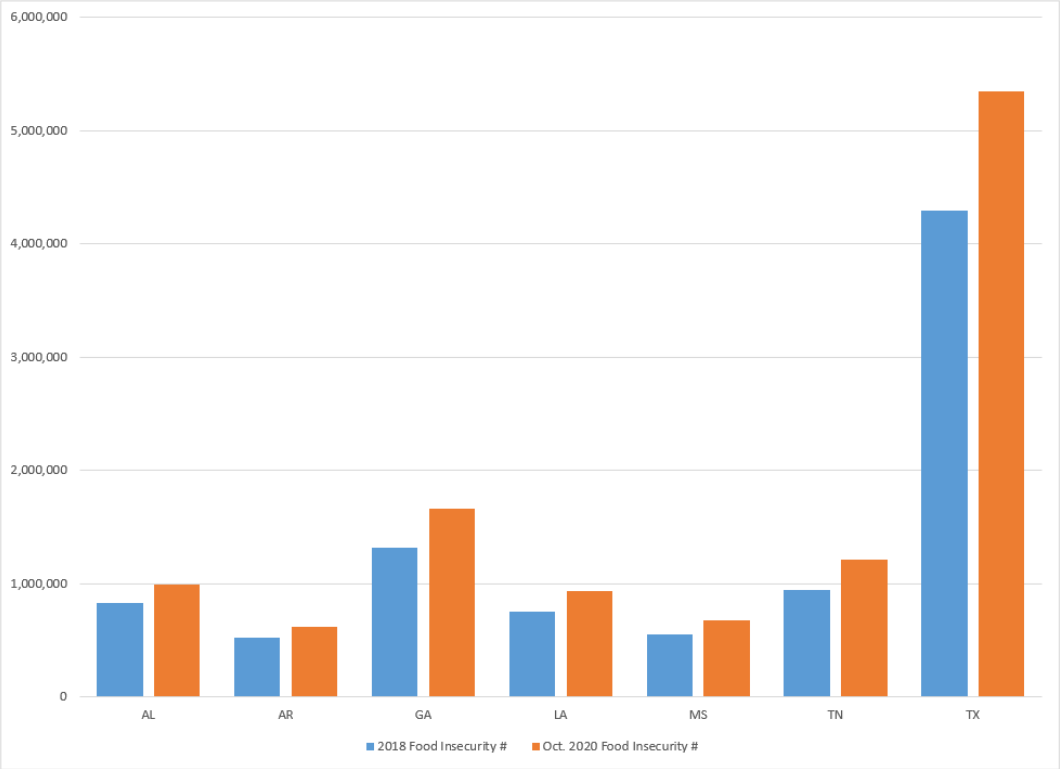
Data: STACR Freddie Mac

Food Insecurity

One unfortunate trend of the ongoing recession is the volume of people who are experiencing food insecurity. Food banks across the country are reporting record usage of their drive-up pantries.

- San Antonio Food Bank: 120,00 people per week (relative to 60,000 per week one year ago);
- Feeding America: 54 million people do not have adequate access to food.

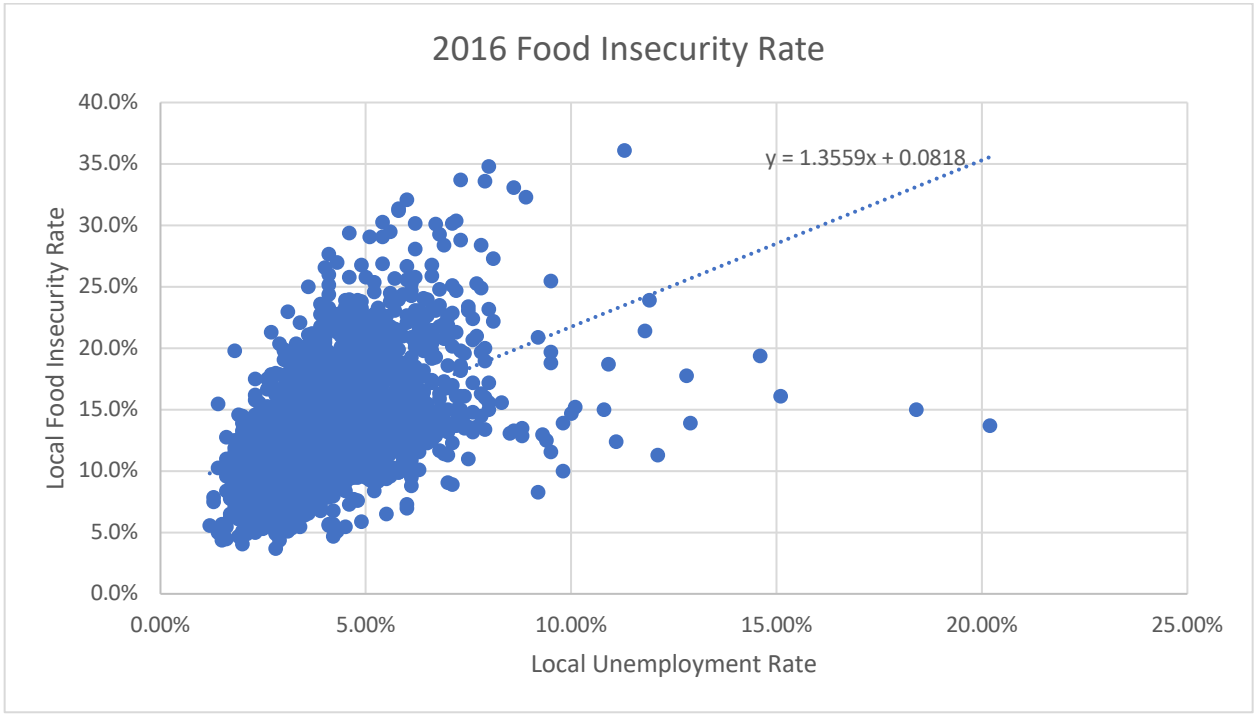
Figure 24: Comparison of 2018 & 2020 Counts of People without Secure Food Sources



Source: Gundersen, C., M. Hake, A. Dewey, E. Engelhard (2020). The Impact of the Coronavirus on Food Insecurity in 2020, Update October 2020. Feed America Data; https://www.feedingamerica.org/research/coronavirus-hunger-research

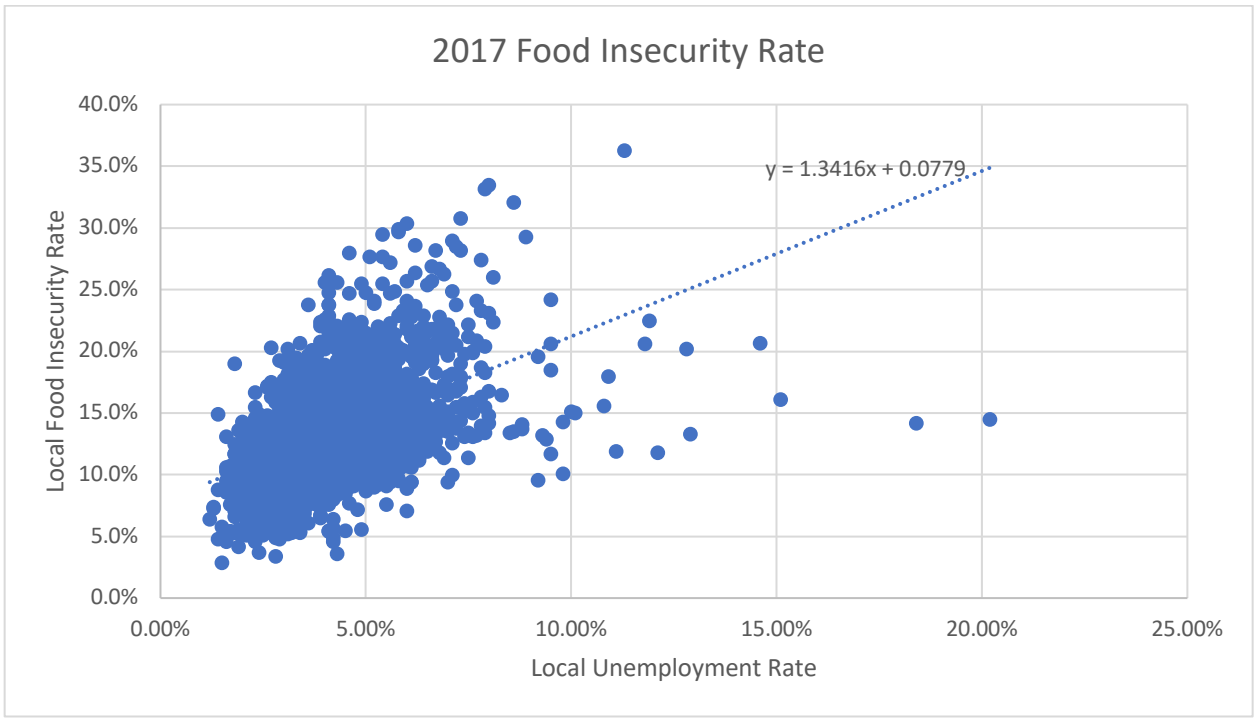
Consider Figure 25, Figure 26, and Figure 27, below. Herein, we see the rates of food insecurity (measured on a per-county basis) as a function of the local unemployment rate. In all charts, unsurprisingly, we see that (generally) as unemployment increases, so does food insecurity. More interestingly, though, based on the fit lines shown, we see that the rate of local food insecurity is increasing (on the whole) given the unemployment rate over time. (Though not shown in this report, this phenomena has been confirmed as increasing since at least 2012.)

Figure 25: 2016 Food Insecurity Rate, as a function of Local (per-County) Unemployment Rate



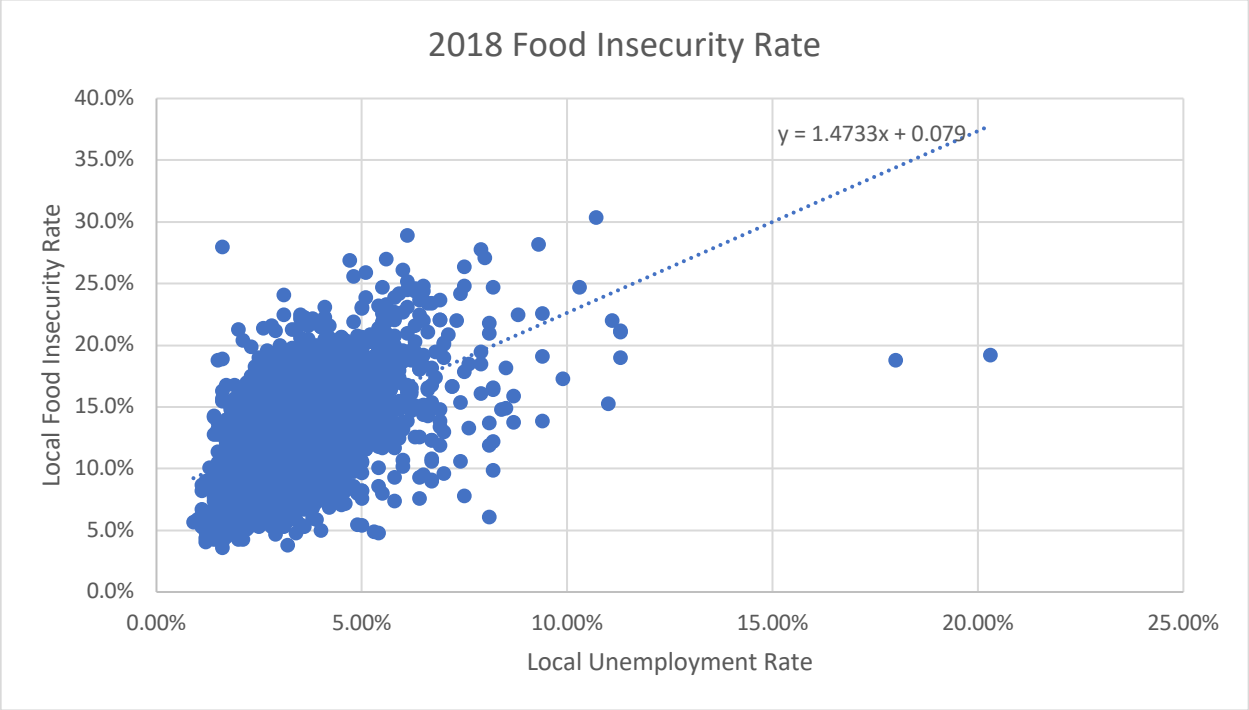
Source: Gundersen, C., A. Dewey, A. Crumbaugh, M. Kato & E. Engelhard. Map the Meal Gap 2018: A Report on County and Congressional District Food Insecurity and County Food Cost in the United States in 2016. Feeding America, 2018.

Figure 26: 2017 Food Insecurity Rate, as a function of Local (per-County) Unemployment Rate



Source: Gundersen, C., A. Dewey, M. Kato, A. Crumbaugh & M. Strayer. Map the Meal Gap 2019: A Report on County and Congressional District Food Insecurity and County Food Cost in the United States in 2017. Feeding America, 2019.

Figure 27: 2018 Food Insecurity Rate, as a function of Local (per-County) Unemployment Rate



Source: Gundersen, C., A. Dewey, E. Engelhard, M. Strayer & L. Lapinski. Map the Meal Gap 2020: A Report on County and Congressional District Food Insecurity and County Food Cost in the United States in 2018. Feeding America, 2020.

Over time, unemployment is having a slightly increasing impact on food insecurity. This changing coefficient might be capturing momentum that likely occurs within families/peer groups when events turn in a negative direction. As family members with similar characteristics – education, training, industry-specific work history – suffer an economic recession, the ability for the family to rely on its own members becomes less plausible. The COVID recession, which is particularly focused on women and persons working in the retail/food service industry, has a very strong cascading effect which is creating more harm for the members that have already been harmed.

Expected Policies After January 20, 2021

We are forecasting the economy 'stumbling' coming out of December 2020. The number of new jobs added, the increase in the number of initial unemployment claims, and an increase in the number of people seeking food assistance all point to a slowing of the economy.

Will President-Elect Biden be able to create a comprehensive fiscal package to address all economic issues that are at hand? It's possible. There are two possibilities for government control on January 20, 2020: a) the Presidency, the House of Representatives and the Senate all have a Democratic majority, b) the Presidency and the House of Representatives have Democratic majorities and the Senate has a Republican majority. The difference between these two outcomes relies on the special election/run-off of the two Senate races in Georgia.

The current polling in Georgia suggests a very close race. The unweighted average of polls for the Perdue-Ossoff race (see Table 6) indicates a tie in the polling between the two candidates. The unweighted average of polls for the Loeffler-Warnock race suggest a slight lean for Warnock (Table 7).

Table 6: Georgia Special Election Polls: Senate Perdue v Ossoff

Poll	Date	Sample	MoE	Perdue (R)	Ossoff (D)
Rasmussen	11/19-11/24	1500	2.6	48	49
Trafalgar	11/8-12/3	1083	2.9	47	48
WXIA	11/27-11/30	588	5.2	48	50
FOX 5	11/16-11/16	800	3.5	49	49
Remington	11/8-11/9	1450	2.6	50	46
Average				**48.4**	**48.4**

Source: https://www.realclearpolitics.com/epolls/2020/senate/ga/georgia_senate_runoff_election_perdue_vs_ossoff-7319.html and http://politicaliq.com/2020/12/04/georgia-senate-races-are-toss-ups/

Table 7: Georgia Special Election Polls: Senate Loeffler v Warnock

Poll	Date	Sample	MoE	Loeffler (R)	Warnock (D)
Rasmussen	11/19-11/24	1500	2.6	46	48
Trafalgar	12/1-12/3	1083	2.9	50	45
WXIA	11/27-11/30	588	5.2	45	52
FOX 5	11/16-11/16	800	3.5	48	49
Remington	11/8-11/9	1450	2.6	49	48
Average				**47.6**	**48.4**

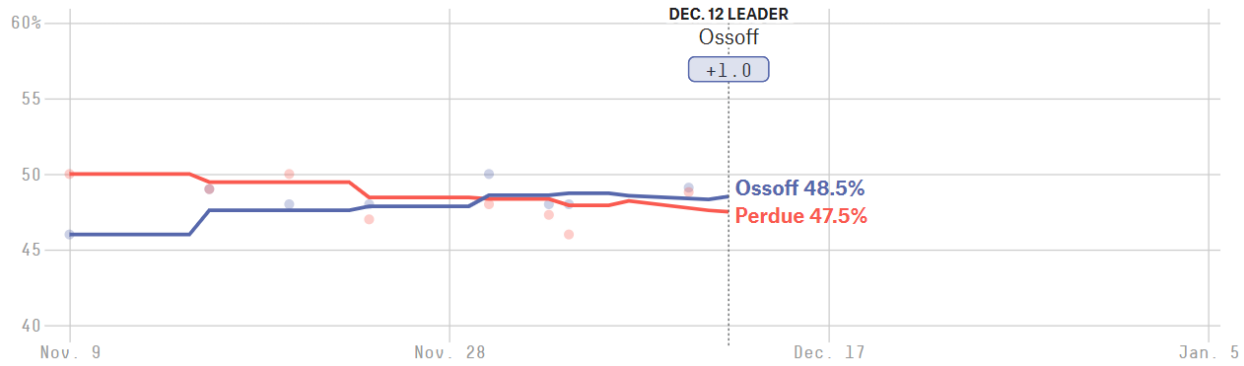
Source: https://www.realclearpolitics.com/epolls/2020/senate/ga/georgia_senate_special_election_runoff_loeffler_vs_warnock-7318.html and http://politicaliq.com/2020/12/04/georgia-senate-races-are-toss-ups/

Election forecasting website *Fivethirtyeight*[13] indicates a 1 point lead for Ossoff and a 1.6 point lead for Warnock. It should be noted that although national and state-wide polls for many swing-state (Michigan, Wisconsin, Pennsylvania, North Carolina, Florida and Georgia) were off by as much as 5 points, the *Fivethirtyeight* pre-election prediction accurately predicted all but two states (Florida and North Carolina) correctly in the Presidential race.

In spite of the current expectation by many that both seats will be won by their respective Democratic contenders, ***the difference between a Democratically controlled Senate and a Republican controlled Senate may make very little substantive difference*** in the near term. If the Democrats control the Senate, we are likely to see a fiscal stimulus bill. If the Republicans control the Senate, we are likely to see a fiscal stimulus executive order.

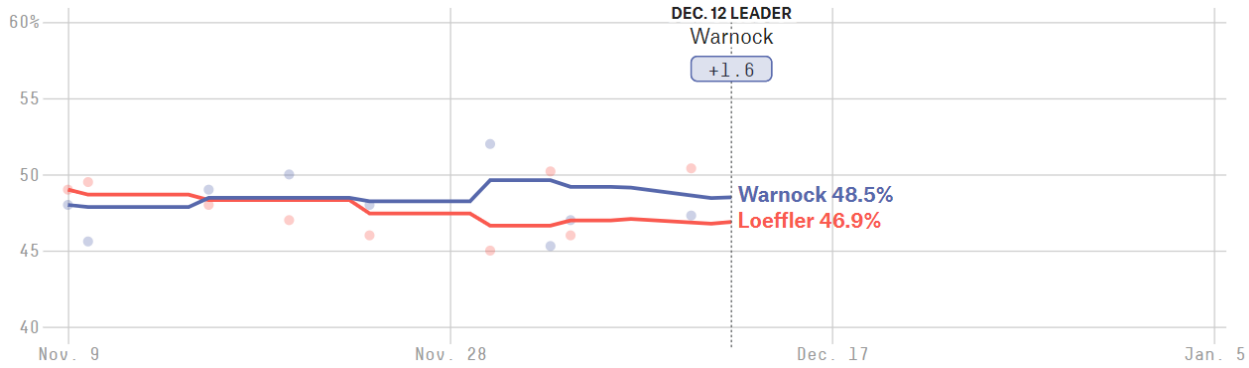
[13] See http://www.fivethirtyeight.com

Figure 28: Vote Projections for Georgia's Senate Runoff, Ossoff v Perdue (per fivethirtyeight.com)



Source: fivethirtyeight.com

Figure 29: Vote Projections for Georgia's Senate Runoff, Warnock v Loeffler (per fivethirtyeight.com)



Source: fivethirtyeight.com

What a Fiscal Stimulus Bill/Executive Order *Might* Include

Given the current state of affairs of the country, and given Biden's participation in the Obama administration, it does seem extremely likely that President-Elect Biden will deploy a stimulus package during the first few weeks that he is in office. His ability to execute a package of a given extent and with a specific timing will be affected by the factors that we have previously mentioned: if he can pass legislation quickly and with the pervasive support of Congress, this path would seem like an ideal one which would help solidify the perception of the administration working with Congress to help the people. If that path is not possible, or if it will require more time that Biden would like to get to a productive end, then he will be more likely to implement his program using an executive order. Regardless, given Biden's campaign platform, we expect this action to occur by mid-February 2021.

We can only guess regarding the exact elements of the Biden Fiscal stimulus package. However, there is evidence that it will include some generic 'buckets' of benefits. The American Recovery and Reinvestment Act (ARRA) and the CARES Act both included direct payments to households/tax payers,

expanded unemployment benefits, small business loans, and funds for healthcare providers. The CARES Act made money available for State and local governments and funds for emergency lending to larger businesses. The ARRA allocated funds for infrastructure (roads and bridges), alternative energy and research. (See "Biden Fiscal I" in Table 8.)

Because Biden's cabinet nominations are reminiscent of the Obama administration[14], and the Obama administration tackled the Great Recession in its first months in office, we believe the Biden administration's fiscal policy will look similar to the American Recovery and Reinvestment Act. Janet Yellen as the Secretary of Treasury is likely to take up policies similar to TARP[15], but with ***less focus on distressed housing assets and more focus on securing mortgage forbearance and eviction moratoriums***. ***Based on her past history, the policies will likely take a moderate approach[16], and aim to make banks and landlords as "whole" as possible with respect to commercial and residential property***.

Table 8: Comparison of ARRA, CARES, and Expected 2021 Fiscal Stimulus Packages

BENEFIT	ARRA (Obama Stimulus)	CARES (COVID-19)	BIDEN FISCAL I (late-Jan or early-Feb)	BIDEN FISCAL II (mid-2Q21?)
Direct Payments	$260B	$290B	X	X
Expanded Unemployment	Extension only	$260B	X	
Small Business Loans	$730B	$377B	X	
Health Care Providers	$128B	$127B	X	X
Infrastructure	$85B	$0		X
Alternative Energy	$22B	$0		X
Education	$109B	$0		X
Research	$18B	$0	X	X
State and Local Governments	$0	$150B	X	X
Emergency Lending	$0	$510B	X	

Source: https://www.thebalance.com/arra-details-3306299; Authors' predictions regarding Biden Fiscal Stimulus packages

If the Georgia special elections either split (one Democrat and one Republican) or lead to two Republican senators, then Biden will either have to compromise on the size and shape of the stimulus package or will have to write and Executive Order to create subsidies and other fiscal stimulus. Recall that Obama compromised[17] with Republican senators during ARRA negotiations by decreasing the size and scope of the bill, and adding tax breaks and other elements viewed as more favorable to Republican senators.

The one problem with the Executive Order route, however, is that the United States Constitution states (Article 1, Section 9, Clause 8)[18] that "No Money shall be drawn from the Treasury, but in Consequence of Appropriations made by Law." Former Presidents, including Obama and Trump, have signed

[14] See https://thehill.com/hilltv/rising/529663-matt-yglesias-says-biden-cabinet-picks-gives-extraordinary-level-of-look-back
[15] See https://www.history.com/topics/21st-century/troubled-asset-relief-program
[16] See https://www.cnn.com/2020/11/29/business/janet-yellen-treasury-wells-fargo/index.html
[17] See https://www.politico.com/story/2009/02/senate-passes-787-billion-stimulus-bill-018837
[18] See https://constitutioncenter.org/interactive-constitution/full-text

numerous executive orders which have appropriated funds. Legal experts support the idea that a President can issue an executive order for national security reasons and can re-allocate money that Congress has already allocated[19]. For example, Trump's executive order on building a border wall between the US and Mexico references national security and reallocates funds which Congress appointed for national defense and for the Pentagon[20]. Under this scenario, it might be possible that President Biden to issue an executive order to strengthen the economy using other national defense dollars or dollars allocated to FEMA or other agencies.

Taking a realistic position, it is unlikely that Biden will be able to secure enough stimulus funding to accomplish his goals with one round of stimulus. In fact, given the projections for deploying a vaccine for COVID, the timing of the stimulus is just as important as the amount of funding secured. Hence, we believe that a sizable amount of funding will need to be available during the period that the majority of Americans are being vaccinated, and industry is attempting to rebuild itself. This point is why we would suspect that a *second* round of stimulus will need to be secured for deployment during mid- to late-2Q2021. This second round may be able to be mitigated if, say, half (author's estimate) of the original $2.5T-$3T funding that Biden has proposed previously is still available during this vaccination period (late 2Q2021). Again, we refer the reader to "Biden Fiscal II" in Table 8 to consider what purposes should likely be addressed by funding during this period as part of the President-Elect's plan.

[19] See https://www.usatoday.com/story/news/factcheck/2020/08/21/fact-check-presidential-spending-through-executive-order-allowed/5582667002/

[20] See https://www.npr.org/2020/02/13/805796618/trump-administration-diverts-3-8-billion-in-pentagon-funding-to-border-wall

Disruptive ("Black Swan") Events

The past five years have seen several unusual events that had a substantial impact on the national and/or global events that warrant mentioning. We mention them from the perspective of considering whether any of these types of events could occur again in the near future, and planning for their potential impact on the economy and or business operations would seem prudent.

1. Biological Events: The world has seen a number of new "Influenza-Like Illnesses" (ILI), with the latest now directly affecting virtually every country on the global in a crippling fashion.

   A. SARS (2002 & 2004)
   B. "Swine flu" (H1N1, 2009)
   C. "Avian flu" (H5N1 in 1997; H7N9 in 2013; H5N6 in 2014; H5N8 in 2016)
   D. COVID-19 (2019-2020)

   While questions during the handling of the COVID-19 emergency have shone a light on the globe's ability to address a new pathogen under pressure, any answer is still a function of the contagiousness of the pathogen. Depending on how quickly a new pathogen spreads, along with its incubation period and symptoms, could mean the difference between survival and massive devastation.

2. Disinformation Campaigns: A staple of international conflicts (both military and otherwise), organized campaigns based on disinformation or propaganda have been around for hundreds of years. Most recently, the US has made allegations against foreign governments that there has been interference in federal elections (and caused social unrest) by using freely available social networks[21]. It is expected that the same types of propaganda that was made noteworthy in 2016 will continue to be seen in future elections at all levels of government.

3. Disruptive Malware and Ransomware: Malware has been an issue for computers for decades, dating back to the initial hypothesized versions of "worms" in US universities of the 1960s and 1970s (as "thought exercises"). More recently, however, sophisticated attacks on businesses has (literally) become a business for some entities, foreign and domestic. "Ransomware" is the latest version of malware that "… [locks and encrypts] a victim's computer or device data, then demand a ransom to restore access."[22] There is currently 1 attack every 11 seconds (during 2020 according to the FBI), with an average cost of about $4M per breach globally (as of YE 2019)[23]. And, just to add an interesting twist, ransomware is now even offered as a *service* in which a criminal may sell a *license* to a (software) ransomware variant to another criminal, who will then infect a system and demand a fee for the decryption key. As our society becomes more dependent on automated systems, disruptions to those systems will have an increasing impact on us.

4. Societal Unrest, including Domestic Social Changes and Terrorism: The events of 9/11 resoundingly affected market activity for years following the attacks on the US. More recently, the social justice movements that have, in some cases, turned violent, have significantly affected

[21] See https://www.nytimes.com/2020/09/01/technology/facebook-russia-disinformation-election.html
[22] See https://us.norton.com/internetsecurity-malware-ransomware-5-dos-and-donts.html
[23] See https://security.berkeley.edu/faq/ransomware/ and https://securityintelligence.com/articles/6-ransomware-trends-2020/

communities (e.g., Portland, OR and Minneapolis, MN) and caused leaders to reconsider the frameworks on which their cities are based. Without warning, these movements have caused rapid and unexpected upheavals in social climates, and upended assumptions on which financial decisions were made. Similarly, with the election of Mr. Biden over President Trump, reports of right-wing violence (whether true or otherwise) have emerged, and led to questions of how deep-seated is the disdain in the country on both sides of the political fence.[24]

5. Unanticipated Changes in Leadership: President-Elect Biden is currently 78 years old, and it is entirely possible that a transition of leadership from him to (assumably) Vice President-Elect Harris may be necessary before the next election in 2024. It is not clear at this time what differences in policy may come to light between Mr. Biden and Ms. Harris if such a transition were to occur, or how effective Ms. Harris may be at leading domestically or internationally. It has been reported that Ms. Harris is a strong advocate of diversity[25] and wage protection[26], but we are most concerned about how she will be perceived on the international stage in negotiations with, e.g., Saudi Arabia (particularly if she inherits Mr. Biden's baggage)[27], countries in the Far East (given cultural differences), and Iran (given the recent assassination of the head of their nuclear program)[28].

[24] See https://www.npr.org/2020/11/05/931829801/election-dispute-increases-risk-of-political-violence-analysts-warn , https://www.independent.co.uk/news/world/americas/us-election-2020/election-results-2020-riots-trump-biden-b1700559.html , and https://www.brookings.edu/blog/fixgov/2020/10/27/why-the-risk-of-election-violence-is-high/

[25] See, e.g., https://www.huffpost.com/entry/kamala-harris-vice-president-nominee-dnc_n_5f36f56bc5b69fa9e2fb7862

[26] See, e.g., https://www.shrm.org/resourcesandtools/hr-topics/benefits/pages/where-kamala-harris-stands-on-workers-pay-and-benefits.aspx

[27] See https://www.middleeasteye.net/news/kamala-harris-joe-biden-vice-president-saudi-israel

[28] See https://www.usatoday.com/story/news/politics/elections/2020/08/26/kamala-harris-vows-support-israel-protection-against-iran/5638966002/

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[29]:

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)

[29] 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 174 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**[30]
6-month Treasury yield		3-year Treasury yield*
Prime rate		3-month Treasury yield
1-month Treasury yield	**… depends on …**	1-year Treasury yield
3-year Treasury yield		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*

[30] 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		6-month 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.

Further, based on the Fed's comments that "… they expect to keep rates near zero at least through next year, and 13 projected rates would stay there through 2023 …"[31], we are modifying our quantitative forecasts so as to maintain T-bill yields and other key indicators at or close to their current rates through 4Q2023, before gradual realistic adjustments. We caution that the previous statement is a matter of policy, and not of law, and may not be in fact what occurs; in other words, ***it is possible for interest rates to rise prior to 2024 based on market conditions, and the opinions of the members of the FOMC*.**

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

Analysis

Our analysis showed that US' real GDP decreased (Q/Q) by (annualized) 1.26% during 1Q2020, then decreased (Q/Q) by almost 9.0% during 2Q2020, and subsequently rebounded by 7.4% during 3Q2020. While our quantitative algorithm shows decreasing improvement, we do believe that GDP will be on par to slightly improved during 4Q (our algorithms predict +/-6% increase Q/Q). While 4Q is typically a strong quarter on which many organizations' balance sheets depend, early reports are that "brick and mortar" retail outlets have not had strong sales thusfar, while e-commerce sales have been very strong. We feel that GDP will show slight gains to slight losses until a medical treatment for the COVID-19 virus is able to be widely distributed.

The path that the US takes until business conditions are able to be effectively restored will be the key to estimating future GDP, and there are several potential turning points that can be anticipated. First and most significantly, the availability of a treatment for COVID will be a key hurdle to bringing the economy back to its maximum effectiveness. We have previously estimated that a vaccine/treatment will be publicly available during 1H2021, with widespread distribution in 2H2021; three sources of a vaccine have shown very strong promise or been approved for widespread use to date, with one type of treatment now being actively distributed.[32] Unfortunately, two of the three treatments require

[31] See https://www.wsj.com/articles/fed-signals-interest-rates-to-stay-near-zero-through-2023-11600279214
[32] See https://www.nytimes.com/interactive/2020/science/coronavirus-vaccine-tracker.html and https://www.nytimes.com/2020/09/17/health/covid-vaccine-when-available.html

extraordinary refrigeration in order to maintain viability, and many questions about manufacturability and distribution for all three treatments still exist.

Given that the Presidential election has now been decided, and we can now plan for Mr. Biden to take office in January, the uncertainties of the past several months can be dispensed with. Former Vice President Biden has proposed a stimulus package totaling around $7T which will be dispensed over as much as the next ten years.

Ordinarily, GDP is driven by several factors:

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

The current COVID emergency is expected to continue significantly hampering domestic output in the near term, starting with international travel, imports & exports, and related industries, which affect the pricing of products & services that can be offered for sale; specifically, we have already also seen dozens of producers bankrupted by the current pandemic[33] (many of which received funds under the PPP program in early 2020, leading to likely losses by the SBA[34]). We have previously discussed unemployment filings[35], and recent personal consumption[36], savings[37], and retail sales figures[38].

Our conclusion is that, while ***government spending will increase*** based on a stimulus plan that should occur prior to the end of 1Q2021, we expect ***personal consumption to hold steady or slightly decline Q/Q (in lieu of savings)***. Further, if weak sales figures continue during Q4, we anticipate bankruptcy filings to continue at a record pace, resulting in additional unemployment during 2021[39].

Finally, we expect ***net trade to 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 through 2023). Given this mixture of factors, we still expect that ***inflation will be essentially neutral, rising at a rate of no more than 0.5% (Q/Q),*** and the ***real and nominal GDP growth rates will be between 1.0% and -2.0% (Q/Q) for the rest of 2020***. Disposable income spiked around 9% for 2Q2020 due to white collar workers staying home for the summer; employers will gradually adjust salaries to adapt to the new working conditions, but these cultural changes will affect automobile and housing purchase choices, along with tax revenue and deployment strategies in smaller and mid-sized cities. At this point, we believe that ***inflation will likely be low (but slowly increasing) through 1H2021 (possibly as high as 1.0% annualized),*** but ***we are concerned about the potential for inflation to rise suddenly through 2022***, with the Federal Funds rate remaining tightly bridled.

[33] See https://www.businessinsider.com/retailers-filed-bankruptcy-liquidation-closing-stores-2020-2
[34] See https://www.stinson.com/newsroom-news-Tom-Salerno-Quoted-in-the-Wall-Street-Journal-on-Bankruptcy-after-PPP-Loans, and https://seekingalpha.com/news/3637171-hundreds-of-ppp-loan-recipients-filed-for-bankruptcy-wsj
[35] See https://www.nytimes.com/2020/12/10/business/economy/unemployment-claims.html
[36] See https://www.brookings.edu/blog/future-development/2020/12/14/the-decline-and-recovery-of-consumer-spending-in-the-us/
[37] See https://www.kansascityfed.org/publications/research/eb/articles/2020/why-are-americans-saving-so-much-income
[38] See https://www.kiplinger.com/economic-forecasts/retail-sales
[39] See https://www.wsj.com/articles/bankruptcy-guru-predicts-second-wave-of-corporate-defaults-11607644460

Other Commentary

- "Expect inflation to rise 2.1% in 2021 as the pandemic recedes. Inflation will end 2020 at 1.2%, far below 2019's 2.3%, but as the pandemic ends, some prices that had been depressed will start to reassert themselves, such as apartment rents, air fares and hotel rates.." (see https://www.kiplinger.com/article/business/T019-C000-S010-inflation-rate-forecast.html; Dec. 10, 2020)
- "GDP growth in the upcoming first quarter of 2021 is likely to slow significantly. Any fiscal stimulus deal in Congress will not be in time to impact the first quarter much, and the beneficial effects of vaccines on the economy are likely to be felt mostly in the second half of the year." (see https://www.kiplinger.com/article/business/t019-c000-s010-gdp-growth-rate-and-forecast.html; Nov. 25, 2020)
- " … we asked [thirty macro-economists] when GDP would return to pre-pandemic levels. … the economists thought that there was a 67 percent chance that we wouldn't be back to [the level of YE2019] until the first half of 2022 at the earliest" (see https://fivethirtyeight.com/features/the-economy-wont-be-back-to-normal-until-2022-or-later-according-to-our-survey-of-economists/; Oct. 19, 2020)

Unemployment Rate

Analysis

In our previous reports, we compared the COVID pandemic to Hurricane Katrina, and we estimated that unemployment would settle above 15%, and possibly as high as 35% by YE2021. The Congressional Budget Office agreed, stating that unemployment would peak as high as 14%, and then gradually decline to 4.5% by 2028[40].

We believe that the tenuousness of the economy for the next 12-18 months will result in industry taking an extremely conservative position, driving efficiencies (i.e., downsizing employment counts, and investing in prioritized fixed-cost automations) wherever possible in an effort to preserve cash. Smaller businesses have been decimated over the past six months, and will continue to walk a fine line in an effort to find its footing.

For retail, in particular, ***the upcoming 4Q period to be critical to the survival of these businesses, and we are extremely concerned about recent reports that consumer spending will not be adequate to support many "brick-and-morter" retailers***. The traditional model of making between 30% and 50% of annual revenues during 4Q will be extremely difficult to realize with end consumers not spending, and not being motivated to have a memorable holiday season. Additionally, depending on the amount of savings that these businesses have accumulated, and their projected revenue (which may be a function of their ability to meet buyers where their products are desired, and in an acceptable manner), investors

[40] See https://www.cbo.gov/publication/56442

may determine that reorganizing the company via bankruptcy, or simply exiting the market, is the wisest move. These decisions will be what drives high-level unemployment numbers nationwide[41,42].

Finally, several sectors will find themselves "re-inventing" how they meet customers. For example, the food service/restaurant businesses, bar, casino, and other social venues will need to continue to quickly try new ways to approach and serve consumers, or face dire circumstances[43]. The alternatives for these industries are bleak[44].

Other Commentary

- "The unemployment rate continued to decline, to 6.7%. However, that improvement was an illusion, as a number of the workers who lost their jobs simply dropped out of the labor force instead of continuing to look for work, and thus are no longer counted as unemployed when calculating the jobless rate. Also, the number of part-time workers dropped, another worrisome sign for the labor market." (per https://www.kiplinger.com/article/business/t019-c000-s010-unemployment-rate-forecast.html, Dec. 7, 2020)
- "The U.S. unemployment rate is expected to stay above its pre-pandemic levels through the end of 2030, according to a 10-year economic report released Thursday by the Congressional Budget Office." (per https://www.washingtonpost.com/business/2020/07/02/cbo-economic-outlook/, Jul. 2, 2020)

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

Analysis

The Federal Reserve and the FOMC have announced that they will no longer simply manage the economy towards a short-term goal of 2% inflation and 3% unemployment, but will now try to take a "longer term" view towards these objectives. This new goal means that inflation, unemployment, and other metrics will be consciously allowed to deviate from their targets in the "short term" in order to potentially allow other objectives to be achieved, and the current strategy of purchasing equities and "quantitative easing" is expected to be continued for the foreseeable future[45]; the net result of this strategy is (hopefully) that confidence in the economy is maintained, and a chain reaction of defaults (which could spiral out of control) can be avoided. Similarly, limiting the maximum yields that may be

[41] See https://www.businessinsider.com/stores-closing-in-2020-list-2020-1 and https://www.businessinsider.com/retailers-filed-bankruptcy-liquidation-closing-stores-2020-2
[42] See https://fivethirtyeight.com/features/the-economy-wont-be-back-to-normal-until-2022-or-later-according-to-our-survey-of-economists/
[43] See https://www.prnewswire.com/news-releases/100-000-restaurants-closed-six-months-into-pandemic-301130280.html
[44] See https://markets.businessinsider.com/news/stocks/yelp-business-closures-permanent-covid-report-2020-9-1029598577, and, e.g., https://www.theverge.com/2020/10/3/21500538/regal-cineworld-theaters-shut-down-james-bond-us-uk
[45] See https://www.politico.com/news/2020/06/15/fed-to-start-buying-debt-from-corporations-in-expansion-of-rescue-effort-320772

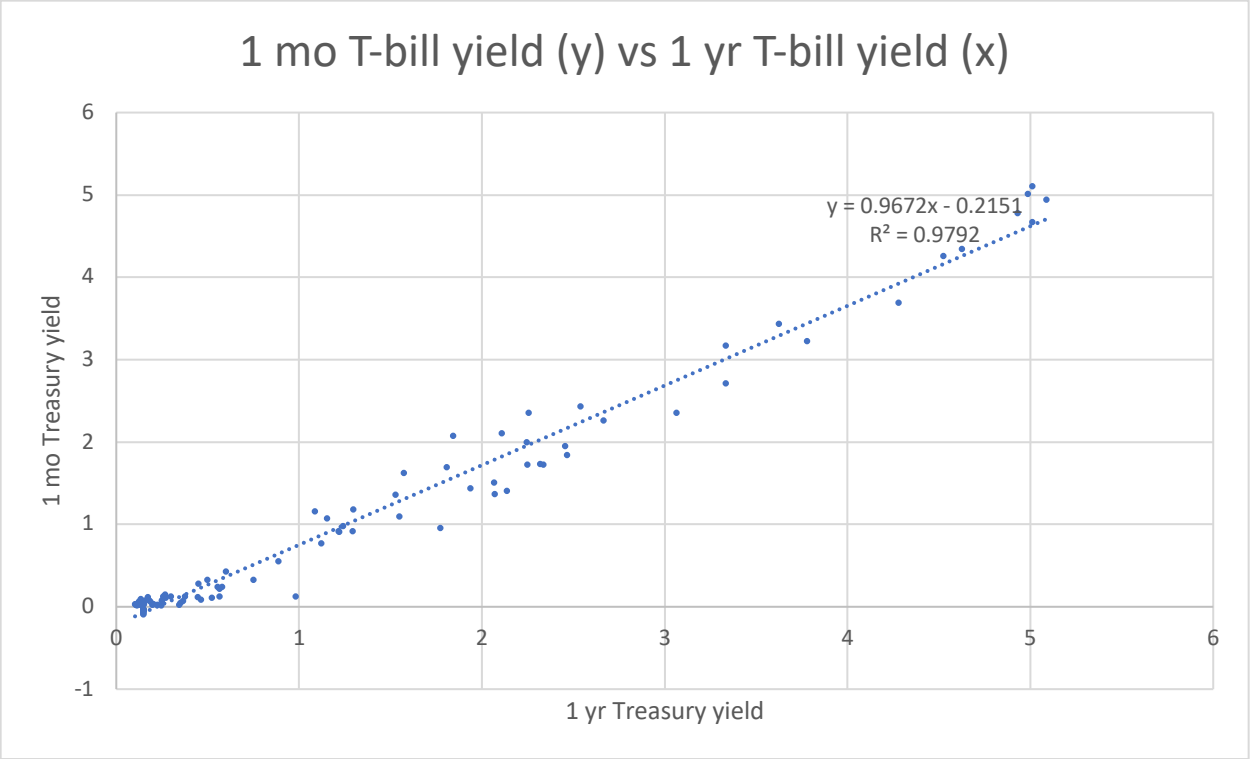
demanded by the market for US Treasuries in order to control inflation, debt and returns is noted as being a potentially dangerous side effect[46].

We have previously discussed that we believe ***inflation will remain essentially flat through 2020, and could potentially rise to 3.0% (annualized) during 2021***. We are assuming that ***the Federal Funds Rate will stay below 0.5% through 2023,*** and will only grow slowly several years after the end of the crisis, once investor confidence returns. Further, based on President-Elect 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. While he would likely prefer to negotiate a supportable piece of legislation to provide a stimulus package to the US population, ***we expect Biden to expedite a $2T-$3T stimulus package through an executive order during his first month in office***. As a result, yields of most instruments will remain flat for the next 24-36 months, and only recover very slowly; longer duration maturities will recover sooner and more quickly than shorter duration maturities.

Other Commentary

- "The news of Pfizer's positive coronavirus vaccine results will boost service businesses and the economy, if and when the vaccine helps get the pandemic under control. But better economic prospects will cause interest rates to rise. As a result, the 10-year Treasury note's rate will likely rise above 1% before the end of the year. If the vaccines from Pfizer and others are effective in practice, the 10-year rate will likely rise at least another half of a percentage point in 2021. However, if Congress fails to pass another stimulus package, then rates will likely tick down temporarily." (see https://www.kiplinger.com/economic-forecasts/interest-rates; Nov. 10, 2020)

[46] See https://www.marketwatch.com/story/the-fed-has-been-buying-etfs-what-does-it-mean-11600704182



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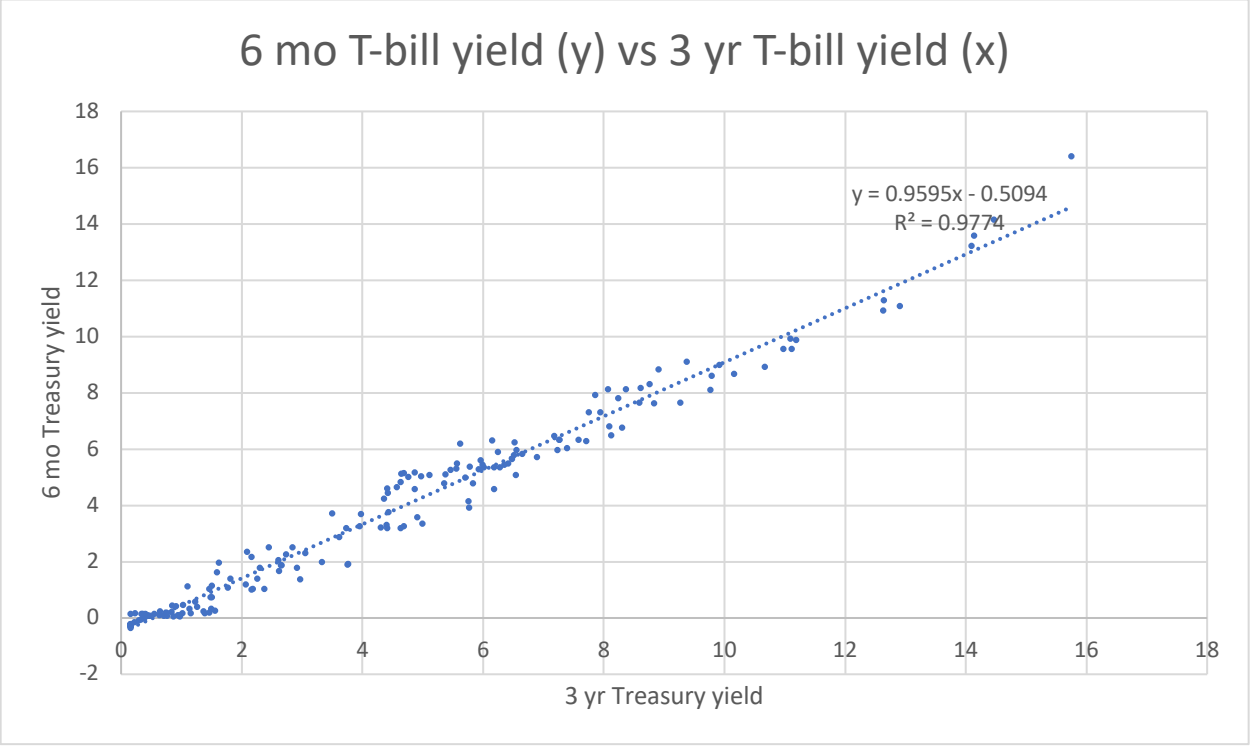

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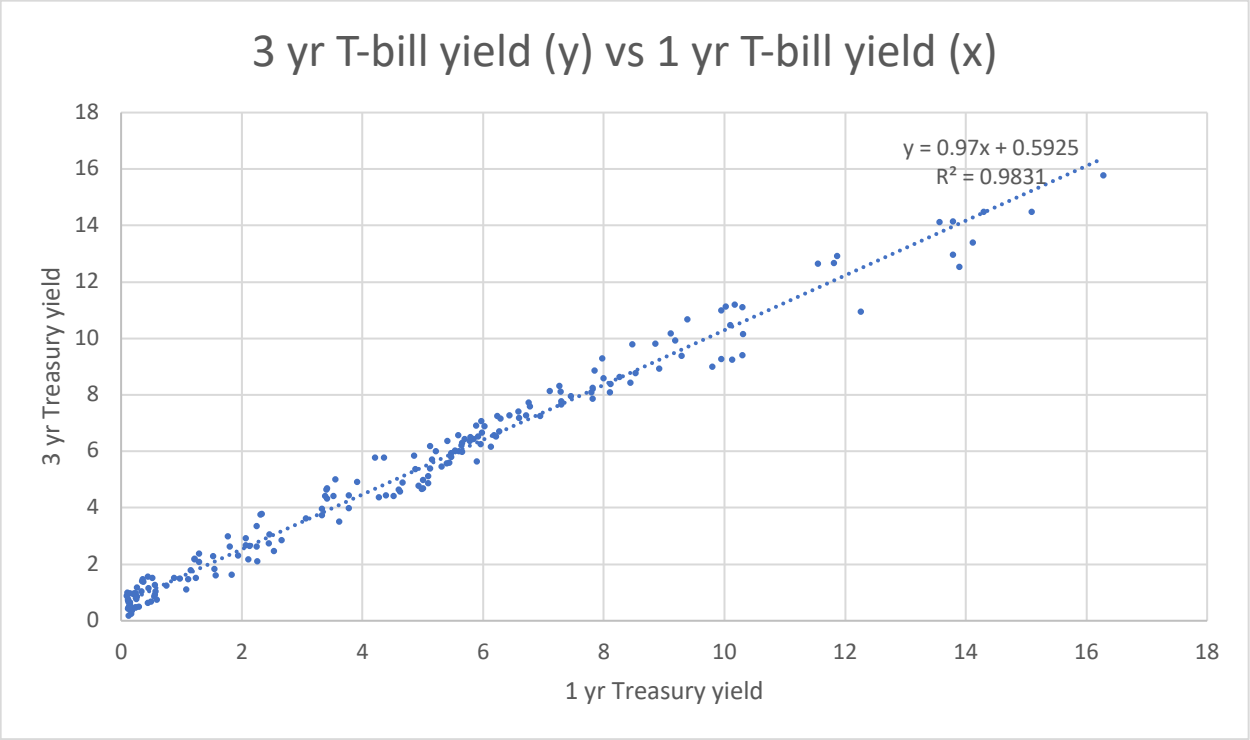

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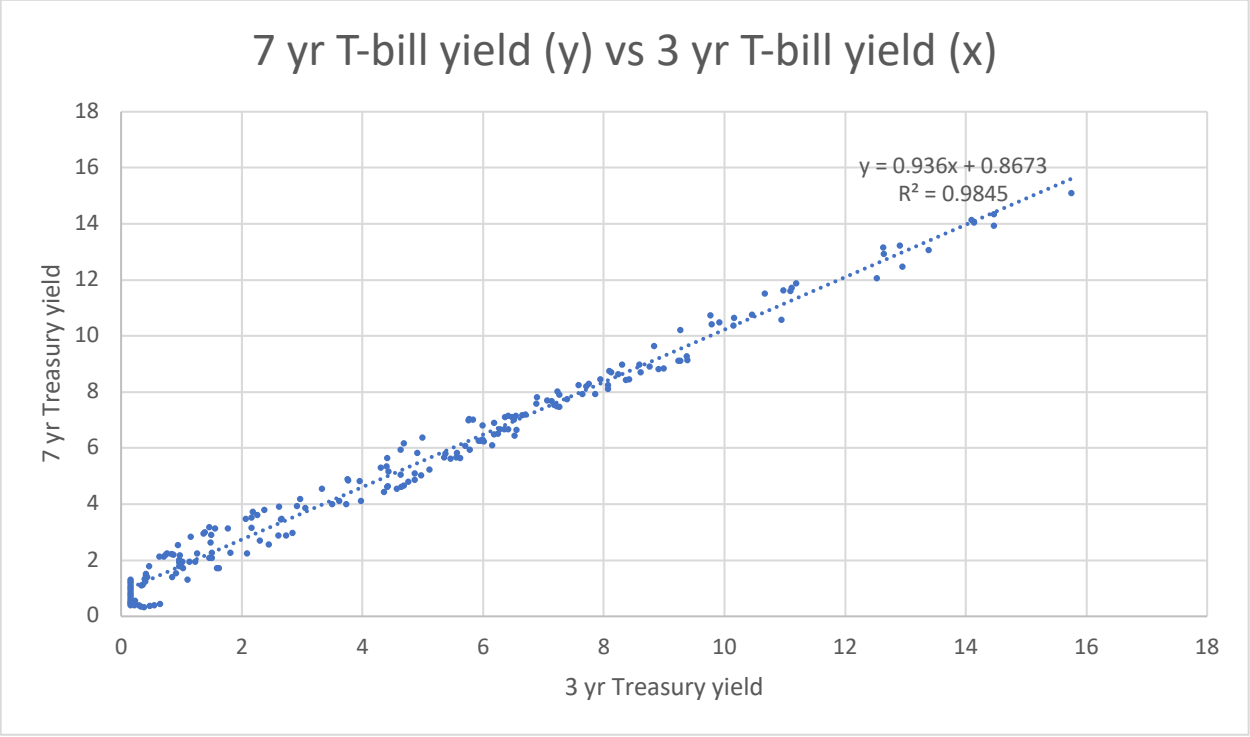

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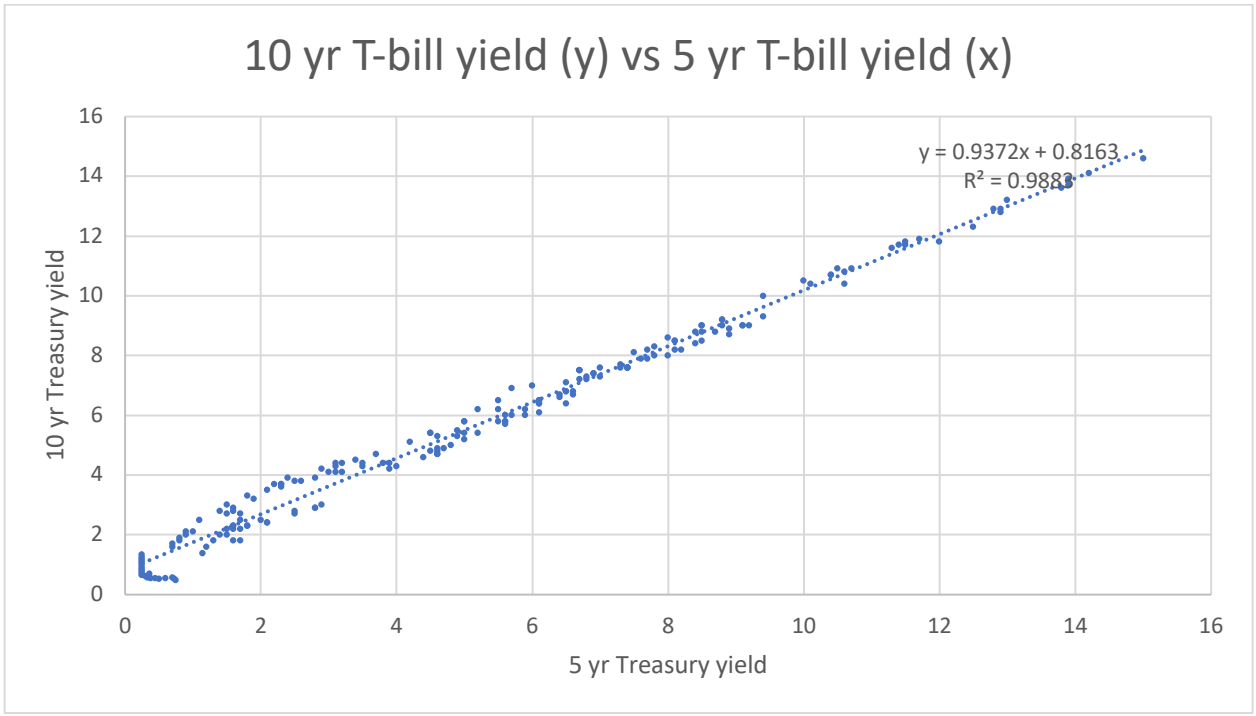

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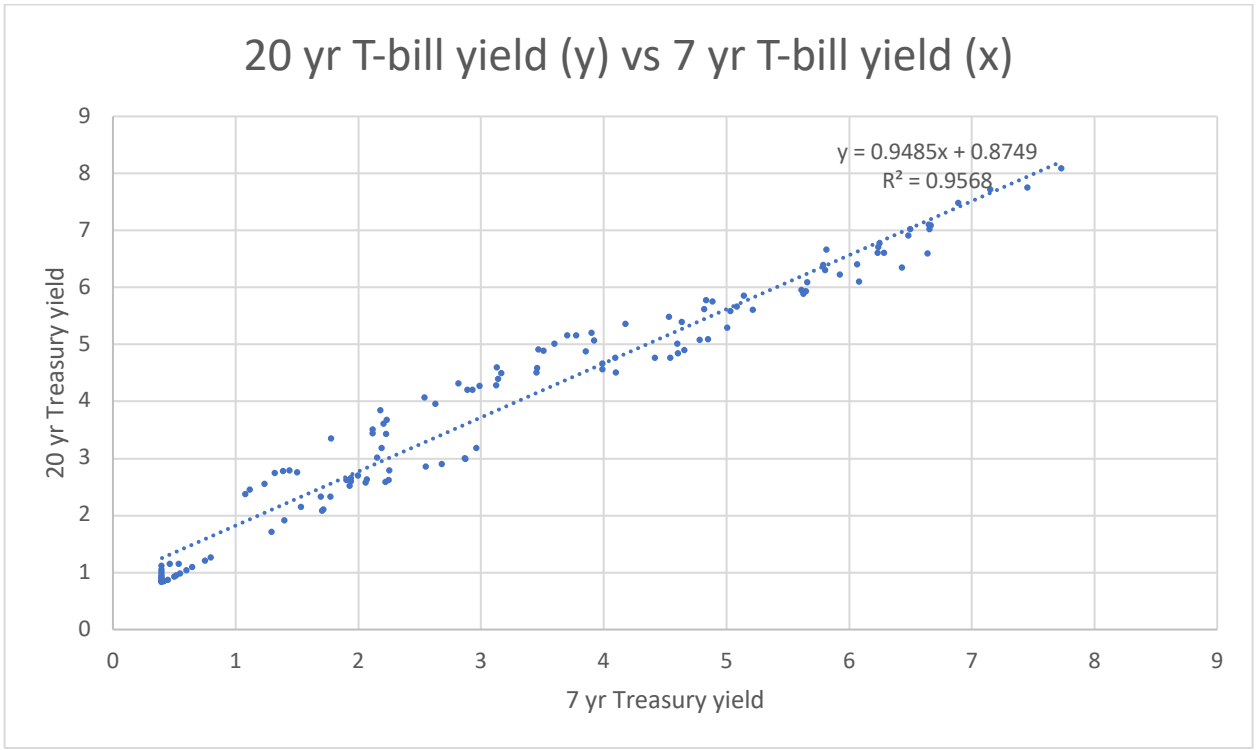

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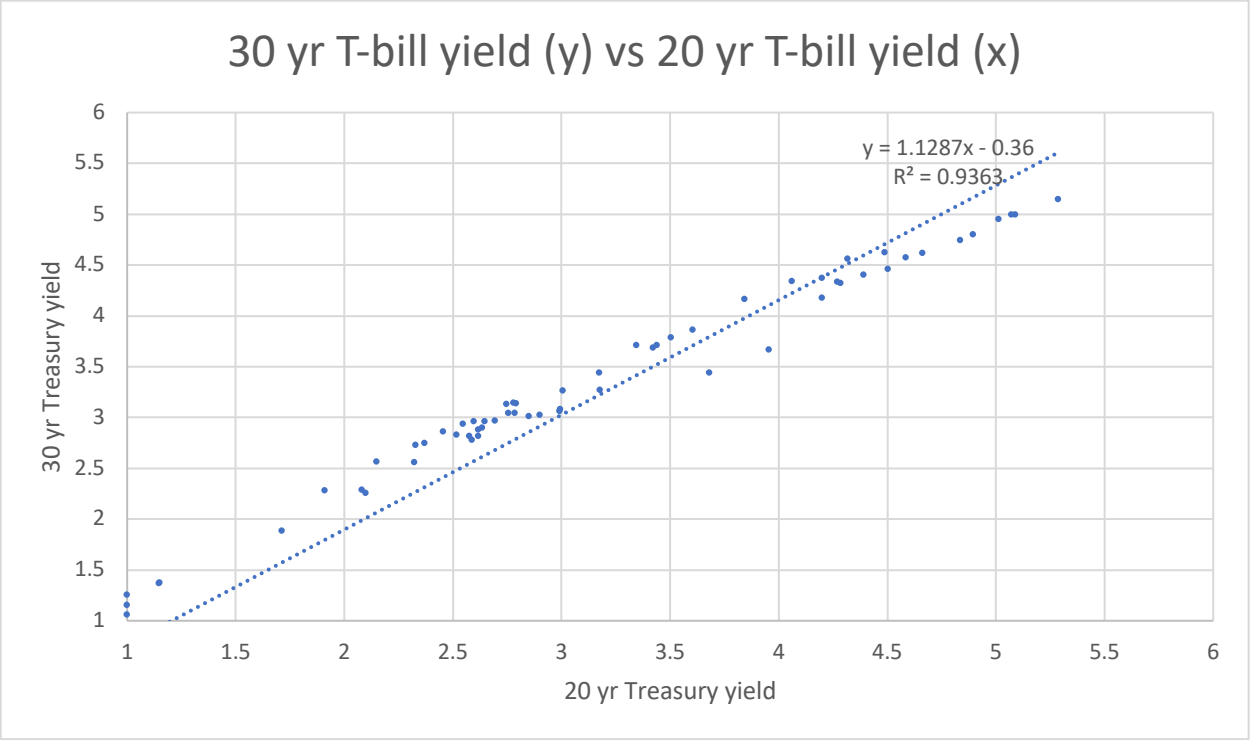


Source: Author's calculation

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. As of this writing, though, rates have continued to drop to as low as 2.5%-3.2%. That demand has been curbed only by the credit requirements imposed by banks, and the 0.5% fee on refinancing's that has been imposed by the FHFA (as of Dec 2020).

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 remain as low as 2.5% (with 2.8% to 3.0% being much more prevalent) during 2021 and 2022*** before they rebound. (Notice that Freddie Mac's surveyed 30-year mortgage rate is at its lowest level since 1971 at 2.71% as of December 3, 2020[47].) When rates do start to recover, we expect them to recover extremely slowly, much as was seen in 2014.

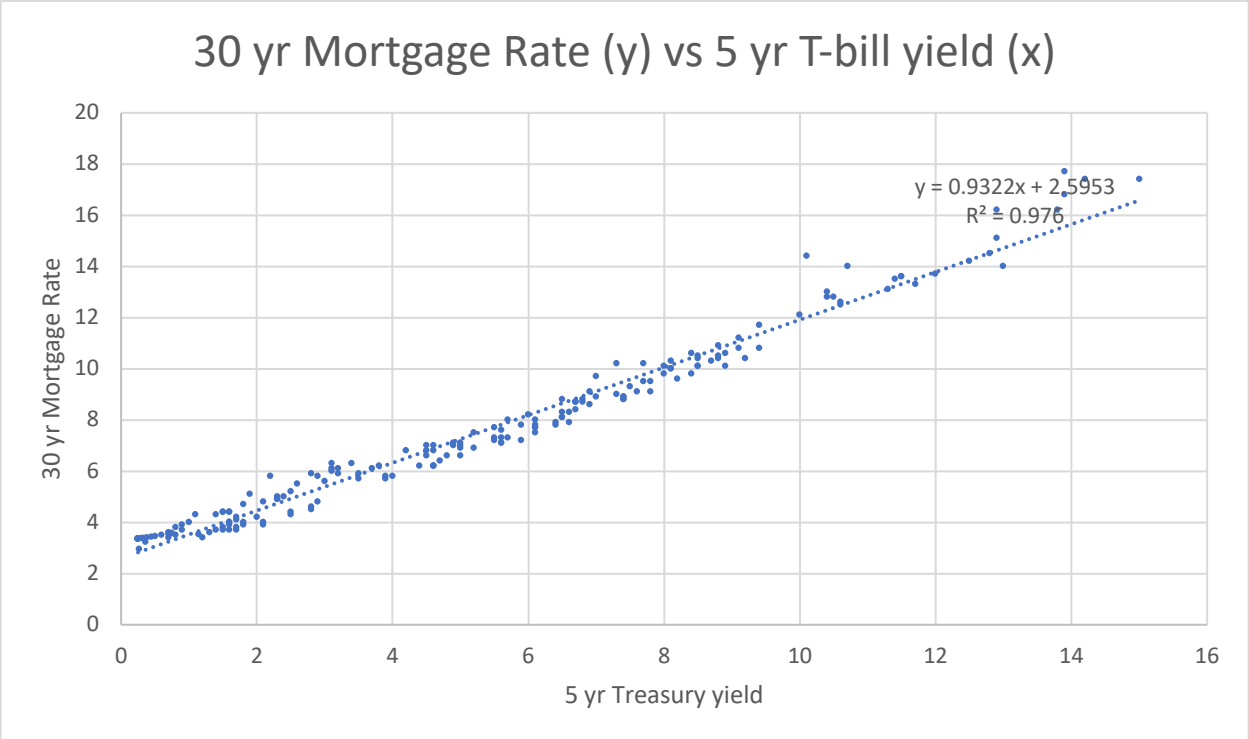
Additionally, we expect that entrepreneurial lenders to become more of a competitive force for traditionally regulated banks, and for their lower-cost offerings to become more commonplace in the coming years[48]. Zillow, Fiserv, and others are offering competitive options that are becoming more mainstream; these companies are using technology to generate efficiencies originating and servicing

[47] See http://www.freddiemac.com/pmms/docs/historicalweeklydata.xls as of Dec. 15, 2020.
[48] See https://djangostars.com/blog/lending-fintech-startups/ and https://www.investopedia.com/investing/fintech-real-estate/

loans which are either backed by debt and/or equity offerings, or by non-FHFA backed banks. By providing this service, another set of CMOs (or similar instruments) can be offered to the market for investment, but they also are providing an alternative to FHFA, FNMA, etc. quasi-government entities. With the conservatorship of Fannie Mae and Freddie Mac approaching a decision point in 2024, these types of commercial alternatives will place some interesting pressure on the FHFA entities[49].

Other Commentary

- "Mortgage rates remain at record lows, resisting their typical correlation to Treasury yields, which have recently been moving higher. Mortgage spreads … are declining from their elevated levels earlier this year. Although today's mortgage spread is about 1.8 percentage points and still has some room to move down if the 10-year Treasury continues to rise, it's encouraging to see that the spread is almost back to normal levels." (see http://www.freddiemac.com/pmms/; as of Dec. 15, 2020)
- "Mortgage interest rates have likely hit their low point and will edge slightly upward from now on. [In early November], the 30-year fixed rate hit its lowest point since the Freddie Mac rates survey began in 1971 — 2.78% (the 15-year rate was 2.32%). The rise in the 10-year Treasury rate means that the gap between it and mortgage rates is close to the historical norm." (see https://www.kiplinger.com/economic-forecasts/interest-rates; Nov. 10, 2020)



Source: Author's calculation

[49] See https://www.americanbanker.com/news/fannie-and-freddie-will-likely-exit-conservatorship-by-2024-calabria-says

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.

Through the coronavirus pandemic, the markets have seen significant amounts of debt downgraded due to the risk associated with the new operating environment; Ford[50], Kraft-Heinz[51], and Occidental Petroleum[52] are three examples of "fallen angels" that have been downgraded due to COVID-19. Unfortunately, we still 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 ***substantial downgrading of corporate debt to/below "junk" status, and many more companies will be pulled into bankruptcy in the coming months***. This change in the landscape will affect otherwise highly rated bonds as markets potentially start to dry. While dozens of significant corporations have defaulted on payments and/or declared bankruptcy, now that the pandemic is considered to be approaching its final phases, those companies that have conserved capital will now be focused on re-strengthening their businesses – through acquisitions, refinancing, investment, and any other technique possible.[53]

Capitalytics' 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. Given the effects of the currently projected freeze on rates through 2023, though, ***we now see AAA rates dropping to 2.15% by YE2023, and bottoming at 2.12% by mid-2025***. Moody's ***BAA investments will yield an additional 1.5%-1.75%*** through this period (with BofA BBB bonds accruing 50-70 bp less than BBB).

Finally, at this point, there are very few sectors of the US Economy that are "stable". We have commented previously on the impact of the pandemic on 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. Over the past six months, many have started to accept the changes in the real estate landscape, specifically that many

[50] See https://www.fool.com/investing/2020/04/09/ford-shares-surge-after-the-fed-backstops-new-debt.aspx and https://www.barrons.com/articles/the-fed-is-buying-more-auto-makers-bonds-than-wall-street-expected-51593446342
[51] See https://www.cnbc.com/2020/05/05/the-market-is-getting-excited-as-the-fed-prepares-to-buy-corporate-bonds.html
[52] Per https://www.forbes.com/sites/nathanvardi/2020/03/23/the-federal-reserve-moves-to-buy-corporate-debt/#787dcb044c47
[53] See https://www.ft.com/content/d38821fe-0b52-4bb8-a3c9-a01804cff9dd

professional organizations are expected to maintain a much higher number of partially or fully remote employees in the future (e.g., Morgan Stanley[54], Google[55], and Nationwide Insurance[56])[57] as a cost-management measure. This point will likely fuel the residential real estate (and home improvement) industry for the near future as buyers look to add home offices, etc.

This market instability, along with the Presidential administration, has fueled the VIX during 2020; however, per the previous comment about the population becoming more comfortable with "the new normal", along with the change in WH occupancy in the coming weeks appears to have helped settle the VIX. While the VIX has spiked as high as 80 with the start of the pandemic, it is currently resting in the mid-20s, and expected to stay there for the near term. ***The next most likely milestone that will assuage the market's volatility is confidence in a distribution strategy for the majority of the population.*** On the other hand, any weaknesses of the currently lauded vaccines (or the emergence of a new biological threat) could cause a dramatic reversal in the VIX and other indices.

Other Commentary

- "There have been 610 bankruptcies this year through Dec. 13, exceeding the number of filings seen in any year since 2012. The 18 new filings match the number of bankruptcies reported during the prior two-week period ... [this] analysis is limited to public companies or private companies with public debt where either assets or liabilities at the time of the bankruptcy filing are at least $2 million. Private companies without public debt must report at least $10 million in either assets or liabilities at the time of filing." (per https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/us-bankruptcies-surpass-600-in-2020-as-coronavirus-era-filings-keep-climbing-61734090; Dec. 15, 2020)

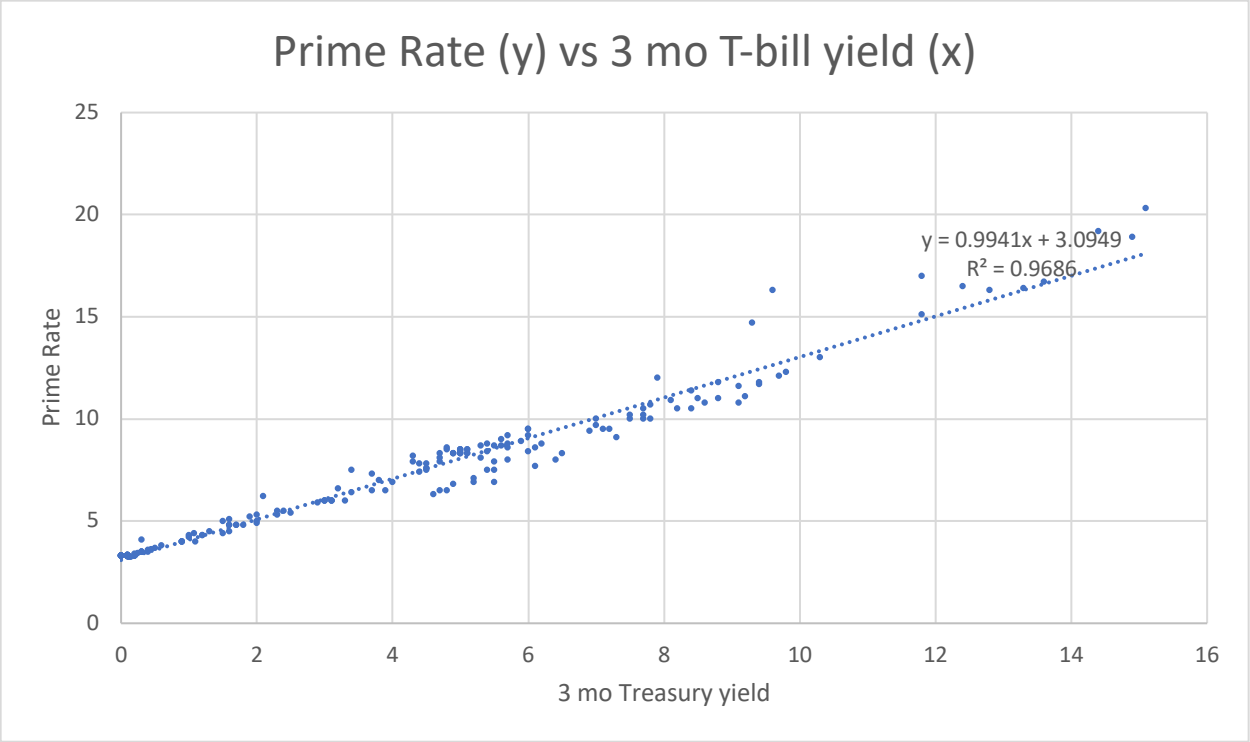
Prime Rate

Analysis

The Prime Rate has historically been very tightly coupled to very short-term Treasury Bills (specifically, 3-month yields). Capitalytics' models anticipate that trend continuing, and the Prime Rate remaining very close its current level of 3.25% for the foreseeable future (through 2024). However, given the Fed's stance regarding rates, ***we feel that it is possible that the Prime Rate could drop to as low as 3.0% by 2024***.

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

[54] See https://www.morganstanley.com/about-us-2020ams/pdf/2020_Letter_to_Shareholders.pdf
[55] See https://www.cnbc.com/2020/12/14/google-ceo-email-delays-return-to-sept-2021-no-permanent-remote-work.html
[56] See https://radio.wosu.org/post/nationwide-moves-smaller-regional-offices-permanent-remote-work#stream/0
[57] See https://globalworkplaceanalytics.com/work-at-home-after-covid-19-our-forecast



Source: Author's calculation

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 (for pleasure and commuting) has been impacted.

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.[58] In line with that forecast, EIA anticipated Brent crude to be approximately $41/barrel during 2H2020 and to reach $47/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**[59].

[58] See https://newsroom.aaa.com/2020/06/aaa-forecasts-americans-will-take-700-million-trips-this-summer/
[59] See https://www.eia.gov/outlooks/steo/report/prices.php, as of July 7, 2020

Other Commentary

- "The national average price of regular unleaded, now $2.16 per gallon, is 50 cents lower than it was at this time last year … We look for gas prices to creep a bit higher as 2021 arrives, but they should remain low compared with the prepandemic levels." (see https://www.kiplinger.com/economic-forecasts/energy; Dec. 14, 2020)
- "EIA estimates that the world consumed 95.6 million b/d of petroleum and liquid fuels in November, which is down 6.3 million b/d from November 2019 but up from the third-quarter 2020 average of 93.5 million b/d. EIA forecasts that global consumption of petroleum and liquid fuels will average 92.4 million b/d for all of 2020, which is down by 8.8 million b/d from 2019, before increasing by 5.8 million b/d in 2021." (Ibid.)
- "Brent crude oil spot prices averaged $43 per barrel (b) in November, up $3/b from the average in October. Brent prices increased in November in part because of news about the viability of multiple COVID-19 vaccines, along with market expectations that the Organization of the Petroleum Exporting Countries (OPEC) and partner countries (OPEC+) would delay or limit production increases planned for January 2021." (per https://www.eia.gov/outlooks/steo/; Dec. 8, 2020)

Federal Funds (Primary Credit) Rate

Analysis

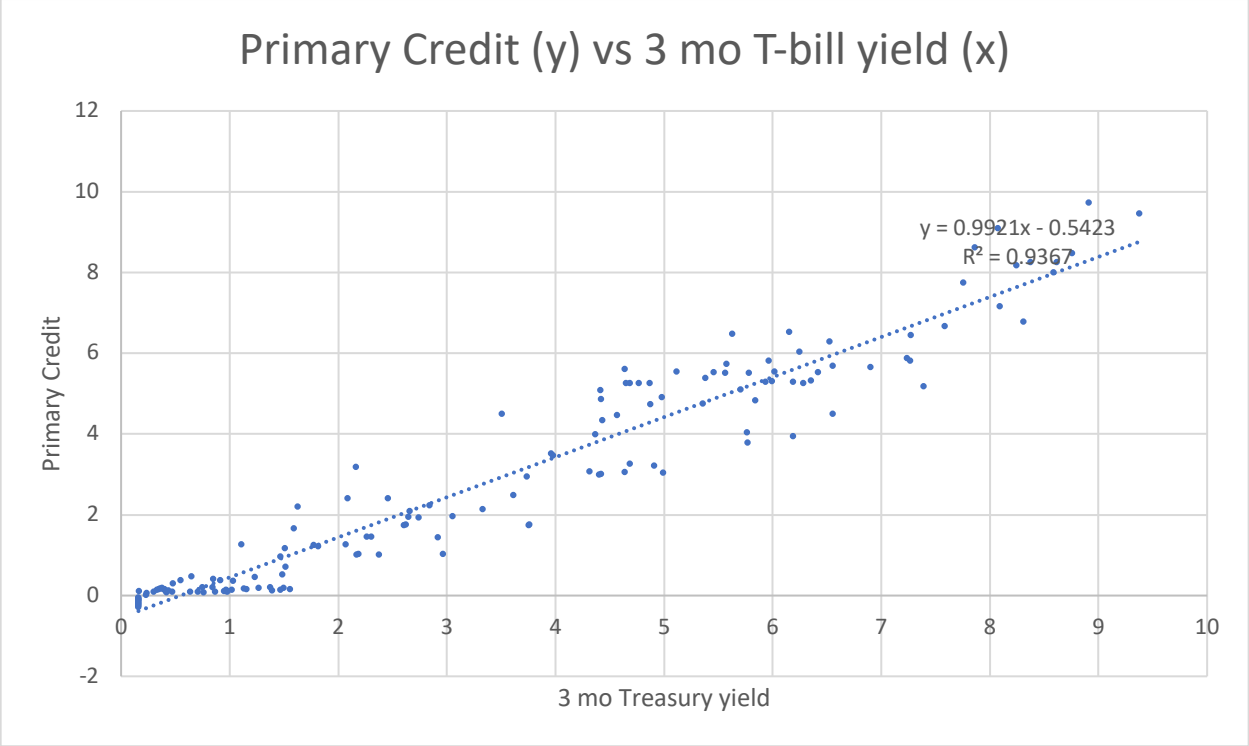
When a depository institution has a shortfall and need for liquidity, it may borrow funds on a short-term basis from the Federal Reserve. The "discount rate" is the interest rate charged to commercial banks and other depository institutions on loans they receive from their regional Federal Reserve Bank's "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.

As we have mentioned, ***the Federal Reserve is currently expecting to maintain the Federal Funds rate at "essentially zero" (0 bp to 25 bp)[60] through 2021, and potentially as long as through 2023***. Looking at history, the Federal Funds rate has generally been 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 also 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 known, speculation in medical circles is that the world is still 6- to 18-months from a cure being widely available. Based on those numbers, and the

[60] See https://www.federalreserve.gov/newsevents/pressreleases/monetary20200916a1.htm

announcements of expected stimulus packages that will be considered, ***we now expect the Federal Funds Rate to remain at or less than 25bp for at least 36 months***.



Source: Author's calculation

Other Commentary

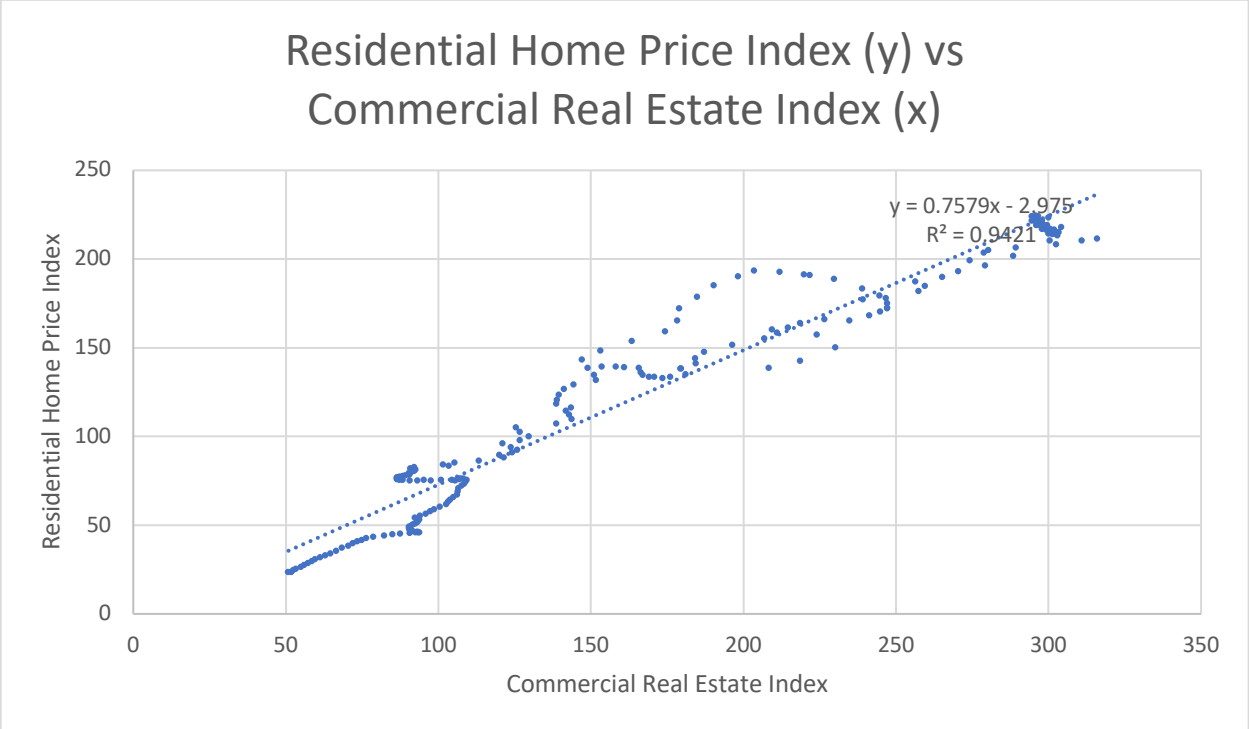
- "The Federal Reserve at its most recent Federal Open Market Committee meeting recommitted itself to keeping short-term interest rates near zero for the foreseeable future, which likely means through 2024. The Fed is also continuing to purchase $80 billion of Treasury securities and $40 billion of mortgage-backed securities every month, adding to its balance sheet. The Fed is "all in" to do whatever it takes to support the economy. Its statement said that it will be willing to tolerate inflation levels above 2% for a time. That means that the Fed will not raise short-term rates even if inflation begins to pick up …" (see https://www.kiplinger.com/economic-forecasts/interest-rates; Nov. 10, 2020)

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 2% per quarter nationally over the next several quarters (from 211.5 in 4Q2019, to 223.5 at YE2020, to 244 at YE2022). 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 very selective of new mortgagees and their employment stability***. Additionally, we expect employer-funded transfers within corporations will be reduced, further hindering sales and leaving an already significant amount of inventory on the market. However, inkeeping with the previously described "K"-recovery, we are already seeing a strong "locale-focused" repositioning by those who can afford it. In other words, given low mortgage rates, those who can afford it (and whose employers allow it) are determined to move to homes and areas that are desirable. Real estate has been a seller's market for the duration of the summer, though expectations are that this trend will not continue indefinitely[61].

Commercial real estate is more of a mixed bag: as we have mentioned in previous reports, "…***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." At this point, we would offer that as an optimistic view. While self-storage, take-out grocery/pharmacy, and professional services are stable in their footprints, most other retail, food service, and hospitality is still significantly impaired[62], and will likely not recover to pre-pandemic levels for several years, if ever[63].



Source: Author's calculation

[61] See https://www.ccn.com/2020-housing-market-buyers-remorse/
[62] See https://www.cnn.com/2020/09/22/investing/commercial-real-estate-recession/index.html
[63] See https://www.cnbc.com/2020/09/27/office-real-estate-back-to-normal-in-2025-cushman-wakefield.html

Other Commentary

- "The myth that work from home is not productive has been busted," [Levi Strauss & Co. CFO Harmit Singh] said. "I believe we will settle into a culture where working from anywhere will be the new norm, with work from home or office or a hybrid arrangement." (https://www.cnbc.com/2020/09/27/office-real-estate-back-to-normal-in-2025-cushman-wakefield.html; Sept. 27, 2020)
- " 'Month-to-month volatility for single-family starts will likely be present in the fall, in part due to supply chain issues, including lumber prices that have increased more than 170 percent since mid-April,' Robert Dietz, chief economist at the National Association of Home Builders said in a statement. 'This scarcity means it is taking longer and costing more to build housing.' " (see https://www.bankrate.com/real-estate/housing-trends/; Sept. 21, 2020)

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. Despite the COVID-19 crisis, the Dow TSM Index has grown by about 1100 points (a gain of approximately 3.8%), and the S&P 500 has risen by about 170 points (a gain of roughly 5.8%), since YE2019.

Our quantitative model for the Dow shows deliberate slow growth for the next several years, without accounting for the change of the administration or other implications. Our model for the S&P, though, shows a coupling with the commercial real estate sector, which we are not inclined to agree with; removing the influence of the commercial real estate sector shows us an expectation of gradual increases by 0.5% to 1% per quarter. However, we cannot underestimate the impact of an executive order from President-Elect Biden, and Biden's general disdain for large technology companies. He has repeatedly stated that he feels that industry has an obligation for support society, and that these companies that have grown dramatically over the past twenty years have not provided the support inkeeping with their success. Further, as the EU launches investigations into the privacy standards of the largest of these companies, there is an expectation that US governments will take similar actions, resulting in curtailing their revenue (and hampering both the Dow & S&P indices).

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 Spring and/or Summer of 2021. As such, ***we expect to see a continuation of the volatility that has been observed during 2020 for at least the next six months (i.e., through 1H2021).*** While Biden will likely be seen as acting more consistently (day-to-day) than his predecessor, the die appears to generally be "cast" until the COVID issue is resolved.

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 and the square of all variables as experimental (dependent) variables; these variables are denoted by a "LN_" prefix and a "^{2}" suffix below (respectively).

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 4Q2010 and 3Q2020, inclusive.

Table 15: Regression Aggregate Errors for 4Q2010 through 3Q2020

Variable	Min Abs. Error	Average Error	Max Abs. Error
Real GDP Growth	***	***	***
Nominal GDP Growth	***	**	***
Real Disposable Income Growth	2.62%	16.42%	***
Nominal Disposable Income Growth	4.73%	75.18%	929.72%
Inflation	0.00%	-21.52%	595.42%
Unemployment Rate	75.42%	544.97%	875.75%
1-month Treasury Yield	0.45%	-46.74%	821.07%
3-month Treasury Yield	0.00%	**	***
6-month Treasury Yield	***	**	***
1-year Treasury Yield	***	**	***
3-year Treasury Yield	***	**	***
5-year Treasury Yield	134.78%	-251.99%	491.39%
7-year Treasury Yield	3.61%	-46.60%	106.61%
10-year Treasury Yield	90.49%	-111.58%	145.16%
20-year Treasury Yield	0.52%	13.49%	91.43%
30-year Treasury Yield	21.48%	66.14%	116.16%
30-year Mortgage Rate	25.42%	-42.18%	54.15%

Moody's AAA Curve	0.01%	2.08%	23.77%
Moody's BAA Curve	25.27%	86.52%	105.38%
BBB Corporate Yield	465.84%	867.36%	***
Prime Rate	0.02%	0.28%	33.31%
US Average Retail Gasoline Price	53.80%	-111.11%	155.13%
Cost of Federal Funds	***	**	***
Dow Jones Total Stock Market Index	0.10%	-1.44%	19.62%
S&P 500 Stock Price Index	766.74%	***	***
Commercial Real Estate Price Index	14.39%	67.12%	125.24%
Residential Home Price Index	136.44%	641.85%	***
Market Volatility Index	286.37%	***	***

** 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	355.664 (+/- 16.899)
	p = 0.00001***
US Fed Reserve O-N Loan Rate	125.266 (+/- 6.430)
	p = 0.00001***
Moody's AAA Curve	18.429 (+/- 1.474)
	p = 0.0001***
Moody's BAA Curve	-16.770 (+/- 1.259)
	p = 0.00005***
Real disposable income growth	7.187 (+/- 0.328)
	p = 0.00001***
Nominal disposable income growth	-7.244 (+/- 0.322)
	p = 0.00001***
Unemployment Rate	-5.159 (+/- 0.228)
	p = 0.00001***
CPI Inflation Rate	7.319 (+/- 0.278)
	p = 0.00001***
BBB corporate yield	15.964 (+/- 0.723)
	p = 0.00001***

30-year Mortgate Rate	-6.383 (+/- 0.369)
	p = 0.00002***
Prime Rate	-52.271 (+/- 3.657)
	p = 0.00004***
Home Price Index	-1.305 (+/- 0.050)
	p = 0.00001***
Commercial Real Estate Price Index	0.457 (+/- 0.019)
	p = 0.00001***
Market Volatility Index	-0.689 (+/- 0.055)
	p = 0.0001***
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	-11.488 (+/- 0.584)
	p = 0.00001***
30-year Treasury Yield	116.150 (+/- 5.397)
	p = 0.00001***
LN_30-year Treasury Yield	-458.876 (+/- 15.044)
	p = 0.00000***
20-year Treasury Yield	18.355 (+/- 4.029)
	p = 0.007***
LN_10-year Treasury Yield	293.508 (+/- 10.762)
	p = 0.00001***
1-month Treasury Yield	-102.318 (+/- 4.343)
	p = 0.00001***

LN_7-year Treasury Yield	-139.178 (+/- 6.593)
	p = 0.00001***
3-month Treasury Yield	48.551 (+/- 3.353)
	p = 0.00003***
5-year Treasury Yield	54.153 (+/- 7.576)
	p = 0.001***
LN_5-year Treasury Yield	-208.155 (+/- 14.235)
	p = 0.00003***
6-month Treasury Yield	-175.064 (+/- 10.353)
	p = 0.00002***
LN_6-month Treasury Yield	27.521 (+/- 1.504)
	p = 0.00001***
3-year Treasury Yield	-185.736 (+/- 15.017)
	p = 0.0001***
LN_3-year Treasury Yield	210.848 (+/- 12.046)
	p = 0.00002***
1-year Treasury Yield	282.936 (+/- 17.052)
	p = 0.00002***
LN_1-year Treasury Yield	-98.488 (+/- 4.389)
	p = 0.00001***
1-year Treasury Yield_2	-47.820 (+/- 3.231)
	p = 0.00003***

3-year Treasury Yield_2	36.886 (+/- 2.388)
	p = 0.00003***
3-month Treasury Yield_2	24.162 (+/- 1.983)
	p = 0.0001***
10-year Treasury Yield_2	-10.790 (+/- 0.690)
	p = 0.00002***
Market Volatility Index_2	0.008 (+/- 0.001)
	p = 0.0003***
Observations	40
R^2	0.999
Adjusted R^2	0.996
Residual Std. Error	0.167 (df = 5)
F Statistic	256.287*** (df = 34; 5)
Note:	*p<0.1; **p<0.05; ***p<0.01

REGRESSION FOR NOMINAL GDP GROWTH

	Dependent variable (+/- SE):
	Nominal GDP growth
Constant	361.437 (+/- 51.800)
	p = 0.00004***
SP500 Stock Price Index	-0.026 (+/- 0.003)
	p = 0.00001***
US Fed Reserve O-N Loan Rate	100.837 (+/- 9.549)
	p = 0.00000***
Moody's AAA Curve	-11.232 (+/- 0.890)
	p = 0.00000***
Unemployment Rate	-5.023 (+/- 0.310)
	p = 0.00000***
30-year Mortgate Rate	-3.753 (+/- 0.801)
	p = 0.001***
Home Price Index	-0.904 (+/- 0.082)
	p = 0.00000***
Commercial Real Estate Price Index	0.412 (+/- 0.039)
	p = 0.00000***
Market Volatility Index	-0.620 (+/- 0.102)
	p = 0.0002***
30-year Treasury Yield	-745.601 (+/- 113.989)

	p = 0.0001***
LN_30-year Treasury Yield	498.408 (+/- 101.607)
	p = 0.001***
20-year Treasury Yield	404.902 (+/- 50.740)
	p = 0.00002***
10-year Treasury Yield	127.581 (+/- 11.676)
	p = 0.00000***
LN_10-year Treasury Yield	-314.797 (+/- 30.678)
	p = 0.00001***
1-month Treasury Yield	-114.967 (+/- 13.897)
	p = 0.00001***
3-month Treasury Yield	36.495 (+/- 4.648)
	p = 0.00002***
LN_5-year Treasury Yield	65.211 (+/- 7.179)
	p = 0.00001***
6-month Treasury Yield	-96.664 (+/- 15.059)
	p = 0.0001***
LN_6-month Treasury Yield	16.309 (+/- 2.618)
	p = 0.0001***
3-year Treasury Yield	-39.187 (+/- 8.157)
	p = 0.001***
1-year Treasury Yield	149.083 (+/- 14.655)

	p = 0.00001***
LN_1-year Treasury Yield	-53.108 (+/- 5.243)
	p = 0.00001***
3-year Treasury Yield_2	19.647 (+/- 2.241)
	p = 0.00001***
6-month Treasury Yield_2	-25.935 (+/- 3.806)
	p = 0.00005***
5-year Treasury Yield_2	-30.116 (+/- 3.134)
	p = 0.00001***
7-year Treasury Yield_2	23.920 (+/- 3.741)
	p = 0.0001***
1-month Treasury Yield_2	17.079 (+/- 3.162)
	p = 0.0004***
20-year Treasury Yield_2	-92.880 (+/- 11.021)
	p = 0.00001***
30-year Treasury Yield_2	108.880 (+/- 14.528)
	p = 0.00003***
Market Volatility Index_2	0.011 (+/- 0.002)
	p = 0.0001***
Observations	40
R^2	0.993
Adjusted R^2	0.974

Residual Std. Error	0.478 (df = 10)
F Statistic	50.656*** (df = 29; 10)
Note:	*p<0.1; **p<0.05; ***p<0.01

REGRESSION FOR REAL DISPOSABLE INCOME GROWTH

	Dependent variable (+/- SE):
	Real disposable income growth
Constant	1.793 (+/- 1.615)
	p = 0.274
LN_10-year Treasury Yield	1.133 (+/- 1.931)
	p = 0.561
Observations	40
R^2	0.009
Adjusted R^2	-0.017
Residual Std. Error	4.146 (df = 38)
F Statistic	0.345 (df = 1; 38)
Note:	*p<0.1; **p<0.05; ***p<0.01

REGRESSION FOR NOMINAL DISPOSABLE INCOME GROWTH

	Dependent variable (+/- SE):
	Nominal disposable income growth
Constant	2.209 (+/- 1.658)
	p = 0.191
LN_10-year Treasury Yield	2.585 (+/- 1.982)
	p = 0.200
Observations	40
R^2	0.043
Adjusted R^2	0.018
Residual Std. Error	4.257 (df = 38)
F Statistic	1.701 (df = 1; 38)
Note:	*p<0.1; **p<0.05; ***p<0.01

REGRESSION FOR CPI INFLATION RATE

	Dependent variable (+/- SE):
	CPI Inflation Rate
Constant	-0.088 (+/- 0.116)
	p = 0.451
Real disposable income growth	-1.273 (+/- 0.059)
	p = 0.000***
Nominal disposable income growth	1.234 (+/- 0.056)
	p = 0.000***
Observations	40
R^2	0.929
Adjusted R^2	0.925
Residual Std. Error	0.411 (df = 37)
F Statistic	240.696*** (df = 2; 37)
Note:	*p<0.1; **p<0.05; ***p<0.01

Unemployment Rate

REGRESSION FOR UNEMPLOYMENT RATE

	Dependent variable (+/- SE):
	Unemployment Rate
Constant	14.649 (+/- 1.222)
	p = 0.000***
SP500 Stock Price Index	-0.003 (+/- 0.0003)
	p = 0.000***
Nominal GDP growth	-0.088 (+/- 0.032)
	p = 0.010***
30-year Treasury Yield	8.207 (+/- 0.688)
	p = 0.000***
LN_30-year Treasury Yield	-26.744 (+/- 2.020)
	p = 0.000***
1-year Treasury Yield	1.930 (+/- 0.335)
	p = 0.00001***
LN_1-year Treasury Yield	-1.361 (+/- 0.230)
	p = 0.00001***
Observations	40
R^2	0.955
Adjusted R^2	0.946

Residual Std. Error	0.514 (df = 33)
F Statistic	115.550*** (df = 6; 33)
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	-0.326 (+/- 0.324)
	p = 0.324
SP500 Stock Price Index	-0.0001 (+/- 0.00002)
	p = 0.008***
Unemployment Rate	-0.015 (+/- 0.005)
	p = 0.006***
Prime Rate	0.432 (+/- 0.054)
	p = 0.00000***
30-year Treasury Yield	-2.315 (+/- 0.459)
	p = 0.00004***
20-year Treasury Yield	2.295 (+/- 0.460)
	p = 0.00004***
LN_7-year Treasury Yield	-0.966 (+/- 0.278)
	p = 0.002***
3-month Treasury Yield	0.475 (+/- 0.043)
	p = 0.000***
5-year Treasury Yield	-0.425 (+/- 0.141)
	p = 0.006***

LN_5-year Treasury Yield	0.745 (+/- 0.215)
	p = 0.002***
3-month Treasury Yield_2	0.059 (+/- 0.008)
	p = 0.00000***
7-year Treasury Yield_2	0.113 (+/- 0.035)
	p = 0.004***
20-year Treasury Yield_2	-0.415 (+/- 0.094)
	p = 0.0002***
30-year Treasury Yield_2	0.385 (+/- 0.085)
	p = 0.0002***
Observations	40
R^2	1.000
Adjusted R^2	1.000
Residual Std. Error	0.015 (df = 26)
F Statistic	7,866.272*** (df = 13; 26)
Note:	*p<0.1; **p<0.05; ***p<0.01

REGRESSION FOR 3-MONTH TREASURY YIELD

	Dependent variable (+/- SE):
	3-month Treasury Yield
Constant	-0.680 (+/- 0.132)
	p = 0.00002***
30-year Treasury Yield	-2.295 (+/- 0.467)
	p = 0.00003***
LN_30-year Treasury Yield	6.924 (+/- 1.293)
	p = 0.00001***
20-year Treasury Yield	2.106 (+/- 0.432)
	p = 0.00003***
LN_20-year Treasury Yield	-5.773 (+/- 1.094)
	p = 0.00001***
1-month Treasury Yield	1.171 (+/- 0.036)
	p = 0.000***
1-month Treasury Yield_2	-0.078 (+/- 0.015)
	p = 0.00001***
Observations	40
R^2	0.998
Adjusted R^2	0.998
Residual Std. Error	0.036 (df = 33)
F Statistic	3,111.489*** (df = 6; 33)

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

REGRESSION FOR 6-MONTH TREASURY YIELD

	Dependent variable (+/- SE):
	6-month Treasury Yield
Constant	4.633 (+/- 3.237)
	p = 0.163
Real GDP growth	0.080 (+/- 0.026)
	p = 0.005***
Unemployment Rate	0.504 (+/- 0.101)
	p = 0.00003***
Home Price Index	0.072 (+/- 0.007)
	p = 0.000***
LN_Market Volatility Index	0.570 (+/- 0.160)
	p = 0.002***
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	0.454 (+/- 0.129)
	p = 0.002***
30-year Treasury Yield	-39.576 (+/- 6.564)
	p = 0.00001***
LN_30-year Treasury Yield	62.381 (+/- 9.786)
	p = 0.00000***
30-year Treasury Yield_2	3.069 (+/- 0.530)
	p = 0.00001***
Observations	40

R^2	0.907
Adjusted R^2	0.883
Residual Std. Error	0.280 (df = 31)
F Statistic	37.885^{***} (df = 8; 31)
Note:	*p<0.1; **p<0.05; ***p<0.01

REGRESSION FOR 1-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	1-year Treasury Yield
Constant	11.918 (+/- 3.090)
	p = 0.001***
SP500 Stock Price Index	0.001 (+/- 0.0004)
	p = 0.001***
Nominal GDP growth	0.084 (+/- 0.018)
	p = 0.0001***
Unemployment Rate	0.589 (+/- 0.085)
	p = 0.00000***
BBB corporate yield	0.676 (+/- 0.143)
	p = 0.0001***
Home Price Index	0.087 (+/- 0.014)
	p = 0.00000***
Commercial Real Estate Price Index	-0.029 (+/- 0.007)
	p = 0.0005***
30-year Treasury Yield	-46.987 (+/- 6.007)
	p = 0.000***
LN_30-year Treasury Yield	72.650 (+/- 8.879)
	p = 0.000***
30-year Treasury Yield_2	3.620 (+/- 0.484)

	p = 0.00000***
Observations	40
R^2	0.937
Adjusted R^2	0.918
Residual Std. Error	0.235 (df = 30)
F Statistic	49.621*** (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	4.901 (+/- 2.241)
	p = 0.037**
SP500 Stock Price Index	0.001 (+/- 0.0003)
	p = 0.001***
Nominal GDP growth	0.049 (+/- 0.013)
	p = 0.001***
Unemployment Rate	0.308 (+/- 0.061)
	p = 0.00003***
BBB corporate yield	0.583 (+/- 0.104)
	p = 0.00001***
Home Price Index	0.053 (+/- 0.010)
	p = 0.00001***
Commercial Real Estate Price Index	-0.015 (+/- 0.005)
	p = 0.008***
30-year Treasury Yield	-27.134 (+/- 4.356)
	p = 0.00000***
LN_30-year Treasury Yield	42.712 (+/- 6.440)
	p = 0.00000***
30-year Treasury Yield_2	2.098 (+/- 0.351)

	p = 0.00001***
Observations	40
R^2	0.957
Adjusted R^2	0.944
Residual Std. Error	0.171 (df = 30)
F Statistic	73.439*** (df = 9; 30)
Note:	*p<0.1; **p<0.05; ***p<0.01

REGRESSION FOR 5-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	5-year Treasury Yield
Constant	-2.870 (+/- 0.396)
	p = 0.00000***
SP500 Stock Price Index	0.001 (+/- 0.0001)
	p = 0.000***
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	-0.312 (+/- 0.082)
	p = 0.001***
LN_30-year Treasury Yield	3.118 (+/- 0.187)
	p = 0.000***
Observations	40
R^2	0.900
Adjusted R^2	0.892
Residual Std. Error	0.207 (df = 36)
F Statistic	108.480*** (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	2.557 (+/- 0.328)
	p = 0.000***
SP500 Stock Price Index	-0.001 (+/- 0.0002)
	p = 0.010***
1-month Treasury Yield	0.619 (+/- 0.141)
	p = 0.0001***
Observations	40
R^2	0.344
Adjusted R^2	0.309
Residual Std. Error	0.492 (df = 37)
F Statistic	9.717*** (df = 2; 37)
Note:	*p<0.1; **p<0.05; ***p<0.01

REGRESSION FOR 10-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	10-year Treasury Yield
Constant	-1.343 (+/- 0.213)
	p = 0.00000***
SP500 Stock Price Index	0.0005 (+/- 0.00004)
	p = 0.000***
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	-0.139 (+/- 0.042)
	p = 0.003***
LN_30-year Treasury Yield	2.339 (+/- 0.185)
	p = 0.000***
30-year Treasury Yield_2	0.057 (+/- 0.011)
	p = 0.00002***
Observations	40
R^2	0.972
Adjusted R^2	0.969
Residual Std. Error	0.108 (df = 35)
F Statistic	303.732*** (df = 4; 35)
Note:	*p<0.1; **p<0.05; ***p<0.01

REGRESSION FOR 20-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	20-year Treasury Yield
Constant	4.676 (+/- 0.273)
	p = 0.000***
SP500 Stock Price Index	-0.001 (+/- 0.0002)
	p = 0.00000***
1-month Treasury Yield	8.137 (+/- 2.249)
	p = 0.001***
3-month Treasury Yield	-7.546 (+/- 2.112)
	p = 0.002***
3-month Treasury Yield_2	3.422 (+/- 0.833)
	p = 0.0003***
1-month Treasury Yield_2	-3.462 (+/- 0.828)
	p = 0.0002***
Observations	40
R^2	0.685
Adjusted R^2	0.638
Residual Std. Error	0.394 (df = 34)
F Statistic	14.756*** (df = 5; 34)
Note:	*p<0.1; **p<0.05; ***p<0.01

REGRESSION FOR 30-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	30-year Treasury Yield
Constant	1.542 (+/- 0.073)
	p = 0.000***
Nominal GDP growth	-0.010 (+/- 0.003)
	p = 0.007***
Nominal disposable income growth	-0.006 (+/- 0.002)
	p = 0.008***
LN_10-year Treasury Yield	1.885 (+/- 0.108)
	p = 0.000***
LN_1-month Treasury Yield	0.040 (+/- 0.011)
	p = 0.001***
LN_5-year Treasury Yield	-0.605 (+/- 0.077)
	p = 0.000***
3-year Treasury Yield	-0.313 (+/- 0.044)
	p = 0.00000***
10-year Treasury Yield_2	0.128 (+/- 0.008)
	p = 0.000***
Observations	40
R^2	0.994
Adjusted R^2	0.993

Residual Std. Error	0.055 (df = 32)
F Statistic	784.118*** (df = 7; 32)
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	2.181 (+/- 0.191)
	p = 0.000***
LN_30-year Treasury Yield	1.560 (+/- 0.169)
	p = 0.000***
1-month Treasury Yield	0.166 (+/- 0.053)
	p = 0.004***
Observations	40
R^2	0.706
Adjusted R^2	0.690
Residual Std. Error	0.257 (df = 37)
F Statistic	44.463*** (df = 2; 37)
Note:	*p<0.1; **p<0.05; ***p<0.01

Moody's AAA & BAA Rates

REGRESSION FOR MOODY'S AAA CURVE

	Dependent variable (+/- SE):
	Moody's AAA Curve
Constant	-8.281 (+/- 2.787)
	p = 0.006***
BBB corporate yield	0.855 (+/- 0.083)
	p = 0.000***
Prime Rate	2.700 (+/- 0.838)
	p = 0.003***
1-month Treasury Yield	-2.670 (+/- 0.786)
	p = 0.002***
Observations	40
R^2	0.766
Adjusted R^2	0.747
Residual Std. Error	0.273 (df = 36)
F Statistic	39.360*** (df = 3; 36)
Note:	*p<0.1; **p<0.05; ***p<0.01

REGRESSION FOR MOODY'S BAA CURVE

	Dependent variable (+/- SE):
	Moody's BAA Curve
Constant	-8.437 (+/- 3.450)
	p = 0.021**
SP500 Stock Price Index	-0.001 (+/- 0.0002)
	p = 0.00003***
Prime Rate	4.336 (+/- 1.087)
	p = 0.0004***
30-year Treasury Yield	1.698 (+/- 0.382)
	p = 0.0001***
LN_30-year Treasury Yield	-4.242 (+/- 1.133)
	p = 0.001***
1-month Treasury Yield	-6.767 (+/- 1.618)
	p = 0.0003***
6-month Treasury Yield	1.968 (+/- 0.589)
	p = 0.003***
1-month Treasury Yield_2	0.467 (+/- 0.117)
	p = 0.0004***
Observations	40
R^2	0.854
Adjusted R^2	0.822

Residual Std. Error	0.231 (df = 32)
F Statistic	26.670*** (df = 7; 32)
Note:	*p<0.1; **p<0.05; ***p<0.01

BBB Corporate Yield

REGRESSION FOR BBB CORPORATE YIELD

	Dependent variable (+/- SE):
	BBB corporate yield
Constant	-13.870 (+/- 3.256)
	p = 0.0004***
Moody's AAA Curve	-0.825 (+/- 0.225)
	p = 0.002***
Moody's BAA Curve	1.004 (+/- 0.197)
	p = 0.00005***
Real GDP growth	0.247 (+/- 0.060)
	p = 0.0005***
Nominal GDP growth	-0.255 (+/- 0.054)
	p = 0.0002***
Home Price Index	-0.059 (+/- 0.013)
	p = 0.0002***
Commercial Real Estate Price Index	0.032 (+/- 0.008)
	p = 0.001***
LN_Market Volatility Index	0.336 (+/- 0.110)
	p = 0.007***
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	0.505 (+/- 0.169)
	p = 0.007***

30-year Treasury Yield	23.603 (+/- 5.675)
	p = 0.0005***
LN_30-year Treasury Yield	-32.442 (+/- 8.184)
	p = 0.001***
LN_1-month Treasury Yield	0.495 (+/- 0.159)
	p = 0.005***
6-month Treasury Yield	-4.964 (+/- 1.119)
	p = 0.0003***
LN_6-month Treasury Yield	-0.754 (+/- 0.240)
	p = 0.005***
3-year Treasury Yield	-1.660 (+/- 0.562)
	p = 0.008***
LN_3-year Treasury Yield	1.513 (+/- 0.459)
	p = 0.004***
1-year Treasury Yield	6.039 (+/- 1.378)
	p = 0.0003***
30-year Treasury Yield_2	-1.960 (+/- 0.482)
	p = 0.001***
Observations	40
R^2	0.956
Adjusted R^2	0.923
Residual Std. Error	0.147 (df = 22)

F Statistic	28.369^{***} (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	2.974 (+/- 0.096)
	p = 0.000***
Moody's AAA Curve	0.071 (+/- 0.025)
	p = 0.008***
LN_Market Volatility Index	-0.062 (+/- 0.020)
	p = 0.005***
30-year Treasury Yield	0.438 (+/- 0.121)
	p = 0.002***
20-year Treasury Yield	-0.493 (+/- 0.115)
	p = 0.0002***
1-month Treasury Yield	1.324 (+/- 0.076)
	p = 0.000***
LN_1-month Treasury Yield	-0.060 (+/- 0.013)
	p = 0.0001***
1-month Treasury Yield_2	-0.107 (+/- 0.023)
	p = 0.0001***
Observations	40

R^2	0.998
Adjusted R^2	0.998
Residual Std. Error	0.036 (df = 32)
F Statistic	2,351.336*** (df = 7; 32)
Note:	*p<0.1; **p<0.05; ***p<0.01

US Average Retail Gasoline Price

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	7.339 (+/- 0.723)
	p = 0.000***
SP500 Stock Price Index	0.001 (+/- 0.0003)
	p = 0.002***
Real GDP growth	-0.209 (+/- 0.045)
	p = 0.0001***
Nominal GDP growth	0.188 (+/- 0.039)
	p = 0.00004***
Commercial Real Estate Price Index	-0.023 (+/- 0.003)
	p = 0.00000***
30-year Treasury Yield	-3.541 (+/- 0.920)
	p = 0.001***
LN_30-year Treasury Yield	3.080 (+/- 0.788)
	p = 0.0005***
20-year Treasury Yield	2.391 (+/- 0.734)
	p = 0.003***
6-month Treasury Yield	2.617 (+/- 0.406)
	p = 0.00000***

1-year Treasury Yield	-2.736 (+/- 0.422)
	p = 0.00000***
Observations	40
R^2	0.921
Adjusted R^2	0.897
Residual Std. Error	0.182 (df = 30)
F Statistic	38.705*** (df = 9; 30)
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	-3.744 (+/- 1.592)
	p = 0.026**
Moody's AAA Curve	-0.923 (+/- 0.189)
	p = 0.00004***
Moody's BAA Curve	1.654 (+/- 0.194)
	p = 0.000***
Unemployment Rate	0.341 (+/- 0.051)
	p = 0.00000***
BBB corporate yield	-0.629 (+/- 0.174)
	p = 0.002***
Dow Total Stock Market Index	-0.0001 (+/- 0.00003)
	p = 0.007***
Home Price Index	0.070 (+/- 0.008)
	p = 0.000***
30-year Treasury Yield	-21.731 (+/- 1.833)
	p = 0.000***
LN_30-year Treasury Yield	40.455 (+/- 3.313)
	p = 0.000***

10-year Treasury Yield_2	-0.422 (+/- 0.087)
	p = 0.00004***
20-year Treasury Yield_2	1.793 (+/- 0.163)
	p = 0.000***
Observations	40
R^2	0.956
Adjusted R^2	0.941
Residual Std. Error	0.188 (df = 29)
F Statistic	63.085*** (df = 10; 29)
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	26,308.320 (+/- 4,935.005)
	p = 0.00001***
LN_Market Volatility Index	-2,931.105 (+/- 908.802)
	p = 0.003***
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	-5,181.864 (+/- 921.895)
	p = 0.00001***
LN_5-year Treasury Yield	-22,473.610 (+/- 3,663.575)
	p = 0.00000***
LN_3-year Treasury Yield	19,897.200 (+/- 3,631.118)
	p = 0.00001***
1-year Treasury Yield	31,466.660 (+/- 5,172.685)
	p = 0.00000***
LN_1-year Treasury Yield	-14,475.870 (+/- 1,773.424)
	p = 0.000***
1-year Treasury Yield_2	-5,831.865 (+/- 1,240.601)
	p = 0.00005***
Observations	40

R^2	0.947
Adjusted R^2	0.935
Residual Std. Error	1,585.788 (df = 32)
F Statistic	80.930^{***} (df = 7; 32)
Note:	*p<0.1; **p<0.05; ***p<0.01

REGRESSION FOR SP500 STOCK PRICE INDEX

	Dependent variable (+/- SE):
	SP500 Stock Price Index
Constant	4,787.440 (+/- 942.295)
	p = 0.0002***
Moody's AAA Curve	-308.755 (+/- 35.051)
	p = 0.00000***
Real GDP growth	87.291 (+/- 14.986)
	p = 0.00005***
Nominal GDP growth	-73.475 (+/- 14.421)
	p = 0.0002***
Real disposable income growth	-227.736 (+/- 37.280)
	p = 0.00003***
Nominal disposable income growth	225.287 (+/- 36.087)
	p = 0.00003***
CPI Inflation Rate	-198.898 (+/- 24.354)
	p = 0.00001***
BBB corporate yield	-505.606 (+/- 34.479)
	p = 0.000***
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	279.907 (+/- 40.322)
	p = 0.00001***
30-year Treasury Yield	21,801.940 (+/- 1,756.630)

	p = 0.000***
LN_30-year Treasury Yield	-49,644.670 (+/- 4,334.152)
	p = 0.00000***
20-year Treasury Yield	-26,422.930 (+/- 2,541.764)
	p = 0.00000***
LN_20-year Treasury Yield	47,948.850 (+/- 4,894.784)
	p = 0.00000***
1-month Treasury Yield	2,392.826 (+/- 254.141)
	p = 0.00000***
LN_1-month Treasury Yield	-199.055 (+/- 27.650)
	p = 0.00001***
7-year Treasury Yield	19,033.870 (+/- 1,103.733)
	p = 0.000***
LN_7-year Treasury Yield	-21,432.020 (+/- 1,789.632)
	p = 0.000***
5-year Treasury Yield	-10,570.150 (+/- 671.048)
	p = 0.000***
LN_5-year Treasury Yield	15,402.260 (+/- 1,147.500)
	p = 0.000***
6-month Treasury Yield	-5,326.348 (+/- 531.467)
	p = 0.00000***
LN_6-month Treasury Yield	634.237 (+/- 77.521)

	p = 0.00001***
LN_3-year Treasury Yield	-4,134.349 (+/- 281.462)
	p = 0.000***
1-year Treasury Yield	3,836.788 (+/- 449.973)
	p = 0.00000***
1-year Treasury Yield_2	170.875 (+/- 54.557)
	p = 0.008***
10-year Treasury Yield_2	-608.883 (+/- 58.928)
	p = 0.00000***
20-year Treasury Yield_2	388.302 (+/- 91.912)
	p = 0.001***
Observations	40
R^2	0.999
Adjusted R^2	0.997
Residual Std. Error	30.879 (df = 14)
F Statistic	602.207*** (df = 25; 14)
Note:	*p<0.1; **p<0.05; ***p<0.01

House and Commercial Real Estate Price Indexes

REGRESSION FOR HOME PRICE INDEX

	Dependent variable (+/- SE):
	Home Price Index
Constant	-135.081 (+/- 29.988)
	p = 0.0001***
Real GDP growth	-1.032 (+/- 0.232)
	p = 0.0002***
Unemployment Rate	-6.370 (+/- 0.721)
	p = 0.000***
Market Volatility Index	-0.200 (+/- 0.059)
	p = 0.002***
30-year Treasury Yield	621.285 (+/- 41.004)
	p = 0.000***
LN_30-year Treasury Yield	-977.794 (+/- 55.210)
	p = 0.000***
3-month Treasury Yield	5.996 (+/- 1.024)
	p = 0.00001***
LN_3-year Treasury Yield	13.501 (+/- 2.156)
	p = 0.00000***
30-year Treasury Yield_2	-49.152 (+/- 3.559)
	p = 0.000***

Observations	40
R^2	0.992
Adjusted R^2	0.990
Residual Std. Error	2.773 (df = 31)
F Statistic	499.625^{***} (df = 8; 31)
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	361.075 (+/- 13.555)
	p = 0.000***
Real GDP growth	-10.477 (+/- 2.297)
	p = 0.0001***
Nominal GDP growth	8.971 (+/- 2.010)
	p = 0.0002***
Unemployment Rate	-4.630 (+/- 1.165)
	p = 0.0005***
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	-30.128 (+/- 5.787)
	p = 0.00002***
LN_30-year Treasury Yield	-139.908 (+/- 11.796)
	p = 0.000***
1-month Treasury Yield	63.619 (+/- 9.084)
	p = 0.00000***
LN_1-month Treasury Yield	-25.814 (+/- 7.092)
	p = 0.002***
5-year Treasury Yield	55.673 (+/- 6.615)
	p = 0.000***
LN_6-month Treasury Yield	84.604 (+/- 21.140)

	p = 0.0005***
LN_1-year Treasury Yield	-93.288 (+/- 18.728)
	p = 0.00003***
1-year Treasury Yield_2	-13.952 (+/- 2.807)
	p = 0.00004***
Observations	40
R^2	0.982
Adjusted R^2	0.975
Residual Std. Error	7.439 (df = 28)
F Statistic	137.939*** (df = 11; 28)
Note:	*p<0.1; **p<0.05; ***p<0.01

Market Volatility Index

REGRESSION FOR MARKET VOLATILITY INDEX

	Dependent variable (+/- SE):
	Market Volatility Index
Constant	435.108 (+/- 29.074)
	p = 0.000***
SP500 Stock Price Index	0.066 (+/- 0.007)
	p = 0.00000***
US Fed Reserve O-N Loan Rate	-391.275 (+/- 24.874)
	p = 0.000***
Moody's AAA Curve	68.048 (+/- 4.152)
	p = 0.000***
Moody's BAA Curve	-50.353 (+/- 3.618)
	p = 0.000***
Real GDP growth	-6.249 (+/- 0.979)
	p = 0.00004***
Nominal GDP growth	9.611 (+/- 0.865)
	p = 0.00000***
Unemployment Rate	7.802 (+/- 1.530)
	p = 0.0003***
BBB corporate yield	18.557 (+/- 3.075)
	p = 0.0001***

Home Price Index	2.458 (+/- 0.241)
	p = 0.00000***
Commercial Real Estate Price Index	-1.763 (+/- 0.100)
	p = 0.000***
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	-39.487 (+/- 3.334)
	p = 0.00000***
20-year Treasury Yield	-290.531 (+/- 35.358)
	p = 0.00001***
10-year Treasury Yield	550.757 (+/- 141.065)
	p = 0.003***
LN_10-year Treasury Yield	469.325 (+/- 112.679)
	p = 0.002***
1-month Treasury Yield	342.965 (+/- 29.584)
	p = 0.00000***
LN_1-month Treasury Yield	-28.414 (+/- 1.363)
	p = 0.000***
7-year Treasury Yield	-851.087 (+/- 78.008)
	p = 0.00000***
5-year Treasury Yield	290.319 (+/- 28.031)
	p = 0.00000***
LN_5-year Treasury Yield	-230.824 (+/- 39.136)
	p = 0.0001***

6-month Treasury Yield	358.480 (+/- 27.371)
	p = 0.00000***
3-year Treasury Yield	-317.921 (+/- 34.321)
	p = 0.00000***
LN_3-year Treasury Yield	196.232 (+/- 23.554)
	p = 0.00001***
1-year Treasury Yield	-324.295 (+/- 24.838)
	p = 0.00000***
LN_1-year Treasury Yield	87.430 (+/- 6.222)
	p = 0.000***
7-year Treasury Yield_2	175.241 (+/- 19.830)
	p = 0.00001***
10-year Treasury Yield_2	-147.314 (+/- 22.220)
	p = 0.00003***
20-year Treasury Yield_2	51.513 (+/- 5.648)
	p = 0.00000***
Observations	40
R^2	0.991
Adjusted R^2	0.972
Residual Std. Error	1.370 (df = 12)
F Statistic	50.915*** (df = 27; 12)
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[64]
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

[64] 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).[65]
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.

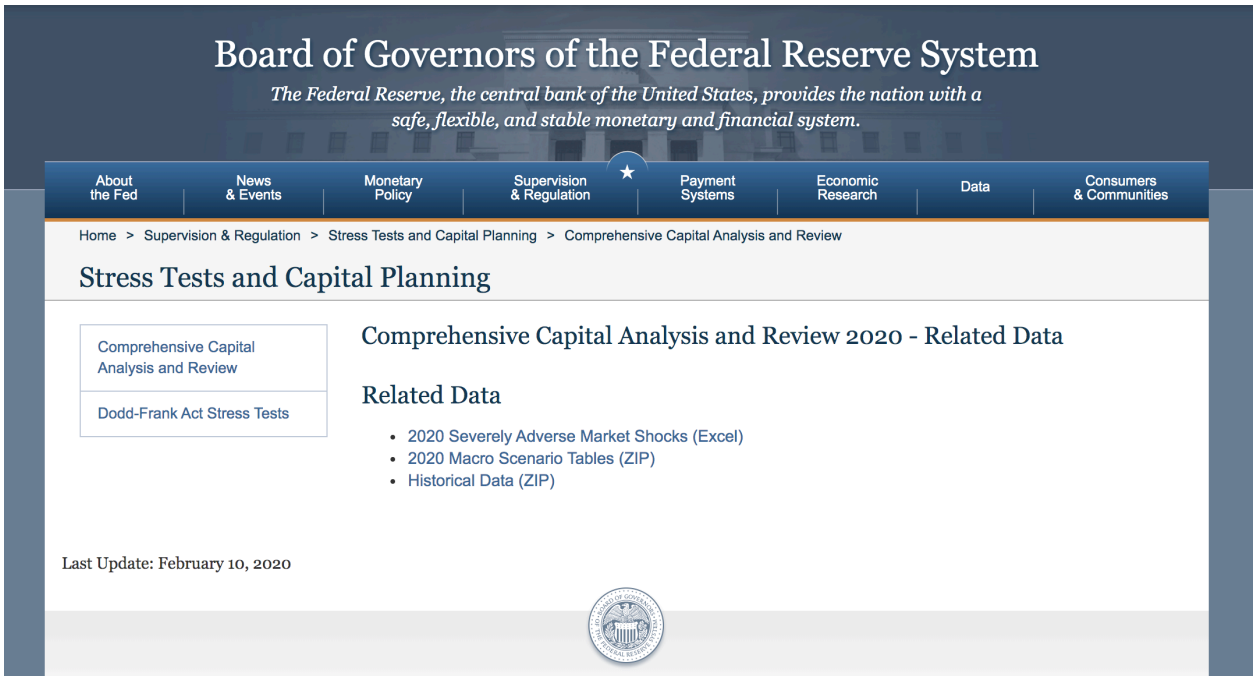
[65] The Merrill Lynch 10-year BBB corporate bond rate is being discontinued from future Z.1 releases as of April 30, 2019 due to licensing restrictions. We will use FRED's BAMLC0A4CBBBEY series as a proxy after April 30, 2019.

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[66].



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)

[66] 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[67] "forecast" package[68]; specifically, the "ets" function (see p.39 of https://cran.r-project.org/web/packages/forecast/forecast.pdf)[69] 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)[70], and the determined parameters. While fitting forecasts to previous values,

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

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

[69] 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.

[70] 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)[71].

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.

[71] 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[72];
    - 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[73].

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

[72] 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.
[73] 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	$\hat{y}_{t+h\|t} = \ell_t + hb_t$ $\ell_t = \alpha y_t + (1-\alpha)(\ell_{t-1} + b_{t-1})$ $b_t = \beta^*(\ell_t - \ell_{t-1}) + (1-\beta^*)b_{t-1}$	$\hat{y}_{t+h\|t} = \ell_t + hb_t + s_{t-m+h_m^+}$ $\ell_t = \alpha(y_t - s_{t-m}) + (1-\alpha)(\ell_{t-1} + b_{t-1})$ $b_t = \beta^*(\ell_t - \ell_{t-1}) + (1-\beta^*)b_{t-1}$ $s_t = \gamma(y_t - \ell_{t-1} - b_{t-1}) + (1-\gamma)s_{t-m}$	$\hat{y}_{t+h\|t} = (\ell_t + hb_t)s_{t-m+h_m^+}$ $\ell_t = \alpha(y_t / s_{t-m}) + (1-\alpha)(\ell_{t-1} + b_{t-1})$ $b_t = \beta^*(\ell_t - \ell_{t-1}) + (1-\beta^*)b_{t-1}$ $s_t = \gamma(y_t / (\ell_{t-1} + b_{t-1})) + (1-\gamma)s_{t-m}$
$\mathbf{A_d}$	$\hat{y}_{t+h\|t} = \ell_t + \phi_h b_t$ $\ell_t = \alpha y_t + (1-\alpha)(\ell_{t-1} + \phi b_{t-1})$ $b_t = \beta^*(\ell_t - \ell_{t-1}) + (1-\beta^*)\phi b_{t-1}$	$\hat{y}_{t+h\|t} = \ell_t + \phi_h b_t + s_{t-m+h_m^+}$ $\ell_t = \alpha(y_t - s_{t-m}) + (1-\alpha)(\ell_{t-1} + \phi b_{t-1})$ $b_t = \beta^*(\ell_t - \ell_{t-1}) + (1-\beta^*)\phi b_{t-1}$ $s_t = \gamma(y_t - \ell_{t-1} - \phi b_{t-1}) + (1-\gamma)s_{t-m}$	$\hat{y}_{t+h\|t} = (\ell_t + \phi_h b_t)s_{t-m+h_m^+}$ $\ell_t = \alpha(y_t / s_{t-m}) + (1-\alpha)(\ell_{t-1} + \phi b_{t-1})$ $b_t = \beta^*(\ell_t - \ell_{t-1}) + (1-\beta^*)\phi b_{t-1}$ $s_t = \gamma(y_t / (\ell_{t-1} + \phi b_{t-1})) + (1-\gamma)s_{t-m}$
M	$\hat{y}_{t+h\|t} = \ell_t b_t^h$ $\ell_t = \alpha y_t + (1-\alpha)\ell_{t-1}b_{t-1}$ $b_t = \beta^*(\ell_t / \ell_{t-1}) + (1-\beta^*)b_{t-1}$	$\hat{y}_{t+h\|t} = \ell_t b_t^h + s_{t-m+h_m^+}$ $\ell_t = \alpha(y_t - s_{t-m}) + (1-\alpha)\ell_{t-1}b_{t-1}$ $b_t = \beta^*(\ell_t / \ell_{t-1}) + (1-\beta^*)b_{t-1}$ $s_t = \gamma(y_t - \ell_{t-1}b_{t-1}) + (1-\gamma)s_{t-m}$	$\hat{y}_{t+h\|t} = \ell_t b_t^h s_{t-m+h_m^+}$ $\ell_t = \alpha(y_t / s_{t-m}) + (1-\alpha)\ell_{t-1}b_{t-1}$ $b_t = \beta^*(\ell_t / \ell_{t-1}) + (1-\beta^*)b_{t-1}$ $s_t = \gamma(y_t / (\ell_{t-1}b_{t-1})) + (1-\gamma)s_{t-m}$
$\mathbf{M_d}$	$\hat{y}_{t+h\|t} = \ell_t b_t^{\phi_h}$ $\ell_t = \alpha y_t + (1-\alpha)\ell_{t-1}b_{t-1}^{\phi}$ $b_t = \beta^*(\ell_t / \ell_{t-1}) + (1-\beta^*)b_{t-1}^{\phi}$	$\hat{y}_{t+h\|t} = \ell_t b_t^{\phi_h} + s_{t-m+h_m^+}$ $\ell_t = \alpha(y_t - s_{t-m}) + (1-\alpha)\ell_{t-1}b_{t-1}^{\phi}$ $b_t = \beta^*(\ell_t / \ell_{t-1}) + (1-\beta^*)b_{t-1}^{\phi}$ $s_t = \gamma(y_t - \ell_{t-1}b_{t-1}^{\phi}) + (1-\gamma)s_{t-m}$	$\hat{y}_{t+h\|t} = \ell_t b_t^{\phi_h} s_{t-m+h_m^+}$ $\ell_t = \alpha(y_t / s_{t-m}) + (1-\alpha)\ell_{t-1}b_{t-1}^{\phi}$ $b_t = \beta^*(\ell_t / \ell_{t-1}) + (1-\beta^*)b_{t-1}^{\phi}$ $s_t = \gamma(y_t / (\ell_{t-1}b_{t-1}^{\phi})) + (1-\gamma)s_{t-m}$

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 3Q2020

Variable 1	Variable 2	Correlation
S&P 500 Stock Price Index	Primary Credit	0.673966
S&P 500 Stock Price Index	BBB Corporate Yield	0.603757
S&P 500 Stock Price Index	**Dow Jones Total Stock Market Index**	**-0.967412**
S&P 500 Stock Price Index	**Home Price Index**	**-0.968985**
S&P 500 Stock Price Index	**Commercial Real Estate Price Index**	**-0.951132**
S&P 500 Stock Price Index	30-year Treasury Yield	-0.678498
S&P 500 Stock Price Index	1-month Treasury Yield	0.671867
S&P 500 Stock Price Index	3-month Treasury Yield	-0.60563
S&P 500 Stock Price Index	6-month Treasury Yield	0.673819
S&P 500 Stock Price Index	1-year Treasury Yield	0.664317
Primary Credit	BBB Corporate Yield	-0.719834
Primary Credit	30-year Mortgage Rate	-0.799184
Primary Credit	Prime Rate	-0.837624
Primary Credit	Dow Jones Total Stock Market Index	0.605907
Primary Credit	Home Price Index	0.641566
Primary Credit	Commercial Real Estate Price Index	0.629195
Primary Credit	US Average Retail Gasoline Price	-0.621026
Primary Credit	20-year Treasury Yield	0.786504
Primary Credit	10-year Treasury Yield	-0.792803
Primary Credit	**1-month Treasury Yield**	**0.992907**
Primary Credit	7-year Treasury Yield	0.891321
Primary Credit	3-month Treasury Yield	-0.824531
Primary Credit	5-year Treasury Yield	-0.827124
Primary Credit	**6-month Treasury Yield**	**0.9941**
Primary Credit	**3-year Treasury Yield**	**0.954757**
Primary Credit	**1-year Treasury Yield**	**0.987448**
Real GDP Growth	Nominal GDP Growth	0.944595
Real Disposable Income Growth	Nominal Disposable Income Growth	0.912142

BBB Corporate Yield	30-year Mortgage Rate	0.935211
BBB Corporate Yield	Prime Rate	0.735224
BBB Corporate Yield	Dow Jones Total Stock Market Index	-0.808697
BBB Corporate Yield	Home Price Index	-0.782667
BBB Corporate Yield	Commercial Real Estate Price Index	-0.747087
BBB Corporate Yield	US Average Retail Gasoline Price	0.737674
BBB Corporate Yield	20-year Treasury Yield	-0.833038
BBB Corporate Yield	10-year Treasury Yield	0.918534
BBB Corporate Yield	7-year Treasury Yield	-0.822879
BBB Corporate Yield	3-month Treasury Yield	0.755111
BBB Corporate Yield	5-year Treasury Yield	0.878411
BBB Corporate Yield	6-month Treasury Yield	-0.73971
BBB Corporate Yield	3-year Treasury Yield	-0.792973
BBB Corporate Yield	1-year Treasury Yield	-0.753331
30-year Mortgage Rate	Prime Rate	0.852403
30-year Mortgage Rate	Dow Jones Total Stock Market Index	-0.796386
30-year Mortgage Rate	Home Price Index	-0.802498
30-year Mortgage Rate	Commercial Real Estate Price Index	-0.800624
30-year Mortgage Rate	US Average Retail Gasoline Price	0.792515
30-year Mortgage Rate	30-year Treasury Yield	-0.675301
30-year Mortgage Rate	20-year Treasury Yield	-0.885362
30-year Mortgage Rate	**10-year Treasury Yield**	**0.993187**
30-year Mortgage Rate	7-year Treasury Yield	-0.897477
30-year Mortgage Rate	3-month Treasury Yield	0.877654
30-year Mortgage Rate	**5-year Treasury Yield**	**0.980525**
30-year Mortgage Rate	6-month Treasury Yield	-0.808582
30-year Mortgage Rate	3-year Treasury Yield	-0.866206
30-year Mortgage Rate	1-year Treasury Yield	-0.822763
Prime Rate	US Average Retail Gasoline Price	0.672069
Prime Rate	20-year Treasury Yield	-0.647833
Prime Rate	10-year Treasury Yield	0.834107
Prime Rate	7-year Treasury Yield	-0.804686
Prime Rate	**3-month Treasury Yield**	**0.992014**
Prime Rate	5-year Treasury Yield	0.905997
Prime Rate	6-month Treasury Yield	-0.8421
Prime Rate	3-year Treasury Yield	-0.843929
Prime Rate	1-year Treasury Yield	-0.849242
Dow Jones Total Stock Market Index	Home Price Index	0.858095

Dow Jones Total Stock Market Index	Commercial Real Estate Price Index	0.916741
Dow Jones Total Stock Market Index	US Average Retail Gasoline Price	-0.650372
Dow Jones Total Stock Market Index	30-year Treasury Yield	0.80706
Dow Jones Total Stock Market Index	20-year Treasury Yield	0.868758
Dow Jones Total Stock Market Index	10-year Treasury Yield	-0.812685
Dow Jones Total Stock Market Index	7-year Treasury Yield	0.826687
Dow Jones Total Stock Market Index	5-year Treasury Yield	-0.714512
Dow Jones Total Stock Market Index	6-month Treasury Yield	0.627523
Dow Jones Total Stock Market Index	3-year Treasury Yield	0.733529
Dow Jones Total Stock Market Index	1-year Treasury Yield	0.646358
Home Price Index	**Commercial Real Estate Price Index**	**0.956863**
Home Price Index	20-year Treasury Yield	0.861299
Home Price Index	10-year Treasury Yield	-0.818901
Home Price Index	7-year Treasury Yield	0.831178
Home Price Index	5-year Treasury Yield	-0.749526
Home Price Index	6-month Treasury Yield	0.663199
Home Price Index	3-year Treasury Yield	0.758496
Home Price Index	1-year Treasury Yield	0.681798
Commercial Real Estate Price Index	US Average Retail Gasoline Price	-0.632773
Commercial Real Estate Price Index	30-year Treasury Yield	0.706583
Commercial Real Estate Price Index	20-year Treasury Yield	0.912162
Commercial Real Estate Price Index	10-year Treasury Yield	-0.826755
Commercial Real Estate Price Index	7-year Treasury Yield	0.844946
Commercial Real Estate Price Index	5-year Treasury Yield	-0.749397
Commercial Real Estate Price Index	6-month Treasury Yield	0.649677
Commercial Real Estate Price Index	3-year Treasury Yield	0.760013
Commercial Real Estate Price Index	1-year Treasury Yield	0.671024
US Average Retail Gasoline Price	20-year Treasury Yield	-0.711497
US Average Retail Gasoline Price	10-year Treasury Yield	0.761836
US Average Retail Gasoline Price	7-year Treasury Yield	-0.75376
US Average Retail Gasoline Price	3-month Treasury Yield	0.678224
US Average Retail Gasoline Price	5-year Treasury Yield	0.742136
US Average Retail Gasoline Price	6-month Treasury Yield	-0.644487
US Average Retail Gasoline Price	3-year Treasury Yield	-0.731634
US Average Retail Gasoline Price	1-year Treasury Yield	-0.667248
30-year Treasury Yield	**20-year Treasury Yield**	**0.990213**
30-year Treasury Yield	10-year Treasury Yield	-0.729118
30-year Treasury Yield	7-year Treasury Yield	0.861837

30-year Treasury Yield	3-year Treasury Yield	0.617489
20-year Treasury Yield	10-year Treasury Yield	-0.890172
20-year Treasury Yield	**7-year Treasury Yield**	**0.970739**
20-year Treasury Yield	3-month Treasury Yield	-0.661806
20-year Treasury Yield	5-year Treasury Yield	-0.825013
20-year Treasury Yield	6-month Treasury Yield	0.805909
20-year Treasury Yield	3-year Treasury Yield	0.899772
20-year Treasury Yield	1-year Treasury Yield	0.82988
10-year Treasury Yield	7-year Treasury Yield	-0.899843
10-year Treasury Yield	3-month Treasury Yield	0.863082
10-year Treasury Yield	**5-year Treasury Yield**	**0.981669**
10-year Treasury Yield	6-month Treasury Yield	-0.800489
10-year Treasury Yield	3-year Treasury Yield	-0.86232
10-year Treasury Yield	1-year Treasury Yield	-0.815358
1-month Treasury Yield	7-year Treasury Yield	0.754723
1-month Treasury Yield	**6-month Treasury Yield**	**0.995189**
1-month Treasury Yield	3-year Treasury Yield	0.926513
1-month Treasury Yield	**1-year Treasury Yield**	**0.98806**
7-year Treasury Yield	3-month Treasury Yield	-0.811114
7-year Treasury Yield	5-year Treasury Yield	-0.886914
7-year Treasury Yield	6-month Treasury Yield	0.911055
7-year Treasury Yield	**3-year Treasury Yield**	**0.977084**
7-year Treasury Yield	1-year Treasury Yield	0.927263
3-month Treasury Yield	5-year Treasury Yield	0.932331
3-month Treasury Yield	6-month Treasury Yield	-0.826842
3-month Treasury Yield	3-year Treasury Yield	-0.836661
3-month Treasury Yield	1-year Treasury Yield	-0.83493
5-year Treasury Yield	6-month Treasury Yield	-0.829833
5-year Treasury Yield	3-year Treasury Yield	-0.871834
5-year Treasury Yield	1-year Treasury Yield	-0.841793
6-month Treasury Yield	**3-year Treasury Yield**	**0.972936**
6-month Treasury Yield	**1-year Treasury Yield**	**0.998038**
3-year Treasury Yield	**1-year Treasury Yield**	**0.983307**

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