Macroeconomic Forecasts, 2Q2021

Domestic Metrics

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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 July 8, 2021) approximately 33.7 million confirmed cases, with over 600,000 deaths[1]. As we exit from this crisis, many are touting the national economy as being in a much better place: in late 2019, we were on the brink of a likely recession, and, in retrospect, COVID may have simply been the straw (or bale of hay) to break the proverbial camel's back. Now, many are contending that the US is on the cusp of a "booming recovery" while others are concerned about a recurrence of virus mutations[2], rising inflation[3], a labor shortage[4], social unrest attributed to wealth concentration[5], rising home prices[6] and a glut of commercial real estate[7]. We also expect these issues to be compounded depending on how the Fed', the White House, and central banks around the world continues to address these problems.

State of Affairs

The US economy is in significantly better shape than it was one year ago. The economy during 2Q2020 saw large spikes in unemployment, huge decreases in labor force participation and massive shut downs within the hospitality and entertainment sector. The economy, however, is not "back to normal" and we do not anticipate a return to the pre-COVID economic conditions for several quarters (perhaps as few as four, but the economy could move along with very small incremental gains for 3 or 4 years.) Figure 1 shows the trend in the change in unemployment since the beginning of each the last five economic recessions. The 2008 recessions had slow recovery (94 months) relative to 2001 and 1991 recessions (74 months). During the 1981 recession – which is often referred to as a V-shaped recovery – the unemployment rate did not return to a pre-recession unemployment rate for 35 months. The unemployment rate during the COVID-recession is trending similarly to the 1981 recession but has started to plateau similar to what we see for the 1991 and 2001 recession.

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[1] https://www.nytimes.com/interactive/2021/us/covid-cases.html

[2] https://www.nbcnews.com/news/us-news/current-state-covid-19-united-states-5-charts-n1273021 and https://www.kff.org/coronavirus-covid-19/poll-finding/kff-covid-19-vaccine-monitor-june-2021/

[3] See https://www.bloomberg.com/news/articles/2021-07-07/fed-officials-saw-progress-toward-taper-move-minutes-show

[4] https://www.businessinsider.com/some-business-owners-are-blaming-workers-for-the-labor-shortage-2021-7

[5] See https://www.washingtonpost.com/us-policy/2019/02/08/wealth-concentration-returning-levels-last-seen-during-roaring-twenties-according-new-research/ and https://finance.yahoo.com/news/super-richs-wealth-concentration-surpasses-gilded-age-levels-210802327.html

[6] See https://www.marketwatch.com/story/home-prices-rise-at-fastest-pace-since-2005-as-housing-grows-more-expensive-in-every-part-of-the-country-11621948739

[7] See https://www.esri.com/about/newsroom/publications/wherenext/covid-rearranges-commercial-real-estate/

Figure 1: Percent Change in Unemployment Since Start of Recession
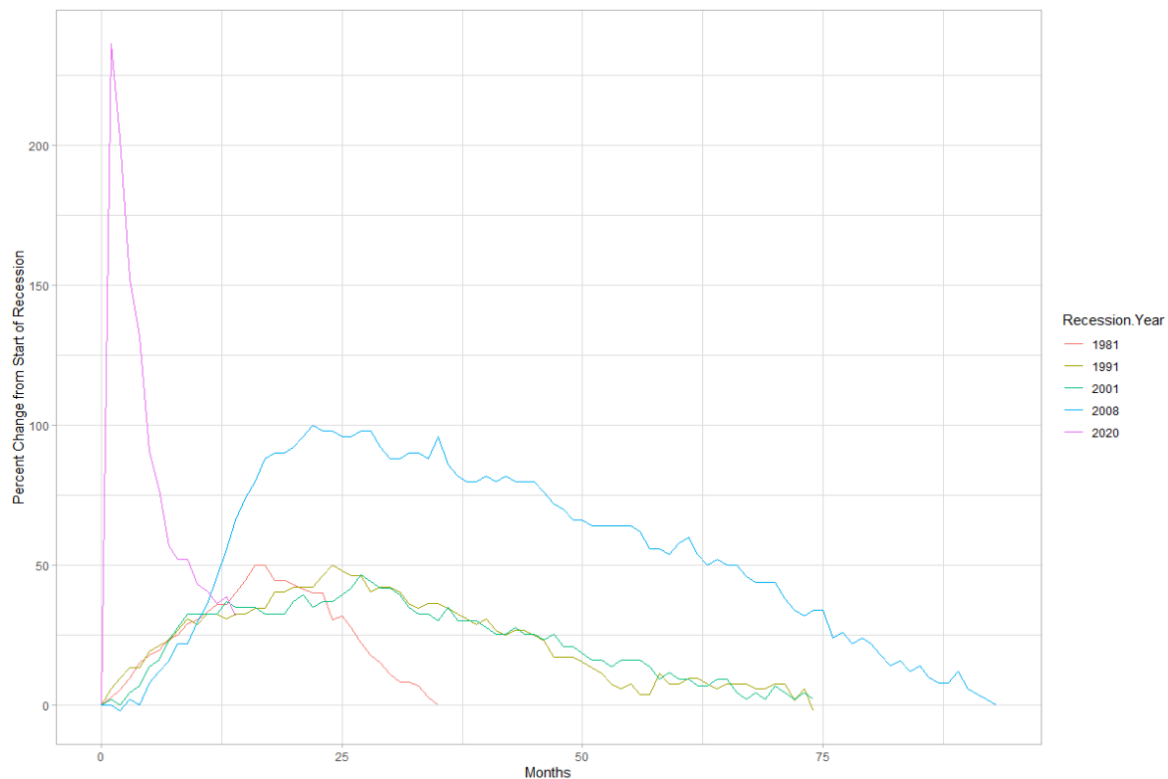
Source: Fred St. Louis; Authors' Calculations

As of July, 2021, approximately 47.6% of the US population was fully vaccinated for COVID[8]. There is considerable variation in vaccination rates between states. Texas is leading the Southeast with the percentage of population with one COVID vaccine dose at 49% -- a sizeable 1300 basis-point difference than Mississippi at 36%. The percentage of the population in each state that is fully vaccinated is, on average, 600 bp smaller than the percentage of the population with a single dose. Texas also leads the way in the Southeast with 42% of its populations fully vaccinated followed by Tennessee at 38% and Georgia at 37%. For reference, New York has 55% of its population fully vaccinated and Colorado has 52% of its population fully vaccinated[9].

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[8] https://www.beckershospitalreview.com/public-health/states-ranked-by-percentage-of-population-vaccinated-march-15.htm
[9] https://usafacts.org/visualizations/covid-vaccine-tracker-states/

Figure 2: Percent of Population with One Dose of COVID Vaccine (July, 2021)

Source: https://usafacts.org/visualizations/covid-vaccine-tracker-states/
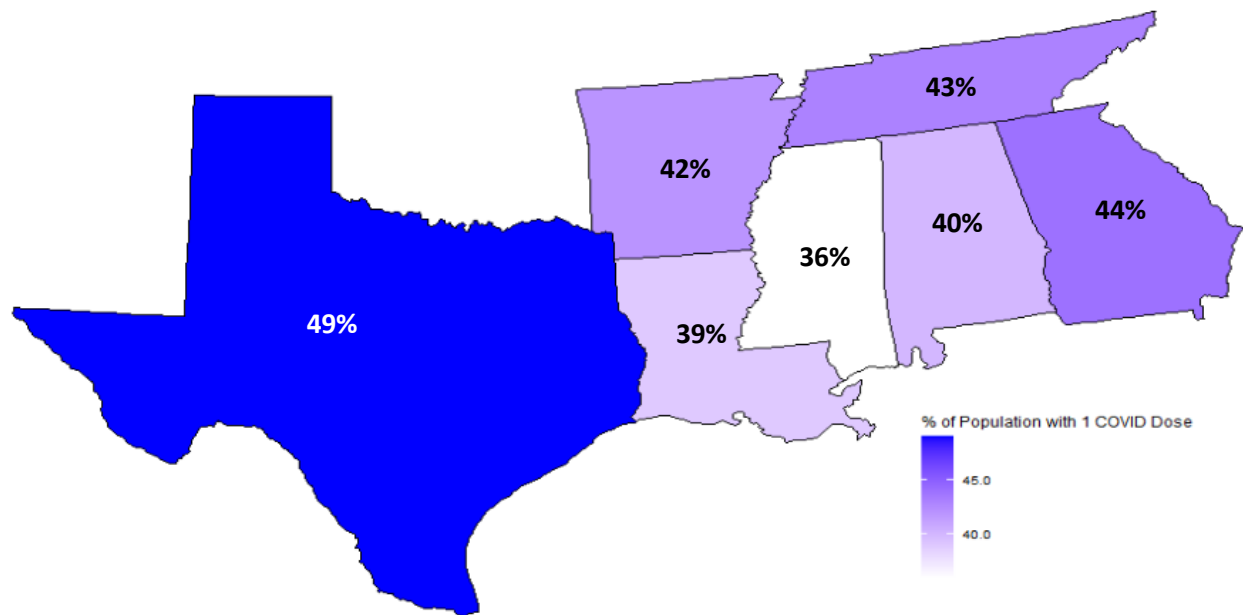
Figure 3: Percent of the Population with Two Doses (or Fully Vaccinated) for COVID (July, 2021)

Source: https://usafacts.org/visualizations/covid-vaccine-tracker-states/
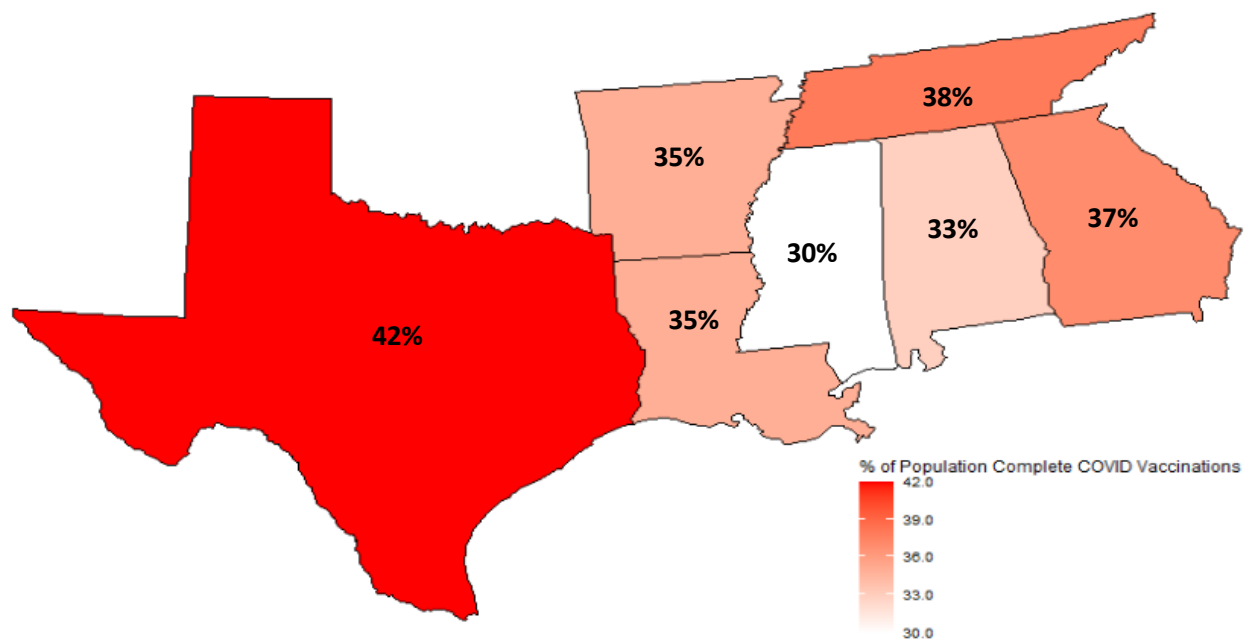
Figure 4 shows the number of new COVID-19 cases by day, a 7-day moving average (red), and a 14-day moving average (green) of new cases. When the 7-day average falls below the 14-day average, we are experiencing a drop in cases. When, however, the 7-day moving average trends above the 14-day moving average, the US is experiencing an up-tick in the number of cases. The 7-day and 14-day moving averages for the US are trending downward. The fourth wave we anticipated was smaller in magnitude and length of time than the second wave the US experienced during Summer, 2020. The current risk is weighted primarily towards a surge in cases due to the "Delta" variant[10], which appears to be more resistant to the current vaccines.

Other countries, such as India and the UK, are still experiencing outbreaks and up-ticks in the number of new cases. This is particularly troubling considering the role that supply-chain break-downs contribute to domestic inflation[11]. There is increasing evidence that price surges and shortages throughout the supply chain is playing a key role in the current inflationary trend in the US[12].

Figure 4: Number of new COVID-19 cases in US (blue), 7-day (red) and 14-day (green) moving average
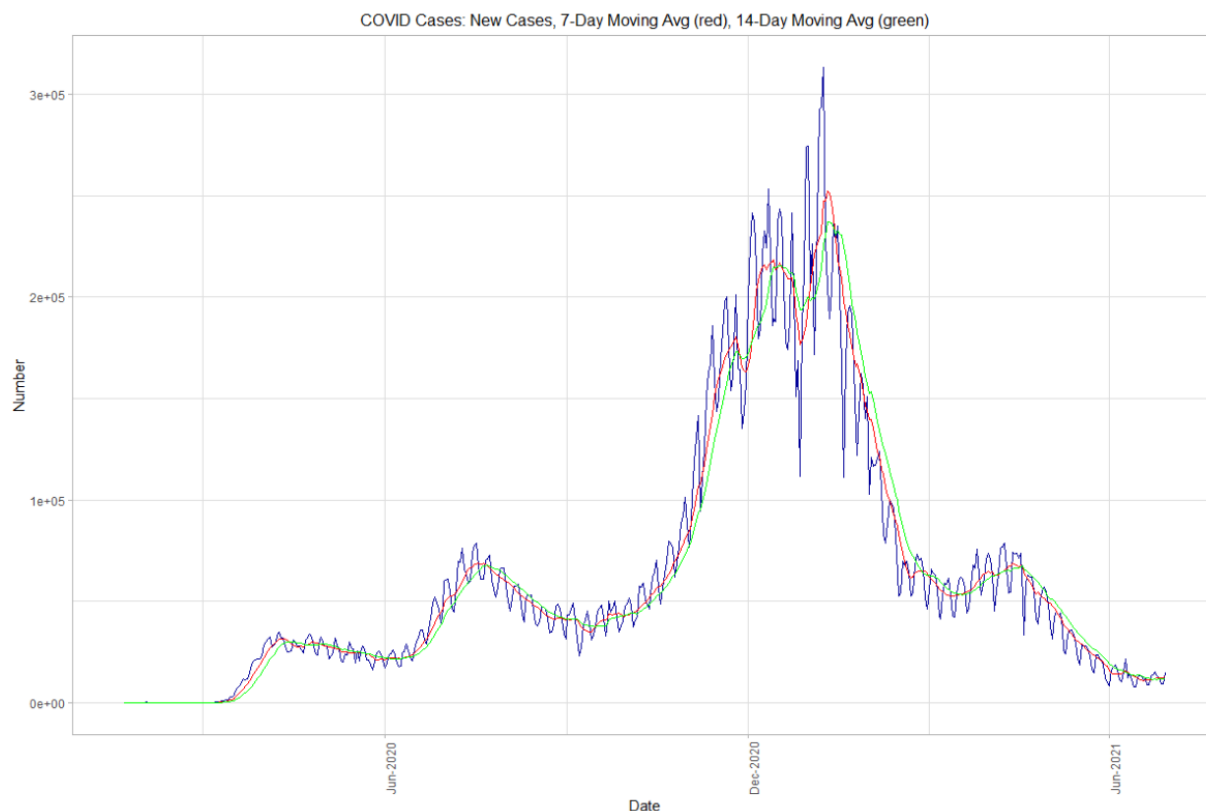
Source: https://covid.cdc.gov/covid-data-tracker/#trends_dailytrendscases

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[10] https://www.ft.com/content/0b3da41e-6390-4f4b-866c-da5c6aec7f5e; https://www.scientificamerican.com/article/how-dangerous-is-the-delta-variant-and-will-it-cause-a-covid-surge-in-the-u-s/

[11] https://www.bloomberg.com/opinion/articles/2021-02-25/inflation-is-more-about-supply-chain-shortages-than-price-hikes

[12] https://www.icis.com/asian-chemical-connections/2021/06/inflation-pressures-build-on-prolonged-supply-chain-disruptions/

Figure 5: New COVID Cases (7-day moving average) by Country: Africa, India, France, Canada and United Kingdom

Source: https://covid.cdc.gov/covid-data-tracker/#trends_dailytrendscases; https://ourworldindata.org/explorers/coronavirus-data-explorer
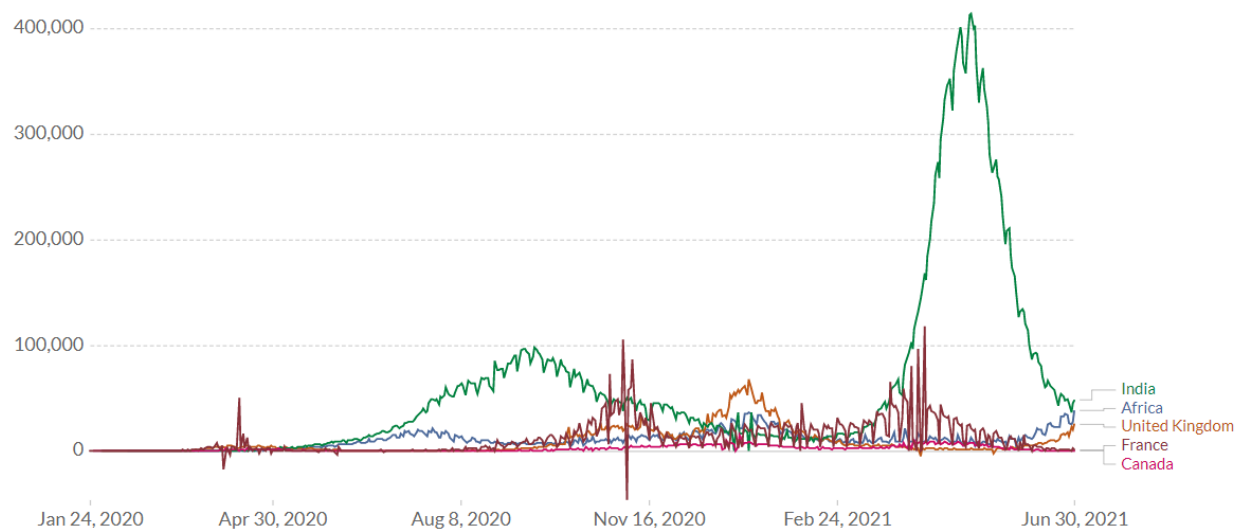
COVID and Recovery

Although our assumption is that the economic recovery is a function of COVID vaccinations, there is some evidence that the recovery is being hampered by hyper-vigilance of different cohorts and that states with lower rates of vaccination are moving forward with recovery at a different pace than states with higher vaccinations rates (although it is impossible to identify the direction of the relationship).

For example, Figure 6 and Figure 7 show the relationship between labor force participation rates and the percentage of the population with 1 dose and 2 doses of the COVID vaccine. Although both figures show a positive relationship, the correlation between these two variables is very weak. Figure 8 shows the relationship between the unemployment rate (by state) and the percentage of the population with 2 doses of the COVID vaccine; this figure shows a small positive relationship (although also very weakly correlated). States with a greater percentage of the population that are fully vaccinated are experiencing higher rates of unemployment. Figure 9 shows the relationship between Real GDP growth (2020Q4 to 2021Q1) and the percentage of the population with 2 doses of the COVID vaccine; this relationship shows a weak negative relationship. ***States with higher vaccination rates are experiencing smaller real GDP growth rates.***

It is possible that the states where the population is more aware of COVID or is more cautious about exposure to COVID are more likely to vaccinate but less likely engage in the market. The large differences between vaccination rates among states and the puzzling relationships between economic growth and vaccination rates is corresponding to a labor market that is moving in fits-and-jerks and will likely lead to a prolonged dis-equilibrium between employers and employees.

Figure 6: Labor Force Participation and Percent of Population with Single COVID Dose
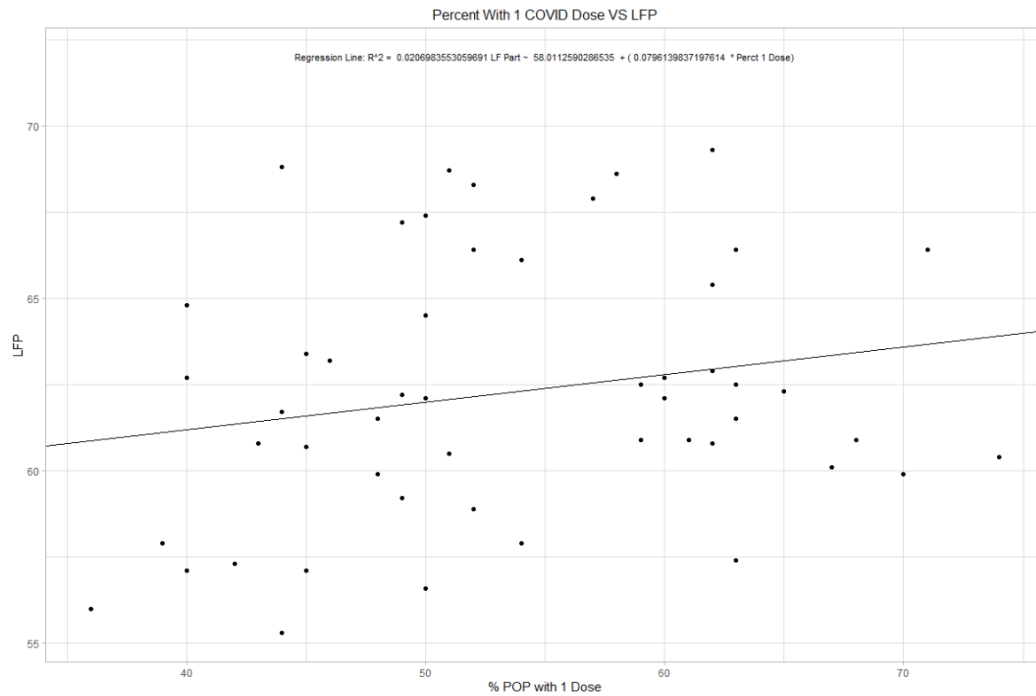
Source: Fred St. Louis; https://usafacts.org/visualizations/covid-vaccine-tracker-states/

Figure 7: Labor Force Participation and Percentage of Population with 2 COVID Doses
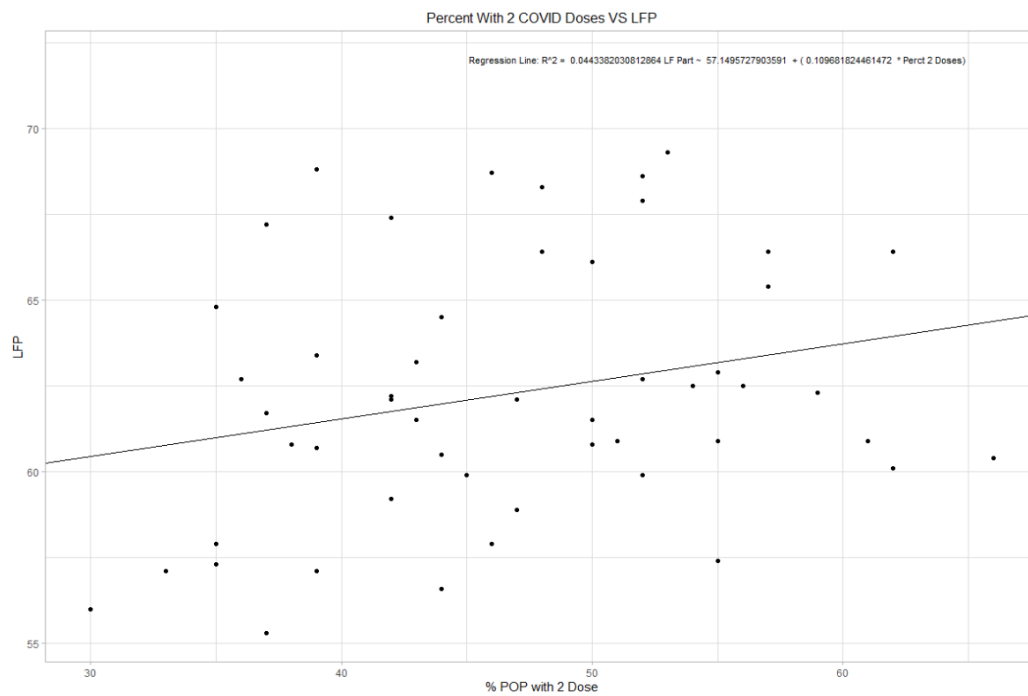
Source: Fred St. Louis; https://usafacts.org/visualizations/covid-vaccine-tracker-states/

Figure 8: Unemployment Rate and Percentage of Population with 2 COVID Doses

Percent With 2 COVID Doses VS Unemployment Rate
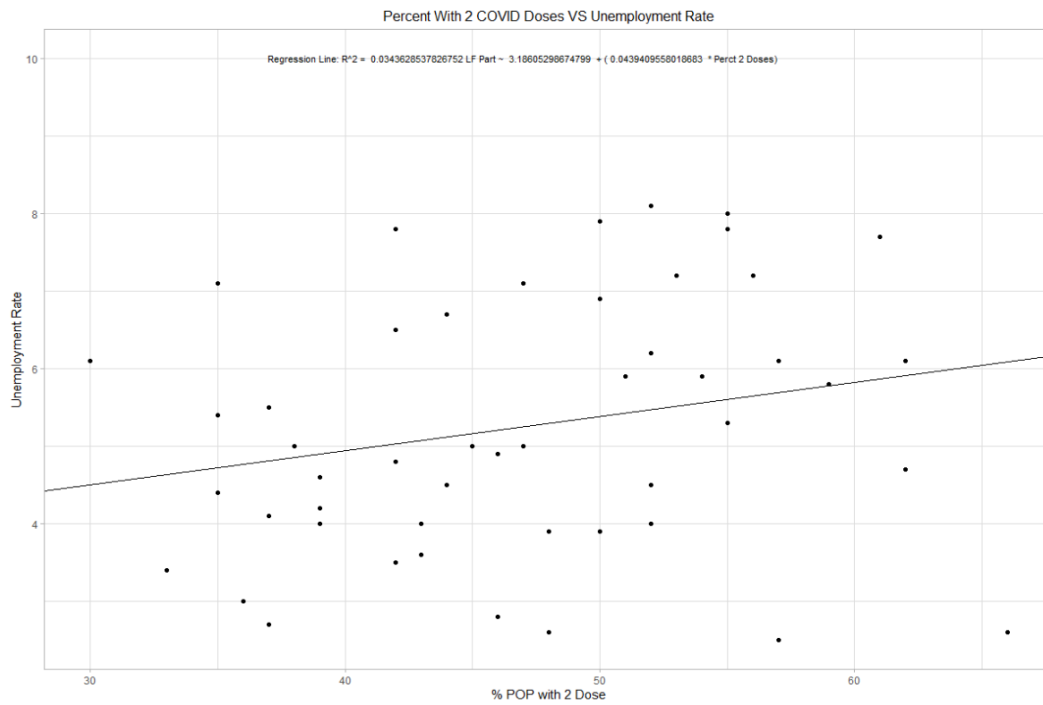
Source: Fred St. Louis; https://usafacts.org/visualizations/covid-vaccine-tracker-states/

Figure 9: Real GDP Growth and Percentage of Population with 2 COVID Doses

Percent With 2 COVID Doses VS Real GDP Growth
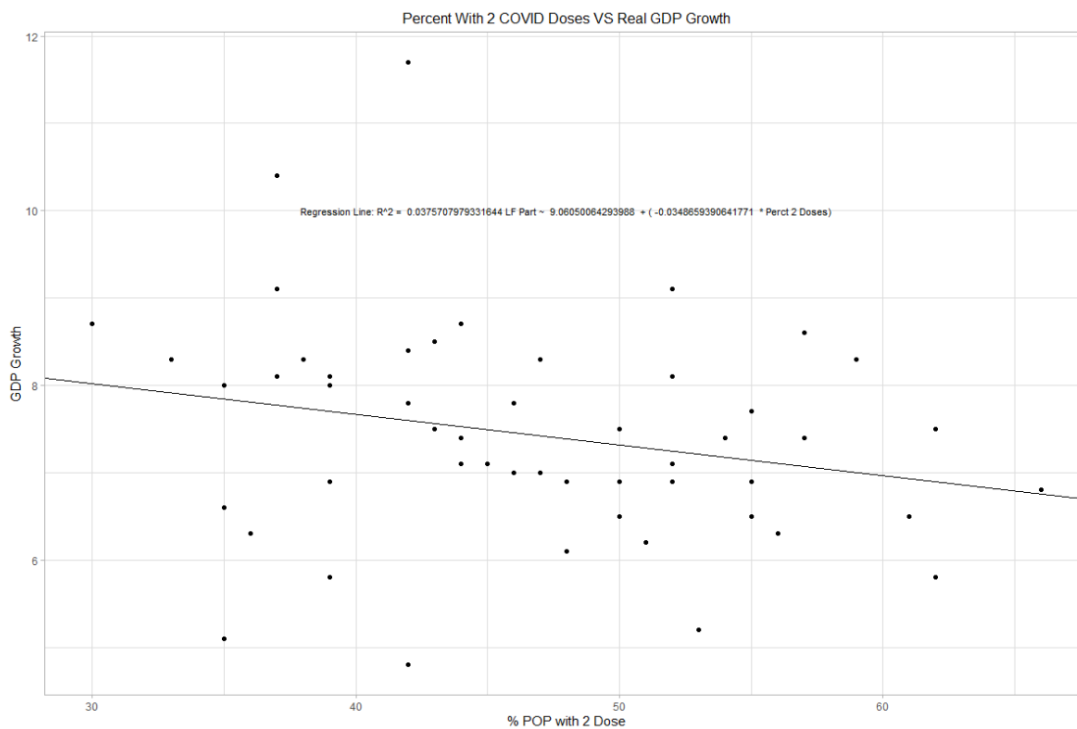
Source: Fred St. Louis; https://usafacts.org/visualizations/covid-vaccine-tracker-states/

Inflation

Inflation is, historically, a monetary phenomenon, driven by expansionary monetary policy and quantitative easing. The connection between "easy" money and inflation has been relaxed since the 2008 recession when the Federal Reserve engaged in extensive quantitative easing without pushing the economy into an inflationary situation. It is now a concern (expressed by the Fed') that the trend in housing prices, lumber prices and the upward trend in consumer products is feeding an overall inflationary trend.

Energy Prices: Oil and Natural Gas

The US economy has experienced inflationary trends during periods of rapid increases in the prices of underlying commodities; oil price shocks in the mid 1970's and late 70's lead to significant inflationary trends[13]. However, changes to Federal Reserve monetary policy throughout the 1990's contributed to a lack of inflationary impacts of oil price shocks in the mid 1990's[14].

Figure 10: Year-over-Year Changes: European Brent Crude Price

Source: Fred St. Louis

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[13] https://www.stlouisfed.org/publications/regional-economist/january-2001/rising-oil-prices-and-economic-turmoil-must-they-always-go-hand-in-hand
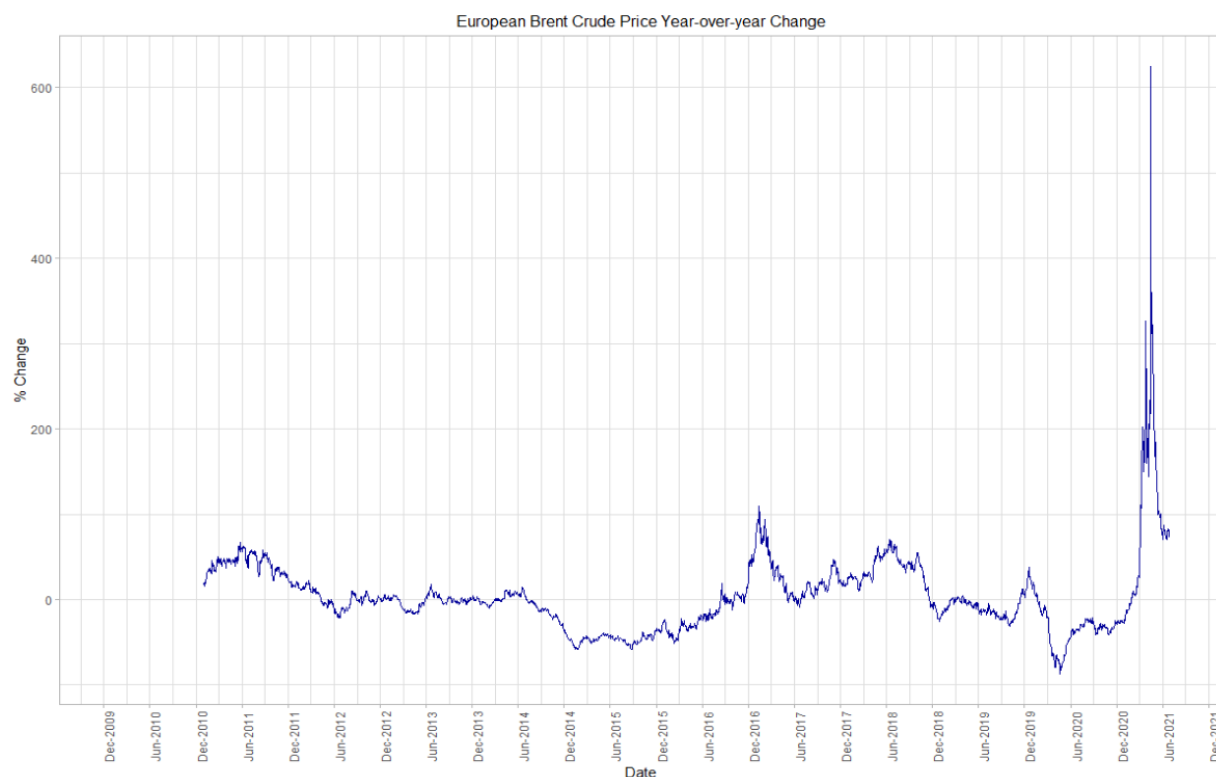
[14] ibid

The year-over-year changes in Brent crude prices are showing a return to normal after the price shock in May. However, the change in prices has not converged to average levels prior to December 2020. First, the Colonial Pipeline hack[15] caused the company to "shut the valves", so to speak, decreasing supply and causing prices to spike. Second, the push to "return to normal" has been accompanied by an increase in the number of vehicle miles traveled, corresponding to an increase in the demand for gas (see Figure 11.) The decrease in supply and increase in demand has pushed oil prices up.

Figure 11: Vehicle Miles Traveled (US)
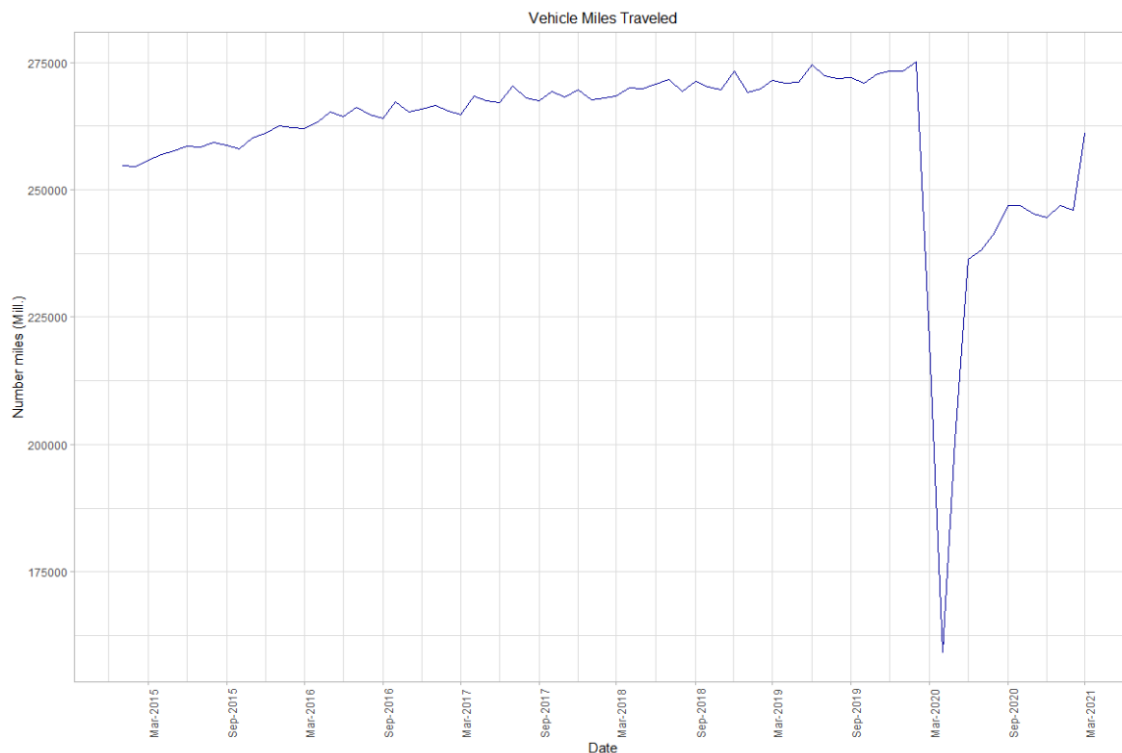
Source: Fred St. Louis

The price changes in crude might be contributing to an inflationary trend. Figure 12 shows the relationship between the % change in CPI (inflation) and the % change in European Brent Crude prices (2010-2020). There is a strong linear relationship between the percent change in Brent crude prices and the percent change in the CPI (R^2 =0.74). There is a smaller and less significant relationship between changes in CPI and changes in the price of natural gas (see Figure 14).

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[15] https://www.reuters.com/business/colonial-pipeline-ceo-tells-senate-cyber-defenses-were-compromised-ahead-hack-2021-06-08/

Figure 12: Relating Inflation to the % Change in Oil Prices
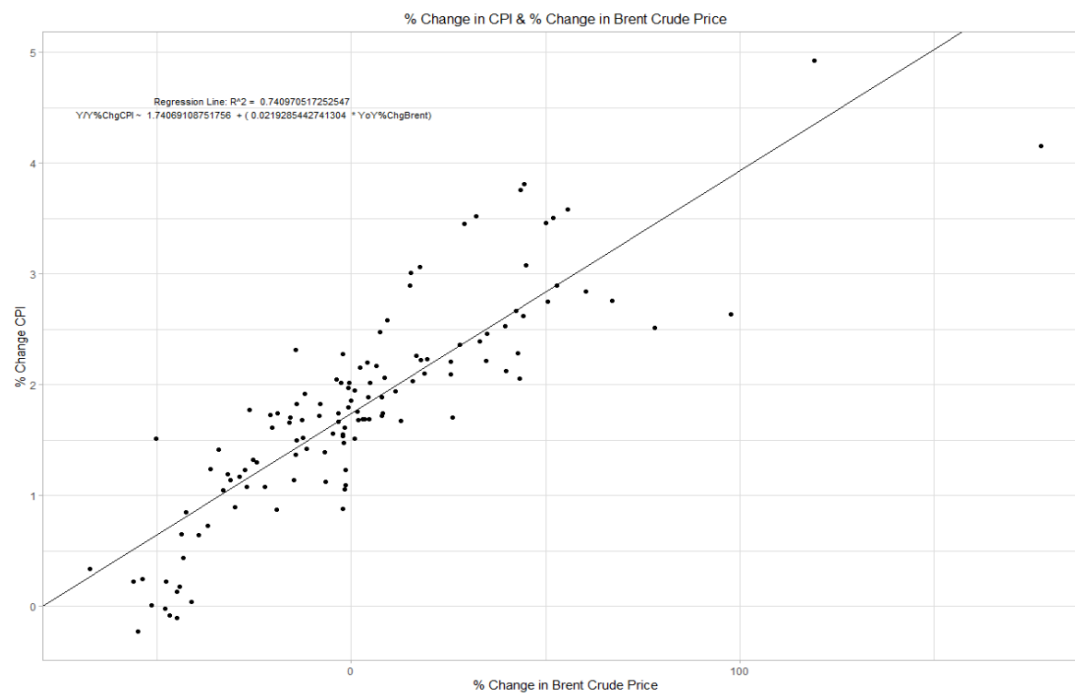
Source: FRED St. Louis

Figure 13: Year-Over-Year Change in Natural Gas Price
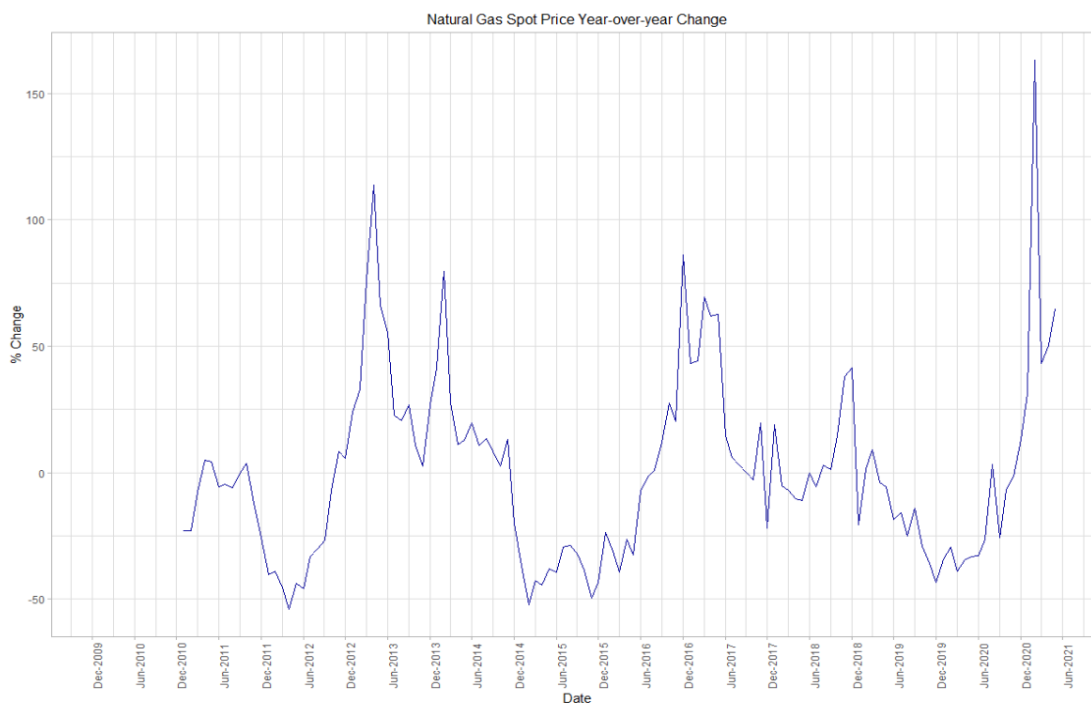
Source: FRED St. Louis

Figure 14: Percent Change in Natural Gas Prices and Percent Changes in CPI

% Change in CPI & % Change in Natrual Gas Prices

Regression Line: R^2 = 0.0630280290514922
Y/Y%ChgCPI ~ 1.7783128285215 + (0.00685011889803321 * YoY%ChgNaturalGas)
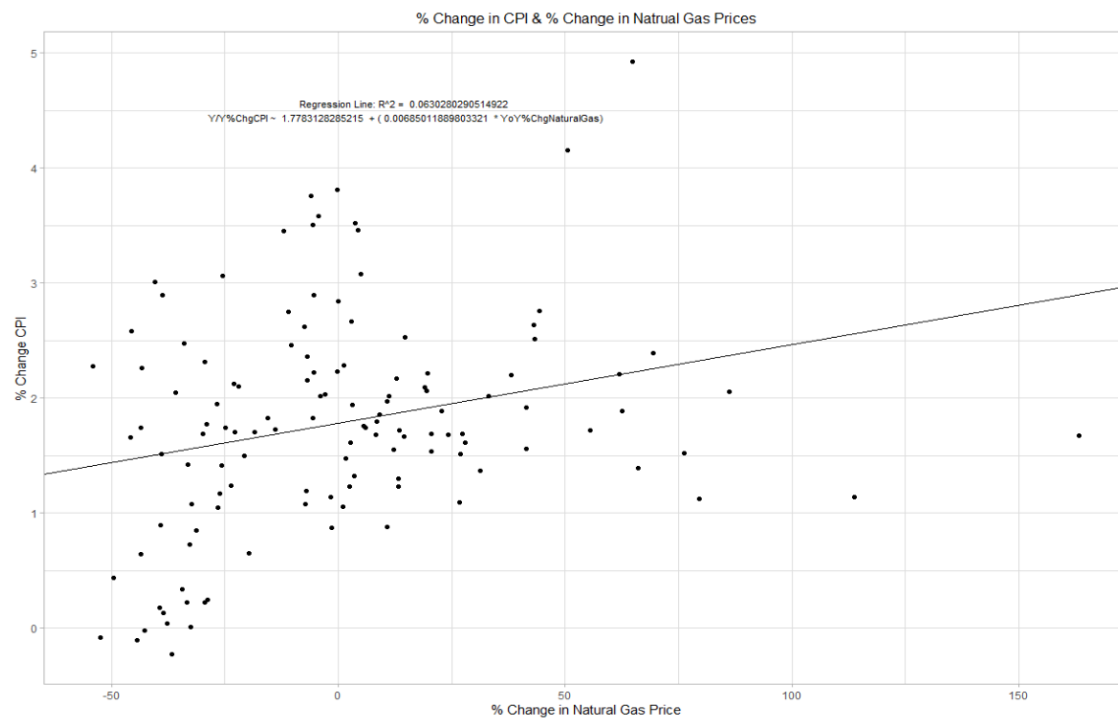
Source: FRED St. Louis

Figure 15: Percent Change in Brent Crude Prices Versus Percent Change in Natural Gas Prices

% Change in Brent Crude & % Change in Natrual Gas Prices

Regression Line: R^2 = 0.165635528162302
YoY%ChgNatGas ~ -0.35472642949175 + (0.409616507869464 * YoY%ChgBrent)
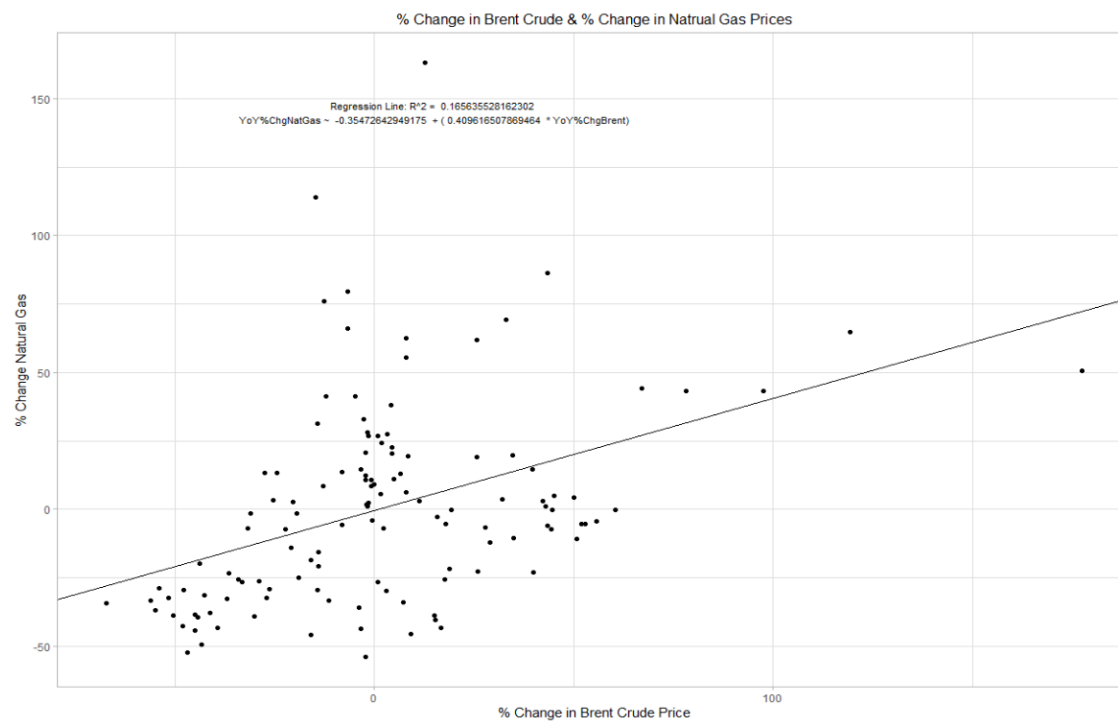
Source: FRED St. Louis

Figure 16, Figure 17, and Figure 18 each show historic inflation calculated by year-over-year change in the consumer price index[16] (CPI: All Cities). The time sequence in these graphs shows the number of months since the start of the series (1/1/2010). For example, the inflation rate at time period 50 (~1.30%), is the rate of inflation experienced in March, 2014. Each figure shows the actual rate of inflation (black line) along with a 36-period forecast rate of inflation (blue line). The blue-line forecast is shadowed by 80% and 95% confidence intervals. The forecasts are built using 12, 24 or 36-period moving averages. Given that the Federal Reserve Board of Governors released a report claiming that the Fed' would be adhering to the Taylor Rule 2% inflation target using a "longer time horizon"[17], we feel that the 24 and 36-period moving-average forecasts are more likely to reflect their reluctance to engage in contractionary monetary policy even if inflation rates jump above 2%. As such, ***we are likely to see short-term inflation rates jump up to ~3% before the Fed' responds with a 25 – 50 basis point increase in the Federal Funds target rate***. ***We have confidence that the Fed's response will be at the tail-end of 4Q2021 or at the start of 1Q2022. We believe that the changing perception of the Fed's Board (as is shown with the Dot Plot) is signaling the board's willingness to change rates sooner rather than later.***

Figure 16: Inflation Forecasts (ARIMA Model with 12-period Moving Average)
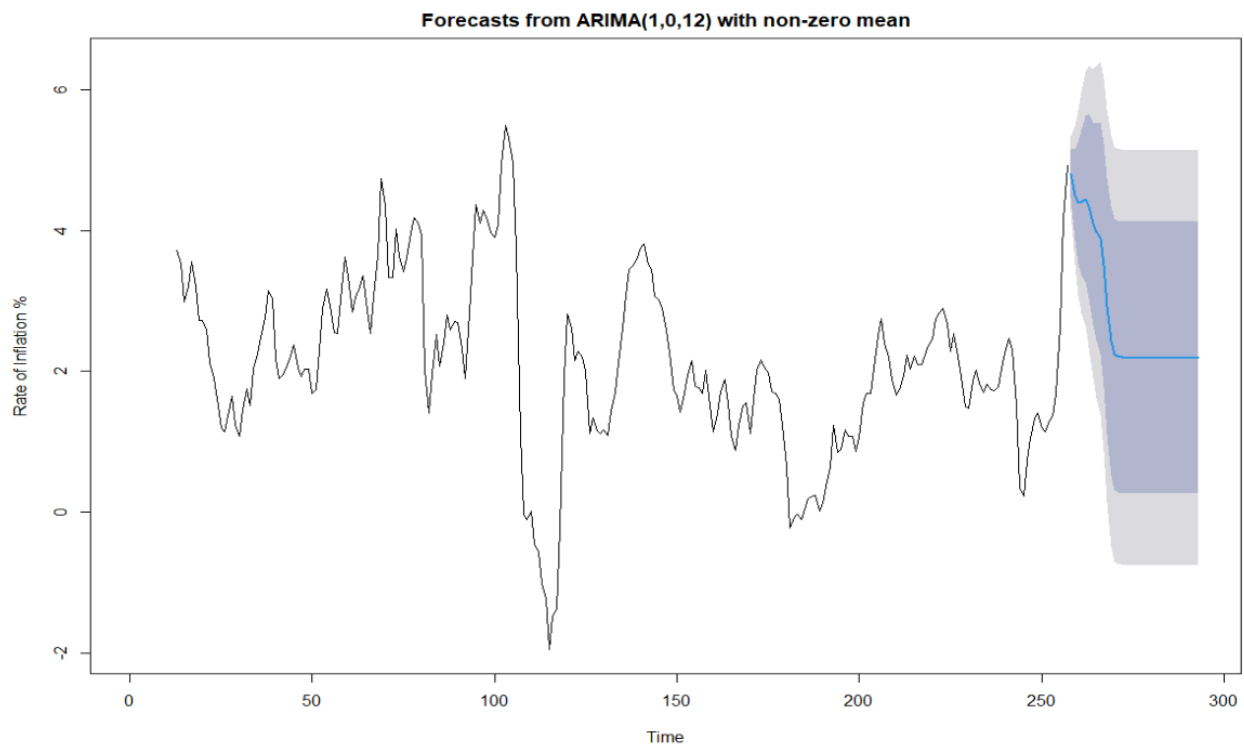
Source: Authors' calculations

Figure 17: Inflation Forecasts (ARIMA Model with 24-period Moving Average)
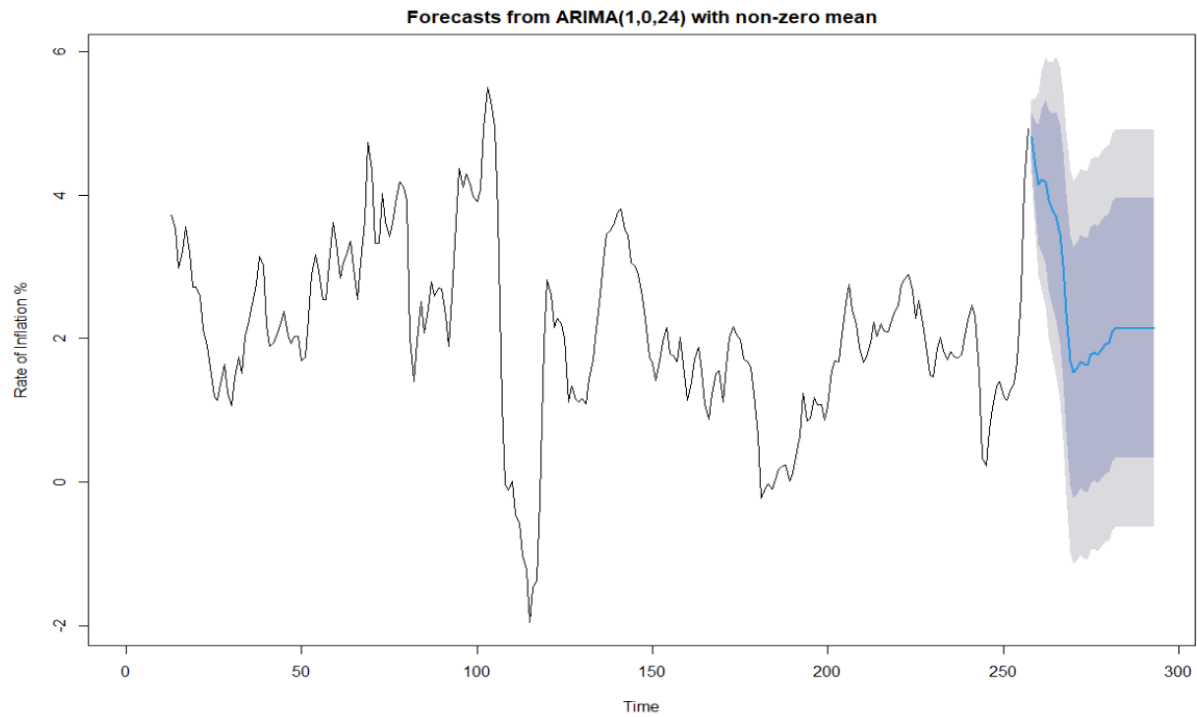
Source: Authors' calculations

Figure 18: Inflation Forecasts (ARIMA Model with 36-period Moving Average
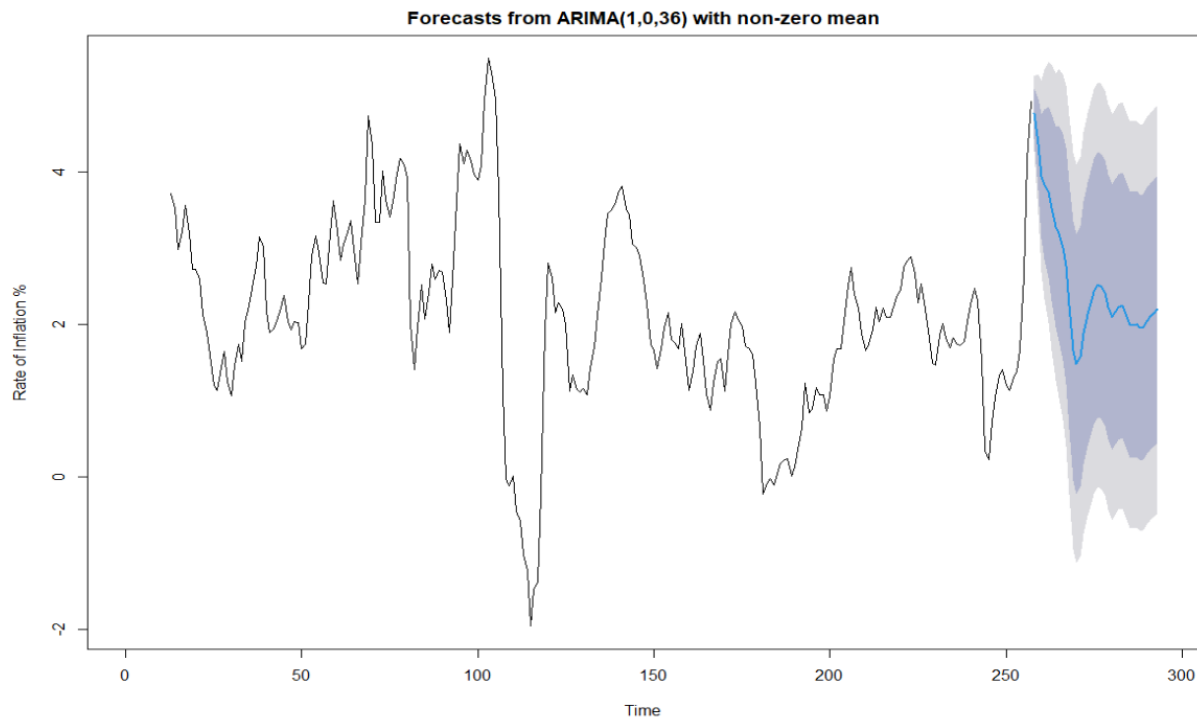
Source: Authors' calculations

Housing & Evictions

The information from the PULSE survey (Census) reveals that the economy is still in very precarious position with respect to mortgage and evictions. Households in the Southeastern US (Alabama, Arkansas, Mississippi, Georgia, Texas, Tennessee and Louisiana) still have shown a high predicted likelihood of eviction or foreclosure; nearly one-in-ten (on average) households are expressing either a very high or somewhat high likelihood of being evicted within the next four weeks months. Nearly 31% of households in the Southeast (see Figure 21) express very high or somewhat high difficulty in making regular payments to monthly bills and expenses, e.g., credit cards, utilities, car loans or other revolving debt payments.

Figure 19: Percentage of Participants Who Expressed They are Very or Somewhat Likely to be Evicted in the Next 4 Weeks (Week Ending June 15, 2021)
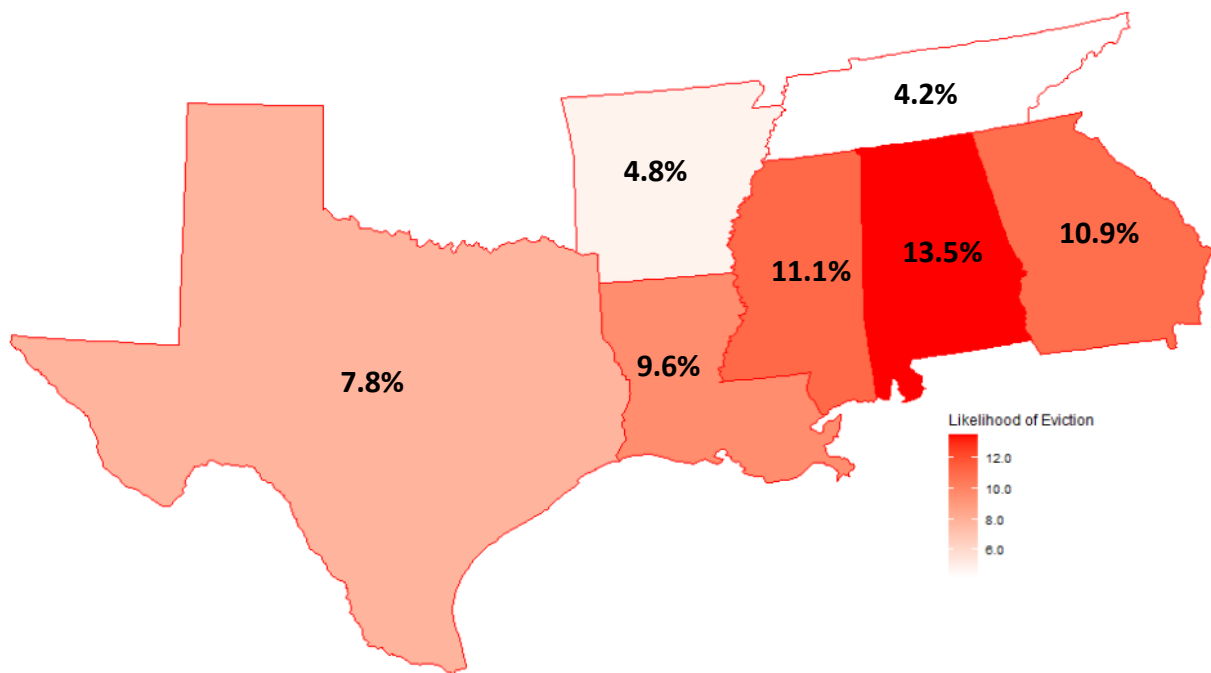
Source: Census Pulse Survey

We've seen a sizable decrease in the percentage of households that express fear about being evicted (down from ~ 30% in Q1). The recent ruling by the Supreme Court staying the eviction moratorium[18] will decrease the actual evictions for the time being. We are also seeing a decrease in the percentage of households expressing fears that they will lose income within the next 4 weeks (see Figure 20).

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[18] *https://www.supremecourt.gov/opinions/20pdf/20a169_4f15.pdf*

Figure 20: Percentage of Participants Who Expressed They are Very or Somewhat Likely to Experience a Loss of Income the Next 4 Weeks (Week Ending June 15, 2021)
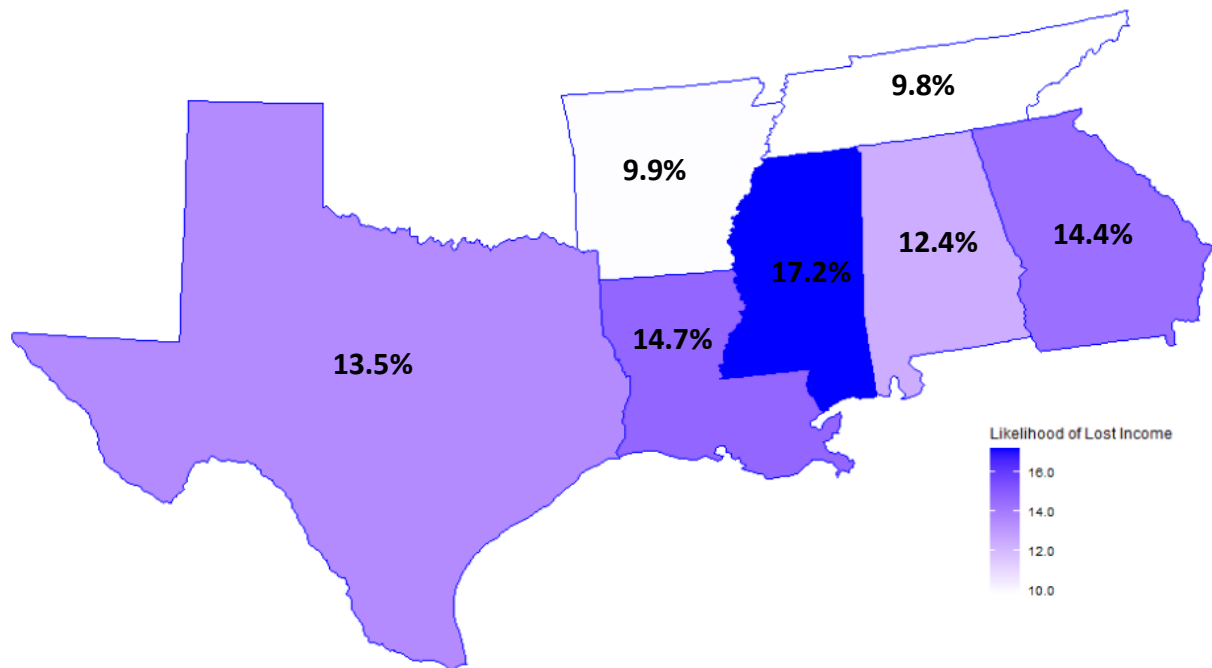
Source: Census Pulse Survey

Figure 21: Percentage of Participants Who Expressed They are Very or Somewhat Likely to Miss A Regular Payment (Debt) the Last 7 Days (Week Ending June 15, 2021)
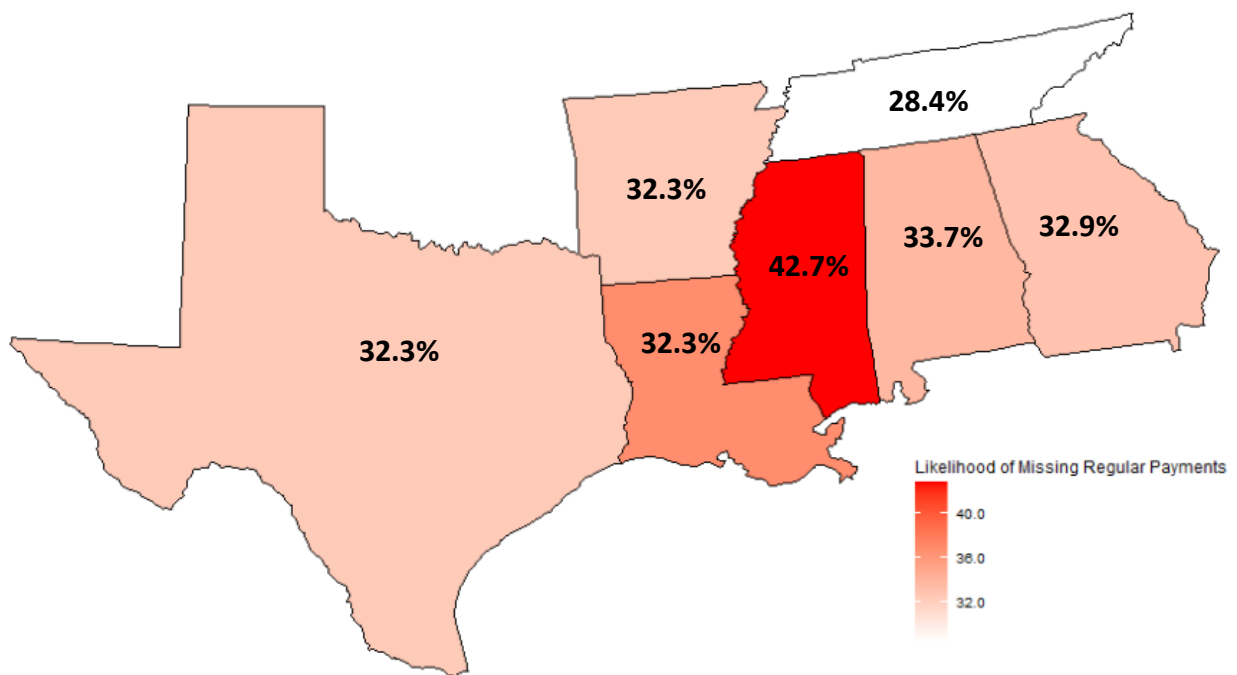
Source: Census Pulse Survey

Table 1: Percentage of Households Spending Received Stimulus Checks for Different Uses (June 9 - 21, 2021)

Stimulus payment uses	% of Households Spending Money By Category
Food (groceries, eating out, take out)	27.16%
Clothing (clothing, accessories, shoes)	30.87%
Household supplies or personal care products	27.05%
Household items (TV, electronics, furniture, appliances)	44.89%
Recreational goods (sports and fitness equipment, bicycles, toys, games)	50.25%
Rent	19.44%
Mortgage (scheduled or monthly)	20.74%
Utilities and telecommunications (natural gas, electricity, cable, internet, cellphone)	20.09%
Vehicle payments (scheduled or monthly)	15.73%
Paying down credit card, student loans, or other debts	12.47%
Charitable donations or giving to family members	41.74%
Savings or investments	8.72%
Other	38.48%

Source: https://www.census.gov/data/tables/2021/demo/hhp/hhp32.html

The Census Pulse survey[19] queried households regarding how they were spending their "American Recovery Plan Act" stimulus checks. Table 1 shows the percentage of households identifying categories of spending between June 9, 2021 and June 21, 2021. Households were allowed to identify as many categories as appropriately captured how they spent their stimulus -- the average household identified slightly more than 3 categories. Approximately 20% of households spent stimulus checks on rent and more than 20% of households spent money on mortgages – over 20% of households spent some of the stimulus money on their house/apartment/condo/living arrangements.

The inventory of homes on the market has decreased substantially during the last year. Although the market typically experiences fluctuations that correspond to the school year the changes in inventories for 2021 have been a dramatic departure from how the market has moved in the past. Figure 22 shows the year-over-year changes in inventory in the United States.

The huge decrease in housing inventory contributed to a dramatic spike in median home prices. There are usually increases in home prices that are consistent with an increase in demand June through August. However, the median sales price for 2021 has trended at a pace that is nearly twice the typical rate of change for this time of the year.

Figure 22: Housing Inventory per MSA

Source: Zillow

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[19] https://www.census.gov/data/tables/2021/demo/hhp/hhp26.html
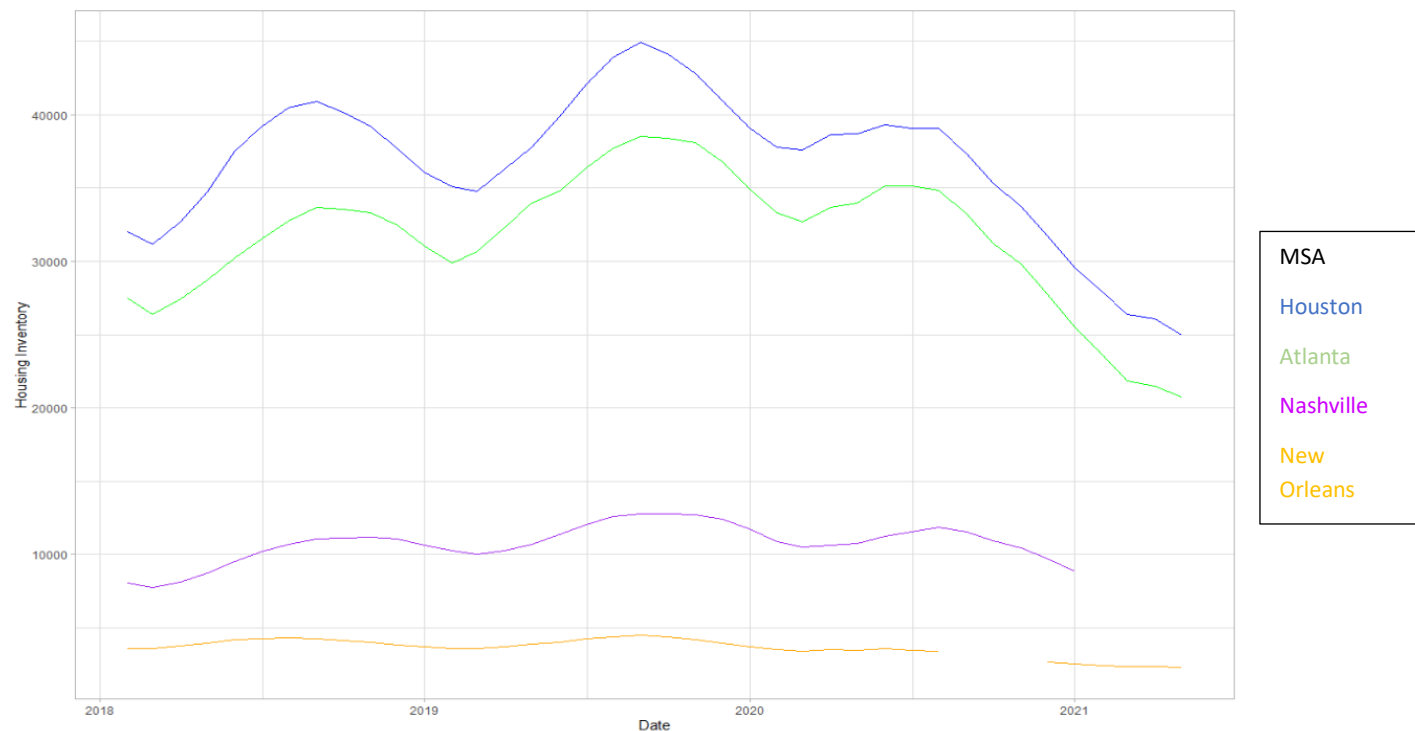
Figure 23: Y/Y % Change in US Housing Inventory
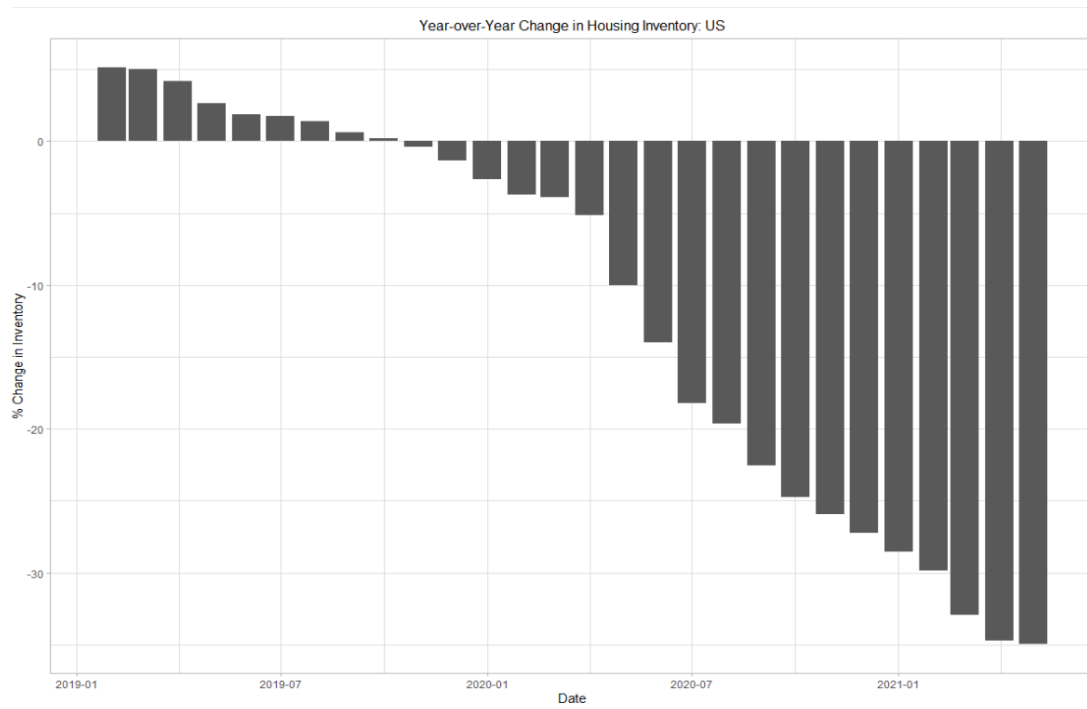
Source: Zillow

Figure 24: Median US Home Price
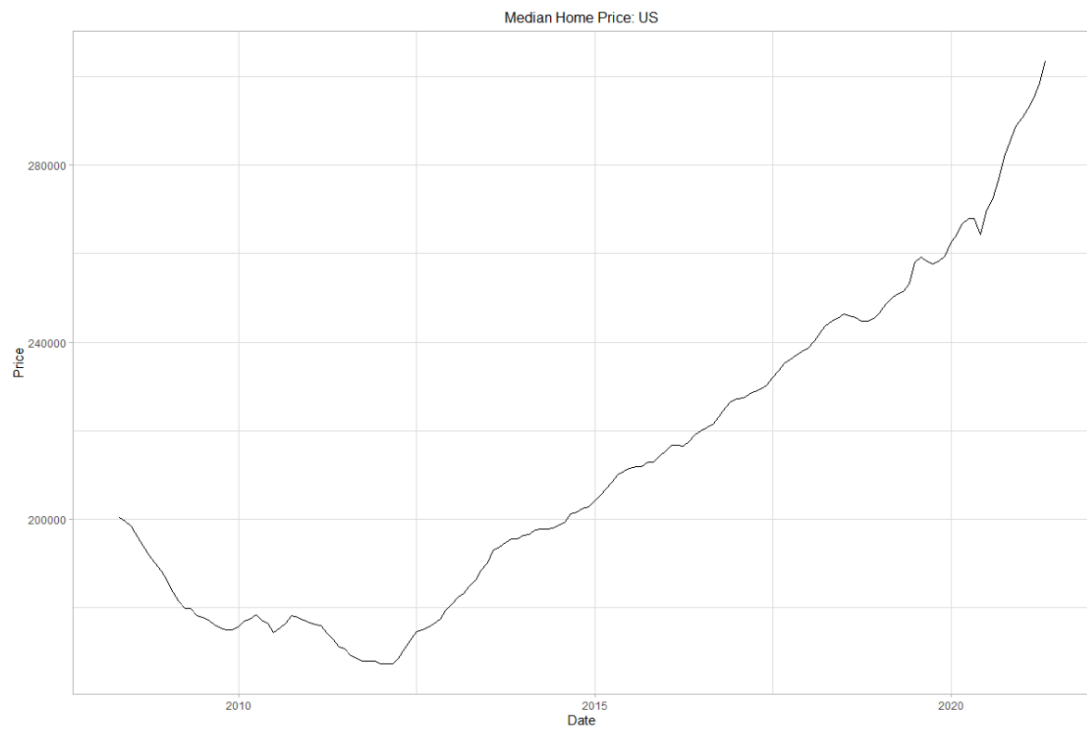
Source: Zillow

Figure 25: Y/Y % change in Median Sales Price of Residential Homes
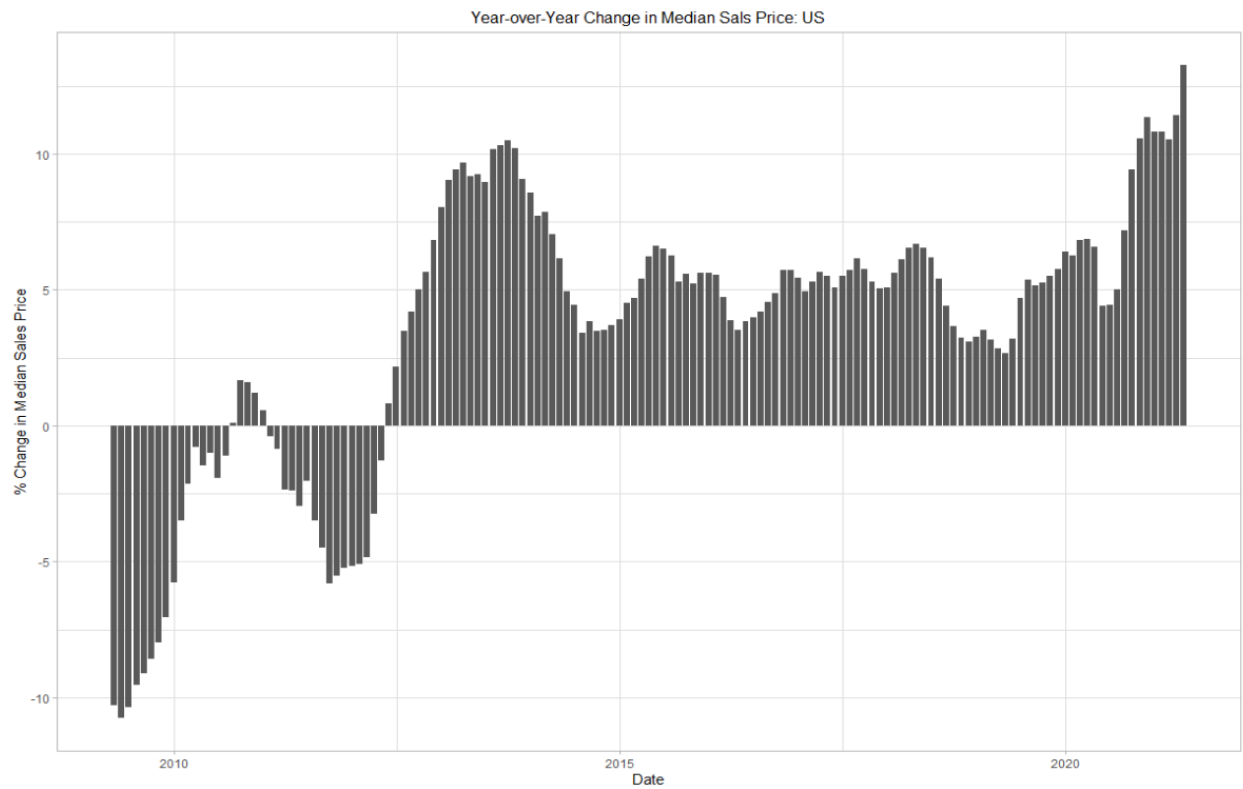
Source: Zillow

The following tables, Table 2 through Table 6, present the delinquency rates of mortgages held by Freddie Mac for May 2021 in several southeastern states, broken down by MSA.

Table 2: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30+ dpd) as of May 2021: 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	1085	1050	7	1	3	24	0.65%	2.58%	3.23%
	2 units	2	2	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	5	5	0	0	0	0	0.00%	0.00%	0.00%
Auburn-Opelika, AL	1 unit	4304	4240	12	10	0	42	0.28%	1.21%	1.49%
	2 units	25	25	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	1	1	0	0	0	0	0.00%	0.00%	0.00%
Birmingham-Hoover, AL	1 unit	28157	27656	142	29	28	302	0.50%	1.28%	1.78%
	2 units	23	23	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	14	14	0	0	0	0	0.00%	0.00%	0.00%
Columbus, GA-AL	1 unit	331	319	2	1	0	9	0.60%	3.02%	3.63%
	2 units	5	5	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	0	0	0	0	0	0	0.00%	0.00%	0.00%
Daphne-Fairhope-Foley, AL	1 unit	6926	6802	33	6	6	79	0.48%	1.31%	1.79%
	2 units	13	13	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	3	3	0	0	0	0	0.00%	0.00%	0.00%
Decatur, AL	1 unit	2021	1995	10	1	1	14	0.50%	0.79%	1.29%
	2 units	5	5	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	8	8	0	0	0	0	0.00%	0.00%	0.00%
Dothan, AL	1 unit	1938	1909	10	2	3	14	0.52%	0.98%	1.50%
	2 units	1	1	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	2	2	0	0	0	0	0.00%	0.00%	0.00%
Florence-Muscle Shoals, AL	1 unit	2516	2463	17	4	2	30	0.68%	1.43%	2.11%
	2 units	3	3	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	0	0	0	0	0	0	0.00%	0.00%	0.00%
Gadsden, AL	1 unit	1152	1117	2	1	2	30	0.17%	2.87%	3.04%
	2 units	1	1	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	0	0	0	0	0	0	0.00%	0.00%	0.00%
Huntsville, AL	1 unit	12756	12589	49	13	7	98	0.38%	0.93%	1.31%
	2 units	16	16	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	40	40	0	0	0	0	0.00%	0.00%	0.00%
Mobile, AL	1 unit	5018	4915	18	8	2	75	0.36%	1.69%	2.05%
	2 units	11	11	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	5	4	1	0	0	0	20.00%	0.00%	20.00%
Montgomery, AL	1 unit	5587	5473	35	8	8	63	0.63%	1.41%	2.04%
	2 units	15	15	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	10	10	0	0	0	0	0.00%	0.00%	0.00%
Tuscaloosa, AL	1 unit	4661	4587	25	3	3	43	0.54%	1.05%	1.59%
	2 units	4	4	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	0	0	0	0	0	0	0.00%	0.00%	0.00%
Outside all MSAs	1 unit	9889	9662	76	14	11	126	0.77%	1.53%	2.30%

	2 units	41	40	0	0	0	1	0.00%	2.44%	2.44%
	3+ units	10	9	0	1	0	0	0.00%	10.00%	10.00%

Data: STACR Freddie Mac, as of 23 May 2021

Table 3: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30+ dpd) as of May 2021: 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	24126	23677	86	29	26	308	0.36%	1.51%	1.86%
	2 units	306	295	4	0	0	7	1.31%	2.29%	3.60%
	3+ units	36	34	1	0	0	1	2.78%	2.78%	5.56%
Crestview-Fort Walton Beach-Destin, FL	1 unit	6560	6444	26	7	4	79	0.40%	1.37%	1.77%
	2 units	13	13	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	18	18	0	0	0	0	0.00%	0.00%	0.00%
Deltona-Daytona Beach-Ormond Beach, FL	1 unit	16915	16603	86	23	17	186	0.51%	1.34%	1.85%
	2 units	132	127	0	0	0	5	0.00%	3.79%	3.79%
	3+ units	45	42	0	0	0	3	0.00%	6.67%	6.67%
Fort Lauderdale-Pompano Beach-Sunrise, FL	1 unit	46713	44708	306	128	104	1467	0.66%	3.64%	4.29%
	2 units	456	424	4	2	1	25	0.88%	6.14%	7.02%
	3+ units	246	231	3	0	1	11	1.22%	4.88%	6.10%
Gainesville, FL	1 unit	5510	5440	8	7	5	50	0.15%	1.13%	1.27%
	2 units	20	20	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	13	13	0	0	0	0	0.00%	0.00%	0.00%
Homosassa Springs, FL	1 unit	2793	2757	16	4	2	14	0.57%	0.72%	1.29%
	2 units	18	18	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	4	4	0	0	0	0	0.00%	0.00%	0.00%
Jacksonville, FL	1 unit	36732	36061	156	49	34	432	0.43%	1.40%	1.83%
	2 units	169	166	0	0	0	3	0.00%	1.78%	1.78%
	3+ units	100	100	0	0	0	0	0.00%	0.00%	0.00%
Lakeland-Winter Haven, FL	1 unit	13662	13381	65	21	14	181	0.48%	1.58%	2.06%
	2 units	90	87	0	0	0	3	0.00%	3.33%	3.33%
	3+ units	32	30	0	0	0	2	0.00%	6.25%	6.25%
Miami-Miami Beach-Kendall, FL	1 unit	39225	37372	279	112	90	1372	0.71%	4.01%	4.72%
	2 units	459	441	4	0	1	13	0.87%	3.05%	3.92%
	3+ units	124	119	0	0	0	5	0.00%	4.03%	4.03%
Naples-Marco Island, FL	1 unit	11470	11236	56	12	9	157	0.49%	1.55%	2.04%
	2 units	37	37	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	15	15	0	0	0	0	0.00%	0.00%	0.00%
North Port-Bradenton-Sarasota, FL	1 unit	28516	27988	116	37	27	348	0.41%	1.45%	1.85%
	2 units	162	161	1	0	0	0	0.62%	0.00%	0.62%
	3+ units	25	24	0	0	0	1	0.00%	4.00%	4.00%
Ocala, FL	1 unit	6871	6737	40	13	7	74	0.58%	1.37%	1.95%
	2 units	21	21	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	15	14	0	0	0	1	0.00%	6.67%	6.67%

Orlando-Kissimmee-Sanford, FL	1 unit	66777	64842	338	122	103	1372	0.51%	2.39%	2.90%
	2 units	280	275	0	0	1	4	0.00%	1.79%	1.79%
	3+ units	84	81	1	0	0	2	1.19%	2.38%	3.57%
Palm Bay-Melbourne-Titusville, FL	1 unit	17382	17038	67	41	18	218	0.39%	1.59%	1.98%
	2 units	50	48	1	0	0	1	2.00%	2.00%	4.00%
	3+ units	24	22	0	0	0	2	0.00%	8.33%	8.33%
Palm Coast, FL	1 unit	182	179	1	1	0	1	0.55%	1.10%	1.65%
	2 units	4	4	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	0	0	0	0	0	0	0.00%	0.00%	0.00%
Panama City-Lynn Haven-Panama City Beach, FL	1 unit	4141	4063	25	5	7	41	0.60%	1.28%	1.88%
	2 units	35	35	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	12	12	0	0	0	0	0.00%	0.00%	0.00%
Pensacola-Ferry Pass-Brent, FL	1 unit	8687	8514	46	9	7	111	0.53%	1.46%	1.99%
	2 units	61	61	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	37	34	0	0	0	3	0.00%	8.11%	8.11%
Port St. Lucie, FL	1 unit	14185	13835	91	39	21	199	0.64%	1.83%	2.47%
	2 units	53	51	1	0	0	1	1.89%	1.89%	3.77%
	3+ units	13	13	0	0	0	0	0.00%	0.00%	0.00%
Punta Gorda, FL	1 unit	6648	6524	27	13	5	79	0.41%	1.46%	1.87%
	2 units	26	25	1	0	0	0	3.85%	0.00%	3.85%
	3+ units	6	6	0	0	0	0	0.00%	0.00%	0.00%
Sebastian-Vero Beach, FL	1 unit	5205	5107	22	6	4	66	0.42%	1.46%	1.88%
	2 units	13	12	0	0	0	1	0.00%	7.69%	7.69%
	3+ units	6	6	0	0	0	0	0.00%	0.00%	0.00%
Sebring, FL	1 unit	1712	1675	9	3	2	23	0.53%	1.64%	2.16%
	2 units	14	14	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	4	4	0	0	0	0	0.00%	0.00%	0.00%
Tallahassee, FL	1 unit	8271	8129	36	12	4	90	0.44%	1.28%	1.72%
	2 units	48	48	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	31	31	0	0	0	0	0.00%	0.00%	0.00%
Tampa-St. Petersburg-Clearwater, FL	1 unit	83803	81934	370	122	115	1262	0.44%	1.79%	2.23%
	2 units	447	440	1	1	0	5	0.22%	1.34%	1.57%
	3+ units	244	234	0	0	1	9	0.00%	4.10%	4.10%
The Villages, FL	1 unit	2314	2290	6	0	0	18	0.26%	0.78%	1.04%
	2 units	0	0	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	0	0	0	0	0	0	0.00%	0.00%	0.00%
West Palm Beach-Boca Raton-Boynton Beach, FL	1 unit	41416	40090	229	88	75	934	0.55%	2.65%	3.20%
	2 units	218	205	2	0	0	11	0.92%	5.05%	5.96%
	3+ units	121	112	1	0	0	8	0.83%	6.61%	7.44%
Outside all MSAs	1 unit	8660	8463	45	23	21	108	0.52%	1.76%	2.28%

	2 units	331	315	2	0	0	14	0.60%	4.23%	4.83%
	3+ units	52	50	1	0	0	1	1.92%	1.92%	3.85%

Data: STACR Freddie Mac, as of 23 May 2021

Table 4: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30+ dpd) as of May 2021: 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	1474	1440	14	2	0	18	0.95%	1.36%	2.31%
	2 units	0	0	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	0	0	0	0	0	0	0.00%	0.00%	0.00%
Baton Rouge, LA	1 unit	18805	18336	109	36	25	299	0.58%	1.91%	2.49%
	2 units	50	48	1	0	0	1	2.00%	2.00%	4.00%
	3+ units	61	58	0	0	0	3	0.00%	4.92%	4.92%
Hammond, LA	1 unit	1846	1793	14	6	1	32	0.76%	2.11%	2.87%
	2 units	10	10	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	8	8	0	0	0	0	0.00%	0.00%	0.00%
Houma-Bayou Cane-Thibodaux, LA	1 unit	3136	3040	19	10	3	64	0.61%	2.46%	3.06%
	2 units	5	5	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	4	4	0	0	0	0	0.00%	0.00%	0.00%
Lafayette, LA	1 unit	7892	7642	52	15	13	170	0.66%	2.51%	3.17%
	2 units	9	9	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	26	24	2	0	0	0	7.69%	0.00%	7.69%
Lake Charles, LA	1 unit	3294	3182	18	4	7	83	0.55%	2.85%	3.40%
	2 units	11	11	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	7	7	0	0	0	0	0.00%	0.00%	0.00%
Monroe, LA	1 unit	2249	2181	20	4	4	40	0.89%	2.13%	3.02%
	2 units	2	2	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	0	0	0	0	0	0	0.00%	0.00%	0.00%
New Orleans-Metairie-Kenner, LA	1 unit	24833	23982	181	67	45	558	0.73%	2.70%	3.43%
	2 units	1294	1239	10	2	0	43	0.77%	3.48%	4.25%
	3+ units	337	320	1	1	0	15	0.30%	4.75%	5.05%
Shreveport-Bossier City, LA	1 unit	6140	5937	50	14	11	128	0.81%	2.49%	3.31%
	2 units	4	4	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	7	7	0	0	0	0	0.00%	0.00%	0.00%
Outside all MSAs	1 unit	5162	4964	43	18	16	121	0.83%	3.00%	3.84%
	2 units	460	429	5	0	0	26	1.09%	5.65%	6.74%
	3+ units	96	96	0	0	0	0	0.00%	0.00%	0.00%

Data: STACR Freddie Mac

Table 5: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30+ dpd) as of May 2021: 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	3655	3569	13	5	8	60	0.36%	2.00%	2.35%
	2 units	23	23	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	9	9	0	0	0	0	0.00%	0.00%	0.00%
Hattiesburg, MS	1 unit	1922	1877	13	6	0	26	0.68%	1.67%	2.34%
	2 units	3	3	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	1	1	0	0	0	0	0.00%	0.00%	0.00%
Jackson, MS	1 unit	7391	7198	40	15	1	137	0.54%	2.07%	2.61%
	2 units	8	8	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	3	3	0	0	0	0	0.00%	0.00%	0.00%
Memphis, TN-MS-AR	1 unit	4521	4427	22	14	3	55	0.49%	1.59%	2.08%
	2 units	2	2	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	0	0	0	0	0	0	0.00%	0.00%	0.00%
Pascagoula, MS	1 unit	78	72	1	0	1	4	1.28%	6.41%	7.69%
	2 units	1	1	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	0	0	0	0	0	0	0.00%	0.00%	0.00%
Outside all MSAs	1 unit	8954	8681	58	22	14	179	0.65%	2.40%	3.05%
	2 units	12	12	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	3	3	0	0	0	0	0.00%	0.00%	0.00%

Data: STACR Freddie Mac, as of 23 May 2021

Table 6: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30 + dpd) as of May 2021: 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	3281	3213	20	8	3	37	0.61%	1.46%	2.07%
	2 units	15	15	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	2	2	0	0	0	0	0.00%	0.00%	0.00%
Amarillo, TX	1 unit	3689	3594	21	4	7	63	0.57%	2.01%	2.58%
	2 units	11	11	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	2	2	0	0	0	0	0.00%	0.00%	0.00%
Austin-Round Rock-San Marcos, TX	1 unit	81376	79943	327	97	74	935	0.40%	1.36%	1.76%
	2 units	949	933	3	0	0	13	0.32%	1.37%	1.69%
	3+ units	198	194	0	0	0	4	0.00%	2.02%	2.02%
Beaumont-Port Arthur, TX	1 unit	4651	4523	23	14	8	83	0.50%	2.26%	2.75%
	2 units	2	2	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	7	6	1	0	0	0	14.29%	0.00%	14.29%
Brownsville-Harlingen, TX	1 unit	2192	2117	21	3	4	47	0.96%	2.46%	3.42%
	2 units	32	32	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	27	27	0	0	0	0	0.00%	0.00%	0.00%
College Station-Bryan, TX	1 unit	5770	5682	21	3	3	61	0.36%	1.16%	1.53%
	2 units	85	84	0	0	0	1	0.00%	1.18%	1.18%
	3+ units	54	50	0	0	0	4	0.00%	7.41%	7.41%
Corpus Christi, TX	1 unit	5993	5829	32	14	12	106	0.53%	2.20%	2.74%
	2 units	12	12	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	14	14	0	0	0	0	0.00%	0.00%	0.00%
Dallas-Plano-Irving, TX	1 unit	156541	152964	743	209	204	2421	0.48%	1.81%	2.29%
	2 units	378	364	6	0	0	8	1.59%	2.12%	3.70%
	3+ units	102	100	0	0	0	2	0.00%	1.96%	1.96%
El Paso, TX	1 unit	5090	4909	33	10	9	129	0.65%	2.91%	3.56%
	2 units	58	57	0	0	0	1	0.00%	1.72%	1.72%
	3+ units	28	28	0	0	0	0	0.00%	0.00%	0.00%
Fort Worth-Arlington-Grapevine, TX	1 unit	65958	64485	336	98	74	965	0.51%	1.72%	2.23%
	2 units	347	341	0	0	0	6	0.00%	1.73%	1.73%
	3+ units	92	92	0	0	0	0	0.00%	0.00%	0.00%
Houston-Sugar Land-Baytown, TX	1 unit	158068	153113	926	372	313	3344	0.59%	2.55%	3.14%

	2 units	264	259	2	0	0	3	0.76%	1.14%	1.89%
	3+ units	222	215	3	0	0	4	1.35%	1.80%	3.15%
Killeen-Temple-Fort Hood, TX	1 unit	5223	5112	14	9	10	78	0.27%	1.86%	2.13%
	2 units	180	178	0	2	0	0	0.00%	1.11%	1.11%
	3+ units	162	162	0	0	0	0	0.00%	0.00%	0.00%
Laredo, TX	1 unit	1545	1492	14	4	3	32	0.91%	2.52%	3.43%
	2 units	3	2	1	0	0	0	33.33%	0.00%	33.33%
	3+ units	8	8	0	0	0	0	0.00%	0.00%	0.00%
Longview, TX	1 unit	2232	2173	16	7	1	35	0.72%	1.93%	2.64%
	2 units	9	9	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	2	1	0	0	0	1	0.00%	50.00%	50.00%
Lubbock, TX	1 unit	6875	6736	35	8	11	85	0.51%	1.51%	2.02%
	2 units	84	84	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	11	11	0	0	0	0	0.00%	0.00%	0.00%
McAllen-Edinburg-Mission, TX	1 unit	3535	3367	27	13	13	115	0.76%	3.99%	4.75%
	2 units	17	11	0	0	0	6	0.00%	35.29%	35.29%
	3+ units	150	147	0	0	1	2	0.00%	2.00%	2.00%
Midland, TX	1 unit	5149	4944	29	13	10	153	0.56%	3.42%	3.98%
	2 units	15	15	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	2	2	0	0	0	0	0.00%	0.00%	0.00%
Odessa, TX	1 unit	1923	1824	18	3	7	71	0.94%	4.21%	5.15%
	2 units	3	3	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	0	0	0	0	0	0	0.00%	0.00%	0.00%
San Angelo, TX	1 unit	2097	2032	22	6	2	35	1.05%	2.05%	3.10%
	2 units	5	4	1	0	0	0	20.00%	0.00%	20.00%
	3+ units	3	3	0	0	0	0	0.00%	0.00%	0.00%
San Antonio-New Braunfels, TX	1 unit	44903	43809	274	93	52	675	0.61%	1.83%	2.44%
	2 units	315	305	4	0	1	5	1.27%	1.91%	3.18%
	3+ units	181	176	0	0	0	5	0.00%	2.76%	2.76%
Sherman-Denison, TX	1 unit	3685	3615	21	6	6	37	0.57%	1.33%	1.90%
	2 units	28	28	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	1	1	0	0	0	0	0.00%	0.00%	0.00%
Texarkana, TX-Texarkana, AR	1 unit	1037	1012	4	8	1	12	0.39%	2.03%	2.41%
	2 units	6	6	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	4	4	0	0	0	0	0.00%	0.00%	0.00%
Tyler, TX	1 unit	3825	3734	21	2	8	60	0.55%	1.83%	2.38%

	2 units	7	7	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	1	1	0	0	0	0	0.00%	0.00%	0.00%
Victoria, TX	1 unit	936	903	7	1	4	21	0.75%	2.78%	3.53%
	2 units	3	3	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	0	0	0	0	0	0	0.00%	0.00%	0.00%
Waco, TX	1 unit	4144	4059	29	7	2	47	0.70%	1.35%	2.05%
	2 units	42	42	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	2	2	0	0	0	0	0.00%	0.00%	0.00%
Wichita Falls, TX	1 unit	1187	1151	8	3	3	22	0.67%	2.36%	3.03%
	2 units	5	5	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	2	2	0	0	0	0	0.00%	0.00%	0.00%
Outside all MSAs	1 unit	29859	29060	211	60	37	491	0.71%	1.97%	2.68%
	2 units	458	453	0	0	0	5	0.00%	1.09%	1.09%
	3+ units	60	59	1	0	0	0	1.67%	0.00%	1.67%

Data: STACR Freddie Mac, as of 23 May 2021

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 (2019-2021), with several different strains (most recently, "Delta" and "Gamma")

    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. The newly identified "Delta" and "Gamma" strains are seen as particularly virulent and threatening at least the (approximately) 1/3 of the unvaccinated US population.[20] 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, and as part of other key events.

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

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[20] See https://www.cbsnews.com/news/covid-19-delta-variant-dense-outbreaks-gottlieb/

[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/

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. Recently, $4.3M in ransom was demanded of the Colonial Pipeline Company[24], $11M was demanded of a JBS USA Holdings (an international meat supplier)[25], and over $21B was demanded of hospitals like St. Joseph's/Candler Hospital in Savannah, GA in 2020[26].

4. Societal Unrest, including Domestic Social Changes and Terrorism: During 2020, we saw many social protests turn violent on both ends of the political spectrum. Without warning, these movements have caused rapid and unexpected upheavals in social climates, and upended assumptions on which financial decisions were made. As these questions have been explored socially and officially, the discussions have led to questions of how deep the disdain in the country remains on both sides of the political fence, and what societal and legislative impacts these investigations may carry.[27]

5. Unanticipated Changes in Leadership: President Biden is currently 78 years old, and it is entirely possible that a transition of leadership from him to (assumably) Vice President 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[28] and wage protection[29], 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)[30], and countries in the Far East (given cultural differences.

6. Supply Chain Disruptions: The recent (March 2021) blockage of the Suez Canal by the tanker Ever Given over a five-day period highlighted the fragility of certain key bottlenecks in distribution of many goods, including paper products, oil, and food. The Suez itself accounts for 10-15% of all goods[31]. While the issue has been resolved, the Suez, along with the Panama Canal, the Strait of Hormuz, and the Malacca Strait, are the four most noteworthy trade chokepoints. If closed, the Panama Canal would impact 5% of global trade (and 60% of US imports and exports); closing the Strait of Hormuz would affect 25% of seaborne oil and a third

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[24] See https://www.nytimes.com/2021/05/13/us/politics/biden-colonial-pipeline-ransomware.html

[25] See https://www.wsj.com/articles/jbs-paid-11-million-to-resolve-ransomware-attack-11623280781

[26] See https://www.savannahnow.com/story/news/2021/06/17/cyberattack-hits-computer-systems-st-josephs-candler-hospital-savannah-ga/7734444002/ and https://www.savannahnow.com/story/news/2021/06/25/cyberattack-savannah-hospital-system-part-growing-trend/5336312001/

[27] 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/

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

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

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

[31] See https://www.businessinsider.com/toilet-paper-coffee-products-delayed-suez-canal-blockage-impact-2021-3

of global liquified natural gas; and the Malacca Strait carries 40% of all global trade (including 16M barrels of oil per day).[32]

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[32] See https://www.dw.com/en/suez-canal-blockage-4-of-the-biggest-trade-chokepoints/a-57020755

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[33]:

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

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[33] 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.

26. House Price Index
27. Commercial Real Estate Price Index
28. Market Volatility Index (VIX)

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 175 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[34]
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*

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[34] 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 "*".

10-year Treasury yield		5-year Treasury yield
20-year Treasury yield		7-year Treasury yield[*]
30-year Mortgage rate		5-year Treasury yield[*]
30-year Treasury yield		20-year Treasury yield[*]
S&P 500 Stock Price Index		Commercial Real Estate Price index
US Residential Home Price Index		Commercial Real Estate Price index
Primary Credit rate		3-year Treasury yield[*]
Moody's AAA Rate		30-year Treasury yield[*]

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

Further, based on the Fed's comments that they are adopting a monetary policy of not adjusting interest rates until the nation's economy has recovered (meaning that employment has returned to "acceptable" levels, while inflation is kept in check), 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 2Q2023, before gradual realistic adjustments. We re-emphasize that the previous statements are only policy, and not law, meaning that, ***it is possible (and we even view it as likely) for interest rates to rise <u>prior to 2023</u> 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

As 2021 has rolled in with a roar, the impatience of the country to return to pre-pandemic times has fueled a jump in the (real Q/Q) US GDP by 6.4% (annualized)[35]. As people and municipalities have become more comfortable with re-opening venues and interacting, the ability for business to transpire has led to more transactions, and a "release" of pent-up demand. Unfortunately, this demand is still stifled by the effects of uneven recoveries globally, specifically the unavailability of trained labor and raw materials, the lack of which are causing spikes in pricing (which may be temporary or persistent in different cases). While we are hopeful that society will be able to resume its course globally, we are still

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[35] https://www.bea.gov/news/2021/gross-domestic-product-third-estimate-gdp-industry-and-corporate-profits-revised-1st

concerned about the possible risks that could exist. These risks are discussed elsewhere in this paper, but it should suffice to mention that they exist on both the conservative and optimistic sides of the scale: on the one hand, taking an excessively cautious approach to resuming activities would prevent the continued spread of the COVID virus and its different strains, but this case would also result in lost opportunities and perpetuating the ongoing economic malaise in which the globe is entrenched.

Ordinarily, GDP is driven by several factors:

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

As the nation continues to recover from the current COVID emergency, we are seeing continued rebuilding of options for international travel, imports & exports, and related industries, which affect the pricing of products & services that can be offered for sale. We have previously discussed unemployment filings[36], and recent personal consumption[37], and retail sales figures[38].

We expect ***government spending will continue to increase*** through much of 2021. President Biden has already lobbied and passed a one-time $1.9T stimulus plan that resulted in substantial aid being distributed to portions of the population. As of the time of this writing (July 2021), the White House and senior Congressional leaders have made progress focusing what was originally a $3T plan into a $1.2T plan to improve portions of American infrastructure, including transportation, water & electricity infrastructure, broadband telecommunication, and other items[39]. Based on the announced financing plans for this work, it is expected that these actions will be primarily funded by additional taxes on the population.

Interest in consumer spending has returned as the populus began to work through the savings that had accumulated during the COVID-19 pandemic; in 1Q2021, Q/Q spending increased (to $15T) by 3.67%, and Y/Y spending was up by 3.61% (the first increase since 1Q2020)[40]. Real expenditures were up to $13.35T (2012 US$) in 1Q2021, up 2.75% Q/Q and 1.79% Y/Y[41]. ***We expect for this trend to continue as the country continues to present an appearance of stability in returning markets, services, and employment opportunities.*** At this point, the main concerns surround the restoration of adequate participation in the labor markets in order for goods and services to be reliably brought to consumers: until the global labor force is restored, there will be a drag on consumer spending and the US GDP, and increases in prices and services will continue to be felt (with a lack of adequate competition).

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[36] See https://www.wsj.com/articles/weekly-jobless-claims-06-24-2021-11624489248

[37] See https://www.wsj.com/articles/consumer-spending-personal-income-inflation-may-2021-11624563378

[38] See https://www.kiplinger.com/economic-forecasts/retail-sales

[39] https://www.whitehouse.gov/briefing-room/statements-releases/2021/06/24/fact-sheet-president-biden-announces-support-for-the-bipartisan-infrastructure-framework/

[40] https://fred.stlouisfed.org/series/PCE

[41] https://fred.stlouisfed.org/series/PCEC96

Finally, as the US has recovered from the COVID pandemic more rapidly than other countries over the past few months (and other countries have returned to experiencing heightened infection rates[42]), the US' demand for foreign products has increased quickly, and much more quickly than foreign demand for US goods. As such, the US' trade deficit rapidly widened during 1Q2021, as it has done since 4Q2019[43]. While we are hopeful that the rest of the world will also recover from the COVID crisis, multiple mutations that appear to have originated in Europe, Africa, and South America are expected to slow the recovery for those areas of the globe, meaning that, we expect **the US' net trade deficit to continue to increase for the near future (i.e., at least through 1H2022)[44].**

We are concerned about the possible route to recovery taken by the US. Given that the US market is showing a strong desire to return to a pre-COVID "lifestyle" (both producers and consumers), we are seeing that labor force participation is the stumbling block to market restoration. Producers are being challenged with staffing their enterprises with skilled labor based on several competing forces[45]:

(1) prospective employees are worried about contracting the COVID virus, as well as the short- and long-term effects that the COVID vaccines may have on them;
(2) American households have saved substantially over the past 12 months, diminishing the sense of urgency to return to work;
(3) prospective employees may be challenged with the care of children, the elderly, and ill; and
(4) prospective employees are monitoring the competitive landscape and waiting to find the opportunity that will net them the greatest wage given their skills[46] (with options including the dwindling subsidized unemployment benefits[47]).

Employers, as a result, are having to not only ensure the safety of the enterprise for their employees, but are also having to increase wages in order to overcome employees' care issues and/or competitive offers, resulting in price increases that are eventually borne at the register. Wal-mart, Amazon, Costco, and McDonald's have all experienced pressure to increase hourly wages to at least $15/hour[48]; further, as one employer in a market advertises that they are offering higher wages (e.g., all US corporate-owned McDonald's franchises raising wages to $15/hour by 2024[49]), it applies upward competitive pressure on wages across the entire local sector. This phenomenon is resulting in employers finding themselves more discriminating in hiring given the higher wages being demanded.

So, while there is demand for products and services, the current rebound is stumbling somewhat in its ability to produce. We expect this trend to continue for a number of years while employers and employees work to re-join each other at an acceptable point, meaning that a certain amount of "churn"

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[42] See https://www.cnbc.com/2021/06/28/how-the-uk-with-the-delta-variant-is-a-blueprint-for-the-us.html

[43] https://fred.stlouisfed.org/series/BOPGSTB and https://www.census.gov/foreign-trade/Press-Release/current_press_release/ft900.pdf

[44] https://www.bea.gov/news/2021/us-international-trade-goods-and-services-january-2021

[45] See https://www.wsj.com/articles/millions-are-unemployed-why-cant-companies-find-workers-11620302440

[46] See https://www.retailwire.com/discussion/does-retail-have-an-answer-for-its-jobs-problem/

[47] See https://www.wsj.com/articles/americans-are-leaving-unemployment-rolls-more-quickly-in-states-cutting-off-benefits-11624786202

[48] See https://www.wsj.com/articles/walmart-promises-raises-for-425-000-workers-after-strong-holiday-sales-11613652639, https://www.wsj.com/articles/amazon-raising-pay-for-hundreds-of-thousands-of-workers-11619650537, https://www.wsj.com/articles/costco-to-raise-minimum-hourly-wage-to-16-as-congress-debates-15-11614272509, and https://www.businessinsider.com/mcdonalds-raises-minimum-wage-aims-average-15-per-hour-2021-5

[49] See https://www.cbsnews.com/news/mcdonalds-wage-13-dollars-hour-company-stores/

in the marketplace is expected until employers find employees that meet their (changing) expectations. Inflation (and the reports thereof) will be the force that will erode the employers' expectations of workers.

However, with all due respect to Mark Twain, we are of the mind that the reports of inflation's presence may be greatly exaggerated. In other words, while we do appreciate that there are transient issues in the domestic and global markets' ability to deliver goods and services – resulting in higher prices for end-consumers, ***we do still believe that competitive pressures will eventually return and force consumers' prices down***. As South America, the Pac-Asia area, and portions of Europe are still working to control their own health issues, competitive pressures from these areas are substantially lessened, allowing US businesses (already feeling social forces to maintain lower prices during 2020) to finally increase prices in an acceptable manner.

While we don't doubt that non-US businesses also feel pressures to increase prices from their own workers and suppliers, in cases that these forces are not equally felt around the globe, there will eventually have to be a reckoning (or several "reckonings" spread across markets as regions regain control of their health). For domestic goods that are experiencing a reprieve at the moment, there will come a time to "pay the piper" during which prices will need to be re-adjusted in the global marketplace. As that competition returns (and turnover in workers occurs), workers' wages will undoubtedly be re-assessed for businesses to survive.

While the Biden administration has promised to donate 500 million doses of COVID-19 vaccine[50] to other countries, the world economy still has a long way to go in order to return to stability. With an estimated global population approaching eight billion people, the G-7 is targeting the "defeat" of COVID-19 in 2022, implying that ***the global economy will remain in a state of flux for another 12 to 24 months (and, potentially, even 36 months)***. Therefore, supply chain issues that are currently plaguing at least some of the US' markets will likely continue into 2023, with the points at which different foreign companies – companies that may have dominated an industry prior to the pandemic – each eventually try to re-assert themselves at some point in the next few years, resulting in a strong competitive scene that will eventually benefit buyers.

Finally, consumer spending (or the desire thereof) has been stronger during 2021 than we previously expected, with the affluent driving more luxury spending of homes, cars, travel, and other high-dollar items, and the non-affluent leveraging government aid in order to make ends meet. As prices have increased and been attributed to inflation (despite our previous discussion), members of the FOMC have accepted that price pressures have emerged more quickly than originally expected[51]. Recognizing that the FOMC intends to manage inflation to a "long term" target of approximately 2%, ***we expect that price changes will be significant & erratic for next 18 months***, whether those changes are coined as "inflation" or not. ***We still expect that inflation will be reported as increasing by over 2% per quarter (i.e., Q/Q inflation rates) through 1H2022,*** and the ***real GDP growth rates will most likely be between***

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[50] Per https://it.usembassy.gov/biden-u-s-will-donate-500-million-vaccine-doses-for-global-covid-19-fight/, the G-7 countries will donate over 1B doses to emerging countries.

[51] See https://www.wsj.com/articles/feds-rosengren-says-it-is-time-to-weigh-pulling-back-stimulus-11624651735 and https://www.wsj.com/articles/inflation-rates-fed-11624304034

7.0% and 9.0% (Q/Q). We take this strong of a position regarding GDP due to the fact that we expect international competitive pressure to be lessened until global vaccination against the currently identified primary coronavirus strains ("Alpha" and "Delta", as of this writing) occurs. It should be noted that this position can be easily undermined if the current concerns about localized outbreaks in the US come to pass[52]; with many states having less than 40% of their adult populations vaccinated, local outbreaks of the different mutations of COVID seem very likely.

Other Commentary

- "We've increased our 2021 inflation forecast for the Personal Consumption Expenditures Price Index to 2.9% from 2.3% previously. We expect 2021 core inflation of 2.5%. For 2022-25, our forecast is essentially unchanged; we expect moderate core inflation averaging 2.3%, just above the Federal Reserve's 2% long-run target." (see https://www.morningstar.com/articles/1040881/2021-inflation-forecast-heads-higher; May 25, 2021)
- "A sudden burst in consumer demand from the economy reopening and an imbalance in supply disruptions are among the main factors driving up prices compared with the same period last year." (see https://www.wsj.com/articles/inflation-rates-fed-11624304034; June 22, 2021)
- "Wages and benefits for U.S. workers have been rising quickly as vaccinations increase and employers try to meet growing demand at restaurants and other businesses, amid a worker shortage triggered by the pandemic. U.S. workers' total compensation rose 0.9% in the first three months of this year, the largest gain in more than 13 years, according to the Labor Department." (see https://www.cbsnews.com/news/mcdonalds-wage-13-dollars-hour-company-stores/; May 13, 2021)
- "Chair Jerome Powell of the Federal Reserve has said that the Fed would consider any spike up in inflation this year to be temporary. That means that the Fed will not raise short-term rates, even if inflation picks up. It remains focused on its goal of seeing a lower unemployment rate and a recovery in the labor market." (see https://www.kiplinger.com/economic-forecasts/interest-rates; June 4, 2021)
- "On June 25, The [Federal Reserve Bank of Atlanta's] GDPNow model estimate for real GDP growth in the second quarter of 2021 is 8.3 percent, down from 9.7 percent on Jun 24. (per https://www.atlantafed.org/cqer/research/gdpnow, June 28, 2021)

[52] See https://www.cbsnews.com/news/covid-19-delta-variant-dense-outbreaks-gottlieb/

Employment

Analysis

Since the economy's peak in February 2020, employment in the US has gone from 158.7M (persons employed) to 133.3M (in April 2020) to 151.6M (in May 2021). Much as we pointed out in our previous report (and seen in Figure 26), the number of persons employed is growing extremely slowly (only +/- 800,000 more people are employed in May over March of 2021); we are attributing this slow growth to the points that we made above:

(1) prospective employees are worried about contracting the COVID virus, as well as the short- and long-term effects that the COVID vaccines may have on them;
(2) American households have saved substantially over the past 12 months, diminishing the sense of urgency to return to work;
(3) prospective employees may be challenged with the care of children, the elderly, and ill; and
(4) prospective employees are monitoring the competitive landscape and waiting to find the opportunity that will net them the greatest wage given their skills (with options including the dwindling subsidized unemployment benefits).

Figure 26: US Employment & Unemployment Levels
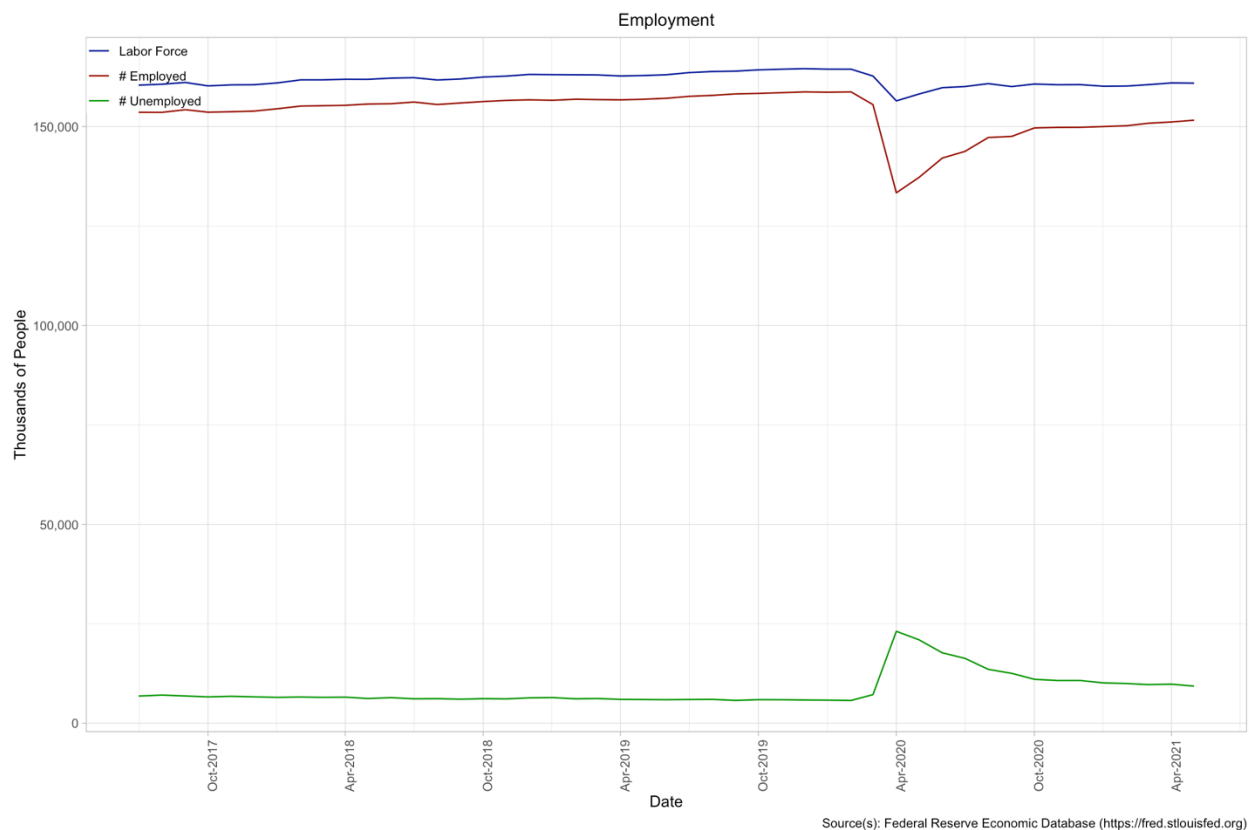
As we have now entered the summer months, we are hopeful that over the next 90 days, issues of child-care will be resolved, and a segment of the population will be able to re-enter the workforce. Looking at Figure 27, we see that white men & women have been most significantly displaced from the workforce in terms of sheer numbers, but Figure 28 shows that Hispanic women have been most disproportionately affected, followed by African-Americans.

Figure 27: Change in Employment (since Oct. 2019) based on race and gender

Source: FRED St. Louis; Authors' calculations

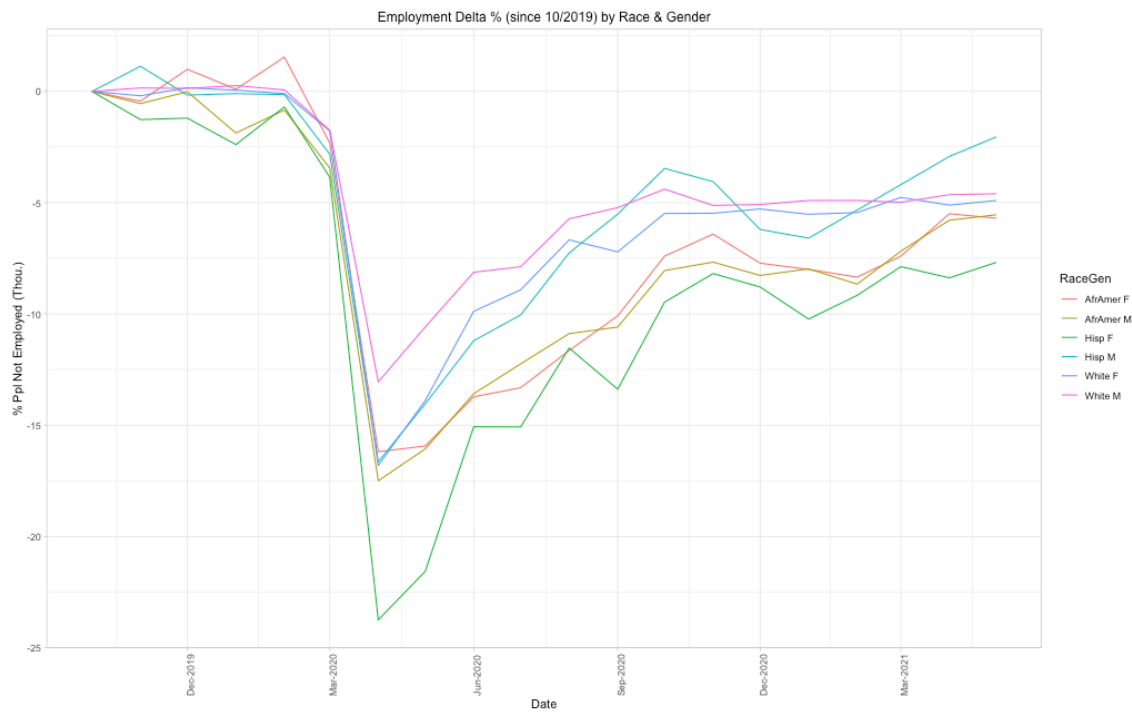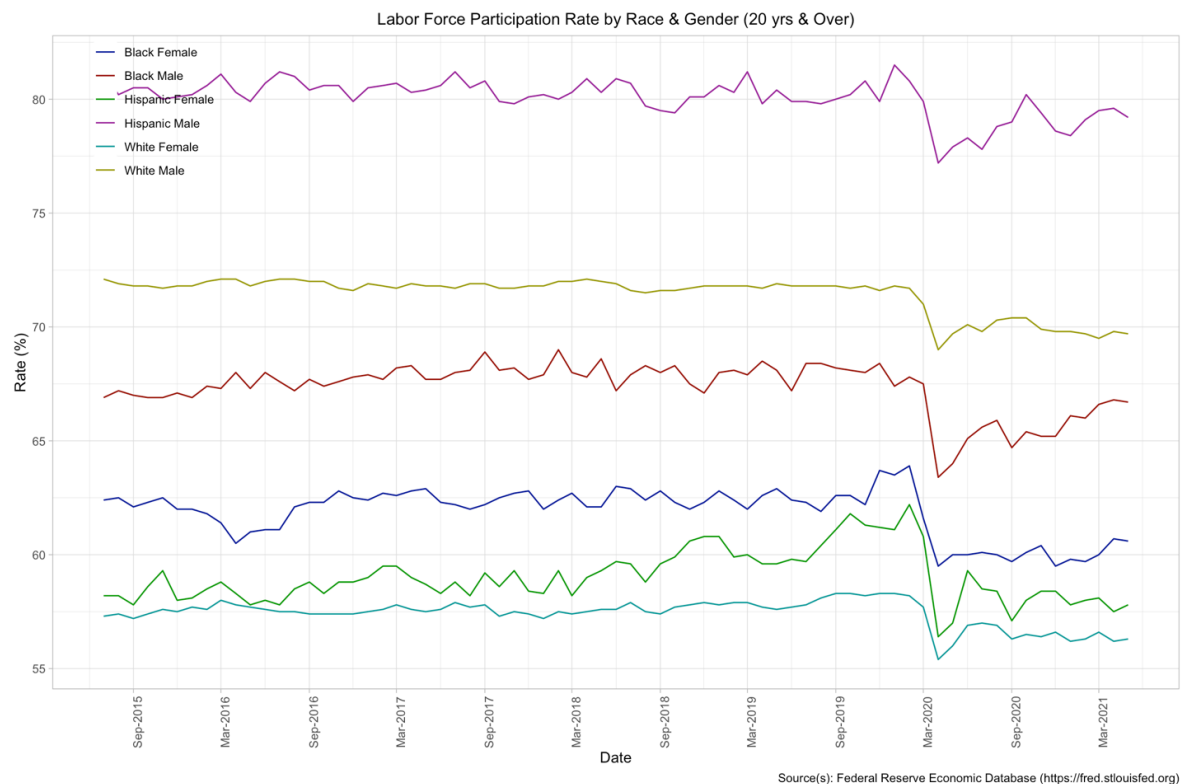*Figure 28: Percent change in Employment (since Oct. 2019) based on race and gender*

Source: FRED St. Louis; Authors' calculations

Figure 29: Labor Force Participation Rate based on race and gender

To put a cap on this discussion, as additional unemployment benefits expire, ***we anticipate that employment will recover during 2H2021 provided that health issues within the US actually recede[53]***. While employers in some sectors are currently offering a premium (in wages) in order to recruit workers, we are concerned about how those premium wages will co-exist with other compensation packages in the long term (i.e., post-COVID): the only two (extreme) outcomes that are apparent are (a) wage adjustments, which will likely not be accepted well by employees; and (b) absorption of premium wages in product prices & inflation (which will similar displease customers). The actual final outcome will surely involve a combination of these two possibilities.

Secondly, we point out the elasticity of positions that some workers are able to live with when considering where they will take employment in the near future: in some locales, restaurants, manufacturers, and retail sectors may be vying for the same pool of workers, and may need to consider the options in their target workers' minds, and their sense of urgency (if any), when recruiting.

Other Commentary

- "Payrolls may have risen by 700,000 in June, according to the median estimate in a Bloomberg survey of economists. … States including California and New York lifted all remaining pandemic-related restrictions in June, which could have boosted new employment in the month. That said, many businesses have reported hiring challenges due to ongoing childcare responsibilities, enhanced federal unemployment benefits and lingering health concerns." (per https://www.bloomberg.com/news/articles/2021-06-26/u-s-jobs-to-be-scrutinized-for-signs-of-faster-hiring-eco-week, June 26, 2021)
- "Restaurants accounted for a third of [May's] job creation, as restrictions on dining faded. They will continue to contribute the bulk of the gains this year, since the industry is still 1.5 million jobs below its pre-pandemic [sic] level. Recreation, hotels, education and health care also showed nice gains. Wages appear to be rising briskly for production workers." (per https://www.kiplinger.com/economic-forecasts/jobs, June 4, 2021)

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

Analysis

Looking at Figure 30, we see how the yield curve for T-bill's has evolved over the past two years. Starting in the middle of May of 2018 and advancing by a year, we see how the yield curve moves from a "normal" shape with good returns to an inverted shape. Moving into early 2020, after the FOMC acted to slash overnight lending rates, the yield curve flattens to reflect the almost negligible returns. Now, after another year, we are seeing a relatively steep curve that is offering short-term rates at virtually

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[53] We admit that this condition/assumption is a tenuous one, at best.

zero to thirty-year rates approaching 2.5%. Unfortunately, these rates are not inflation-protected returns, so factoring in the loss in value as a result of inflation makes the high end of the yield curve a questionable investment.

We have previously discussed that we believe ***inflation could potentially rise by as much as 3.0% (Q/Q annualized) during 2021 before the FOMC potentially takes action***. However, given that Chairman Powell has now taken an extremely strong stance against any action prior to 2022, we are even more concerned about price spikes and/or inflation during 2021 and 2022. We do interpret the steep slope of the yield curve as the expression by investors that (a) the strength of the overall economy is improving with the distribution of the COVID-19 vaccines, and (b) they expect that the economy will experience inflation due to (1) President Biden's stimulus plans, (2) global supply chain issues (both in raw materials & transportation), and (3) domestic labor issues. Historically, uncontrolled inflation has been managed by the central bank reacting to increase bond rates, but Chairman Powell's change in strategy to manage to the "longer term" view makes one wonder at what point the FOMC will respond.

We still believe that yields will continue to rapidly increase in order to remain competitive and continue to "price in" the current beliefs that are circulating regarding price hikes. Chairman Powell's "flexible" approach to managing inflation will allow for a more volatile inflation curve, and means that interest rate changes may need to be more dramatic when they are called for, resulting in the market taking more time to adjust to changes. While it will be discussed later in this paper, we expect that, upon its maturation, this approach will have the effect of causing the VIX to increase to a steady-state value higher than it would be if Chairman Powell had not changed the Fed's monetary policy.

Other Commentary

- "U.S. Treasury yields rose on Friday and ended higher for the week, with long-dated debt registering the steepest weekly climb in months, after economic data showed an upward march in the cost of living, based on the Federal Reserve's preferred inflation gauge, the personal-consumption expenditures, or PCE." (see https://www.marketwatch.com/story/u-s-treasury-yields-mixed-ahead-of-inflation-report-11624623814; June 25, 2021)

Figure 30: Treasury Yield Curves based on maturity duration
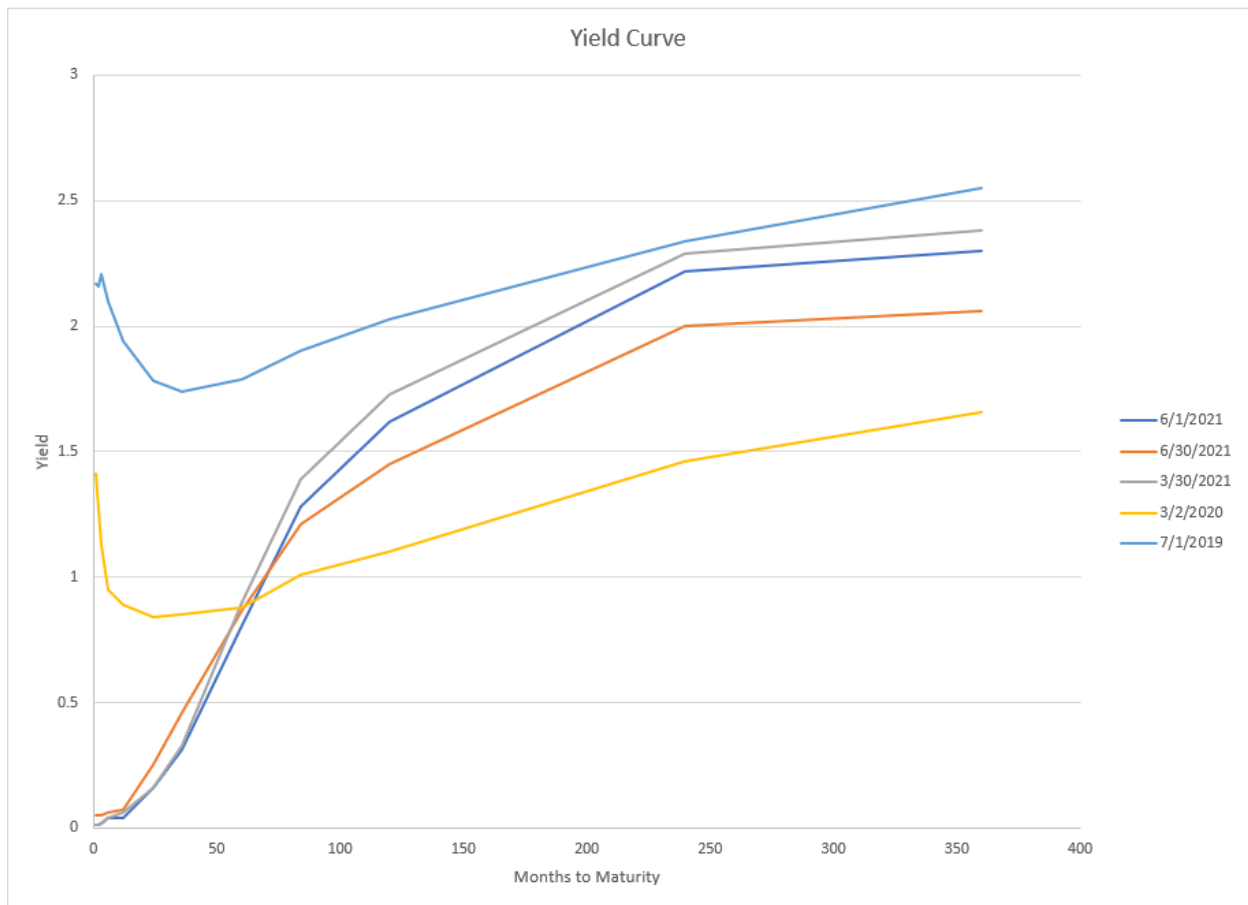
Source: US Treasury
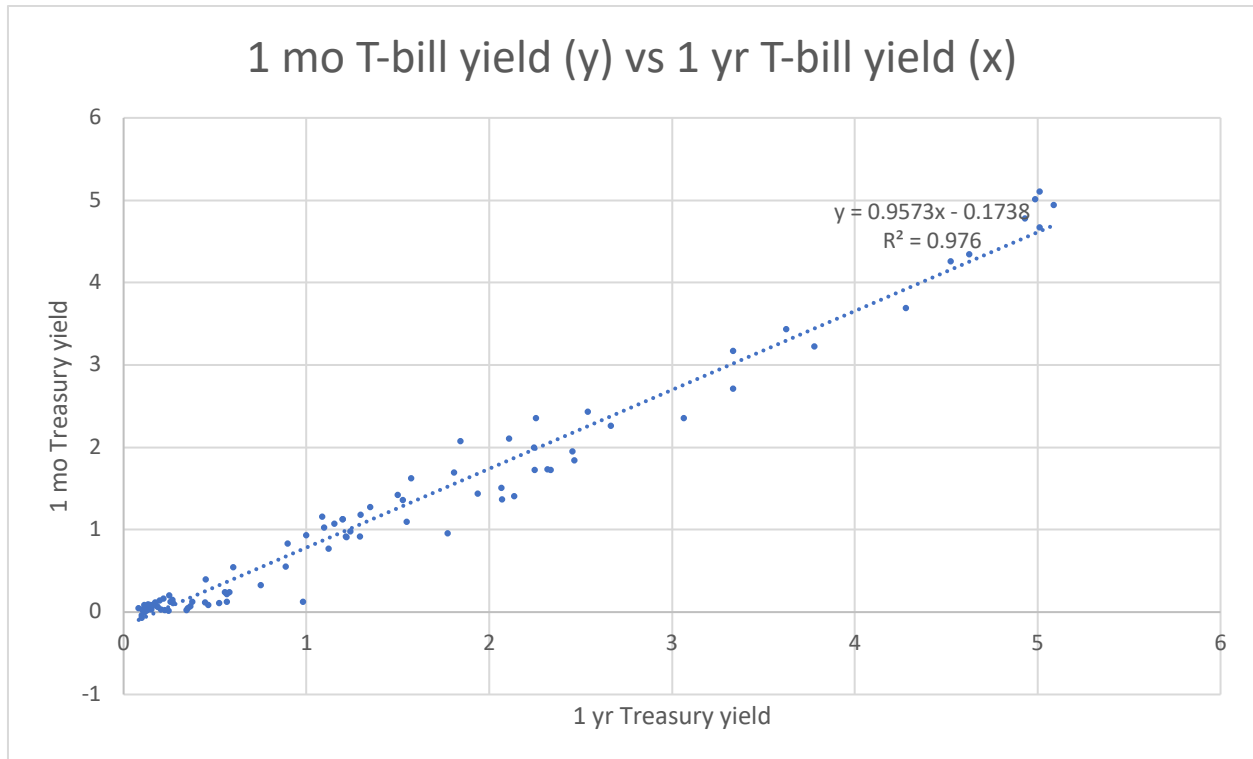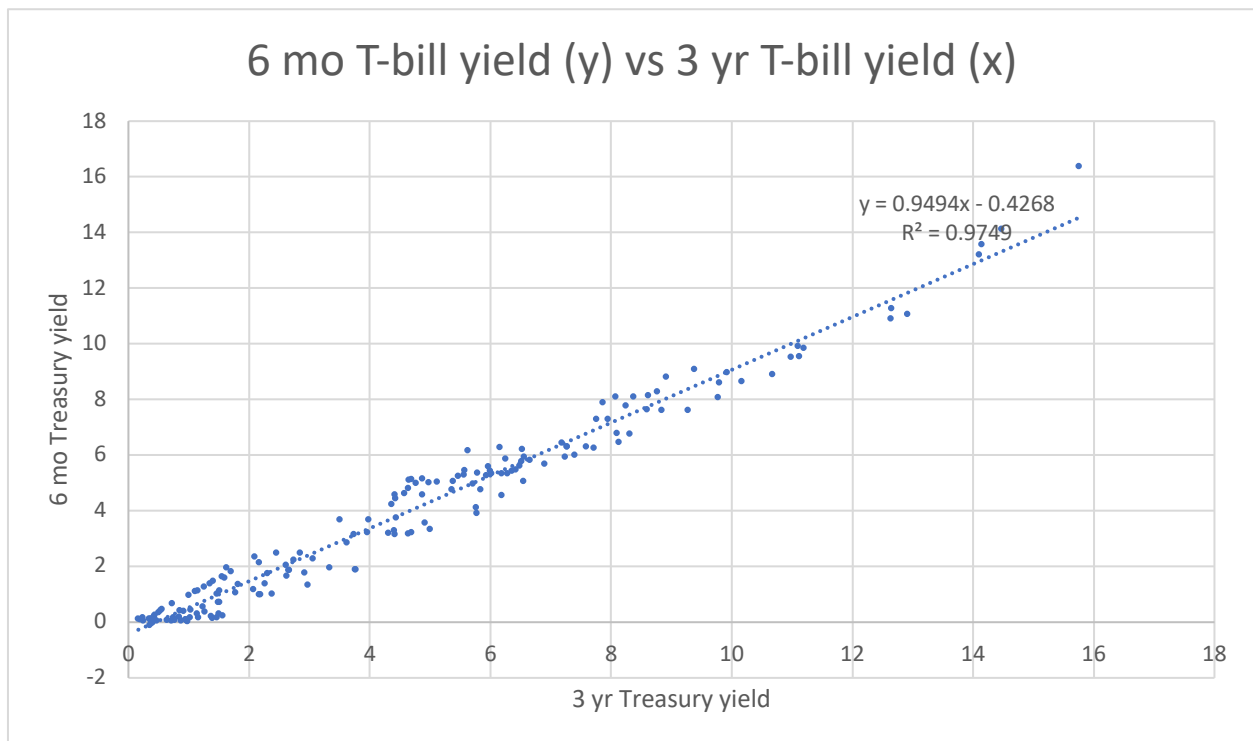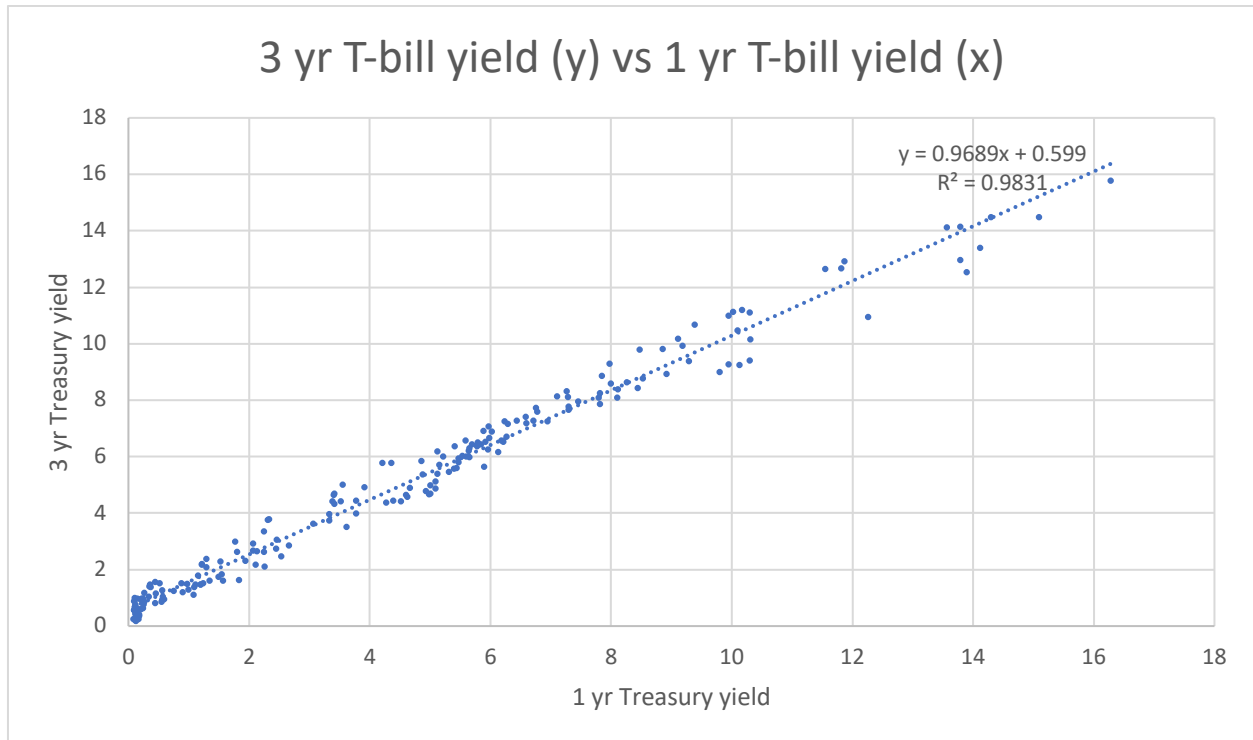
1 mo T-bill yield (y) vs 1 yr T-bill yield (x)

$y = 0.9573x - 0.1738$
$R^2 = 0.976$

Source: Author's calculation

6 mo T-bill yield (y) vs 3 yr T-bill yield (x)

$y = 0.9494x - 0.4268$
$R^2 = 0.9749$

Source: Author's calculation

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

$y = 0.9689x + 0.599$
$R^2 = 0.9831$

Source: Author's calculation

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

$y = 0.9316x + 0.8988$
$R^2 = 0.9859$

Source: Author's calculation

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

$y = 0.9319x + 0.8534$
$R^2 = 0.9895$

Source: Author's calculation

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

$y = 0.9238x + 0.9672$
$R^2 = 0.9479$

Source: Author's calculation

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

Plot annotation: $y = 0.9081x + 0.4554$, $R^2 = 0.9843$. X-axis: 20 yr Treasury yield. Y-axis: 30 yr Treasury yield.
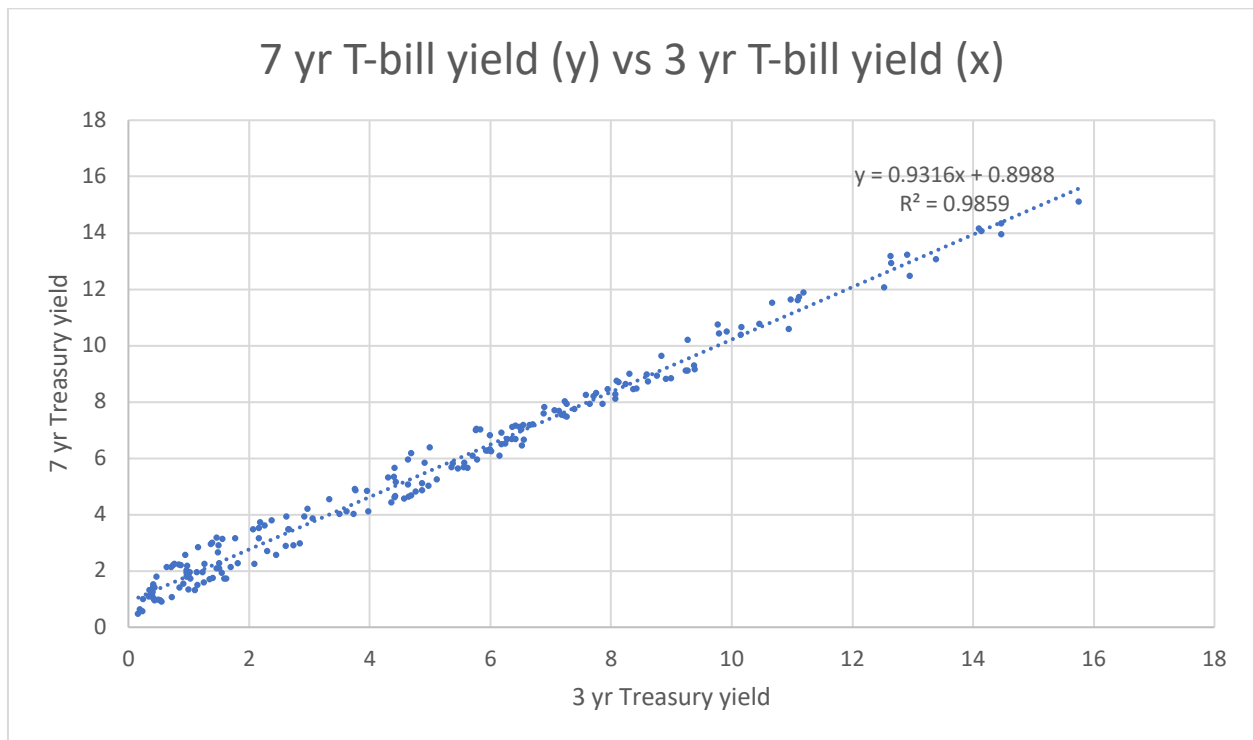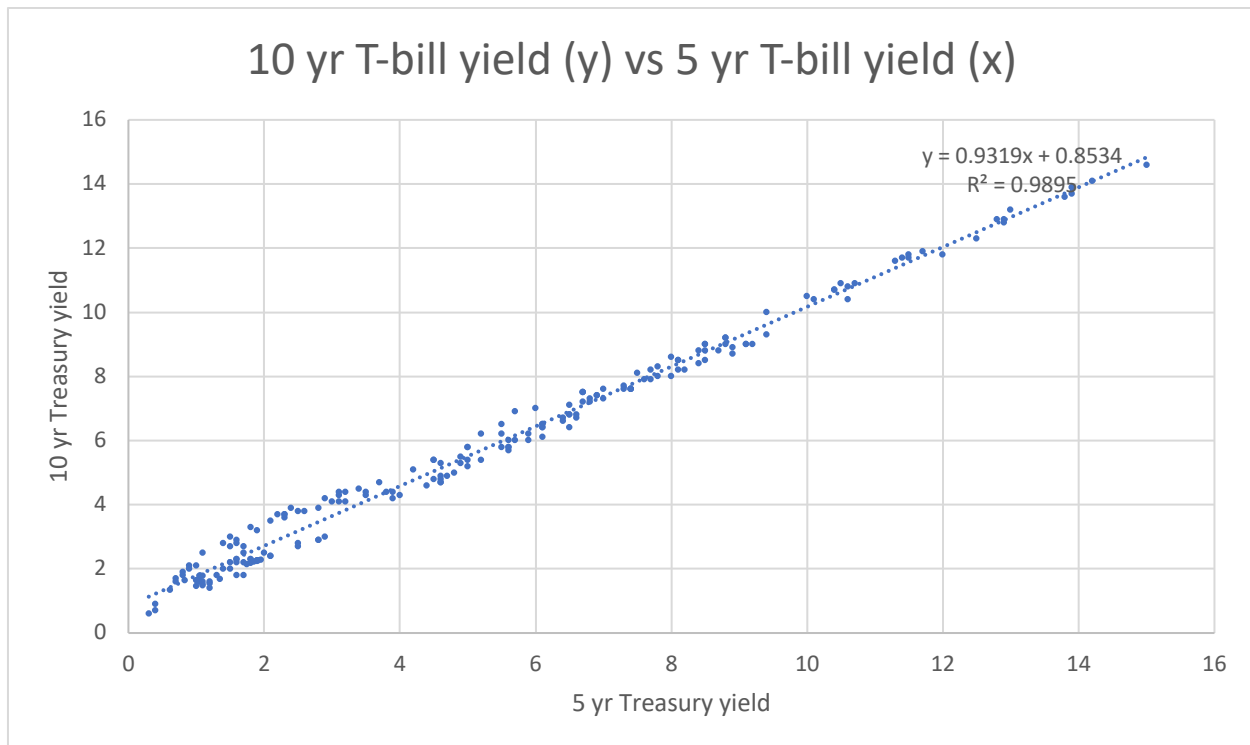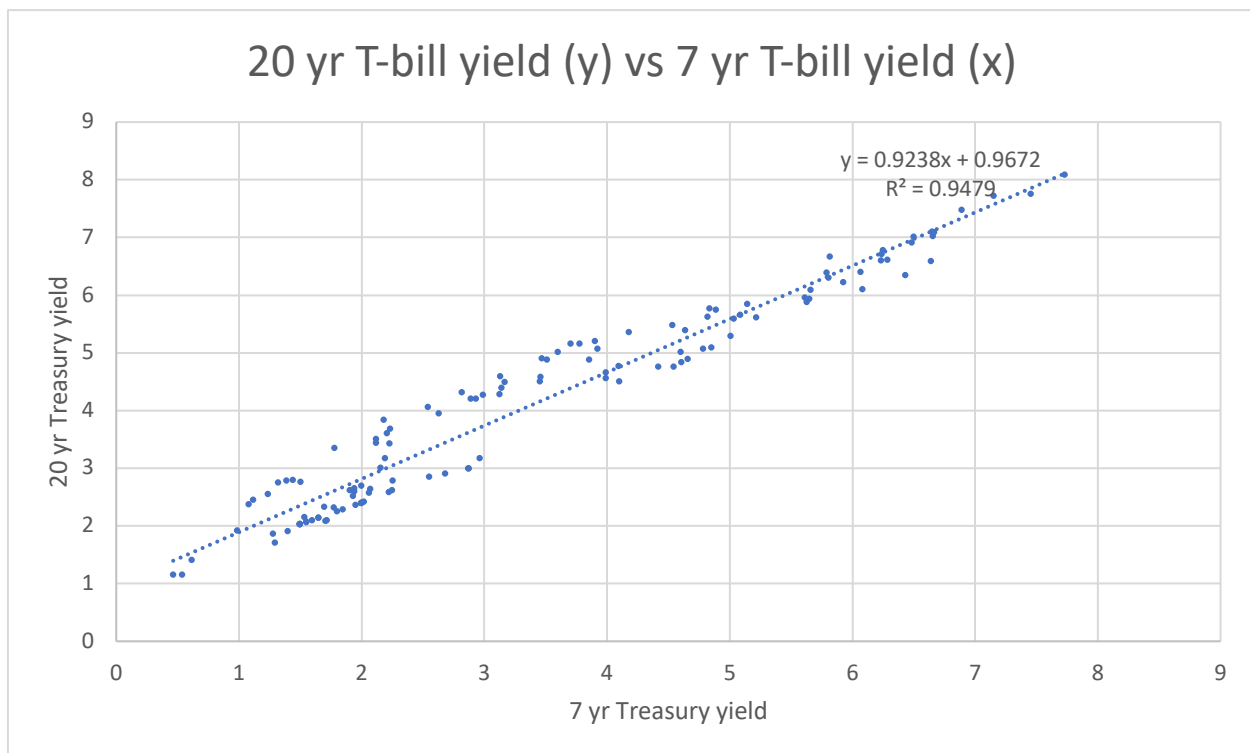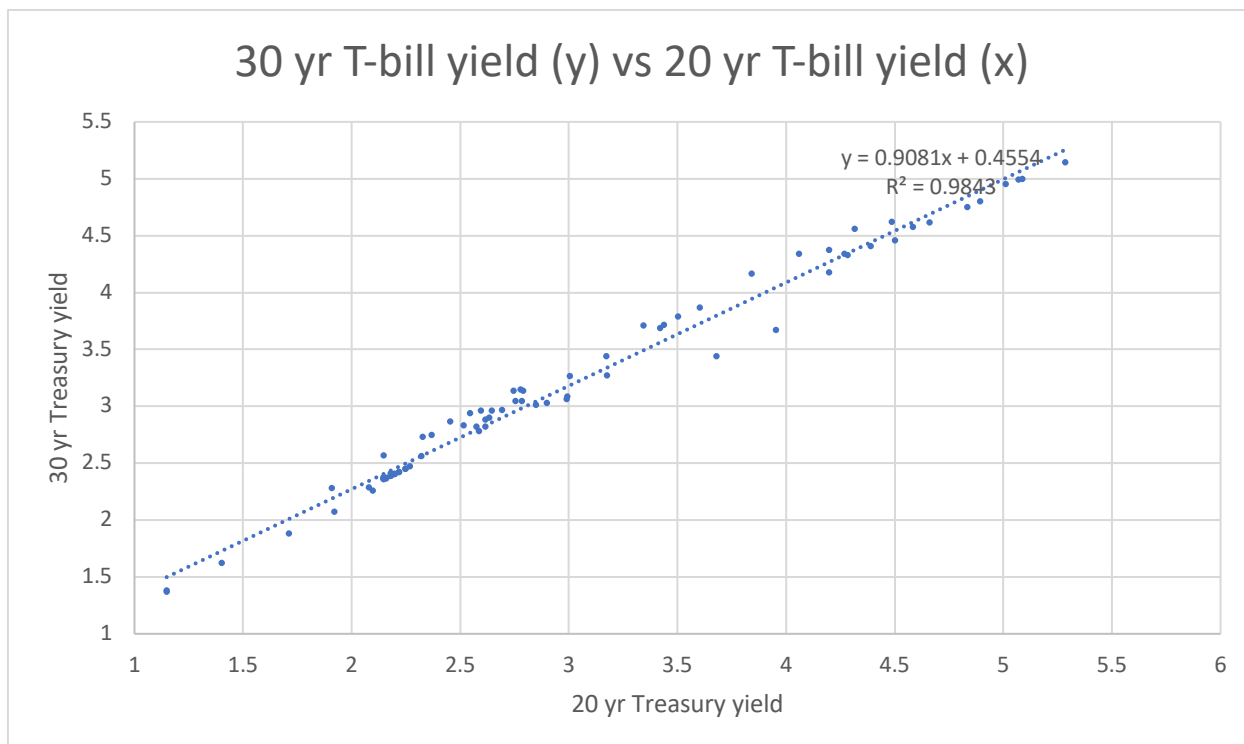
Source: Author's calculation

30-year Mortgage Rate

Analysis

At the risk of being repetitive, mortgage rates have remained extremely low, and they are expected to remain low, but will be tempered by two factors: first, banks are managing their risks by being extremely cautious in their vetting processes, and only granting new mortgages (and refinancing) to extremely well-vetted and well-qualified applicants. Secondly, given the nature of the markets, and the fact that many mortgages find their way into "Collateralized Mortgage Obligations" (CMOs) and other trading instruments, futures on these instruments are finding themselves as investments that are in demand, which, in turn, pressure mortgage rates up from their otherwise extremely low positions. As such, while the housing market is still seeing significant "irrational exuberance" (which is discussed elsewhere in this report), mortgage rates are seeing some increases in the marketplace.

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 between 2.8% to 3.75% during 2021 and 2022*. (Averaged 30-year fixed rates were at 2.65% in early January 2021, but are now at 3.02%, having peaked in early April.[54])

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[54] https://fred.stlouisfed.org/series/MORTGAGE30US

Other Commentary

- "According to Freddie Mac, In spite of low mortgage rates, there is evidence of a pullback by those looking to enter the housing market. … Purchase demand has diminished compared with late May and early June 2020, when mortgage rates were at the same level. … This confirms that the marginal buyer is feeling the affordability squeeze resulting from rising mortgage rates and house prices.." (see https://finance.yahoo.com/news/u-mortgage-rates-7-row-003835961.html; April 3, 2021)
- "Mortgage rates tend to move in the same direction as the yield on the 10-year Treasury, which has been rising. Treasury yields rise when investors feel confident enough in the economy to forgo safe-haven assets such as bonds for riskier ones including stocks." (see https://www.wsj.com/articles/30-year-mortgage-rate-tops-3-for-first-time-since-july-11614870208; as of March 4, 2021)
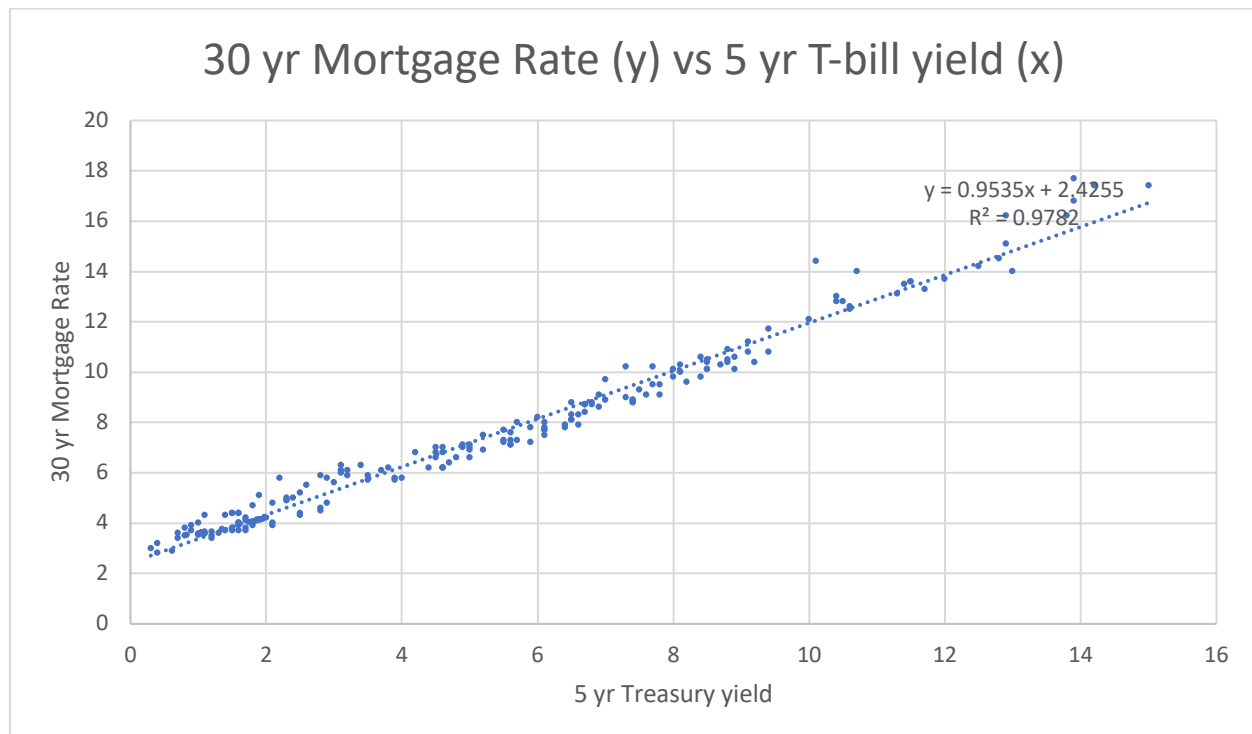
Source: Author's calculation

Moody's AAA & BAA Rates; and the BofA BBB Corporate Yield

Analysis

Moody's AAA bond rates tend to track in conjunction with mid-duration T-bill yields. 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 Moody's indices both show a noteworthy inverse correlation with the BBB Corporate Yield and the 30-year Mortgage Rate.

Capitalytics' quantitative models see AAA rates gradually rising over the next several years (through 2024) from 2.77% in 2021Q1 to 3% by the end of 2023. We do not believe that this is a likely outcome, instead believing that BAA yields will continue to track with AAA yields, with approximately 0.5% additional return to counter the risk associated with the BAA instruments. We anticipate that AAA yields will actually drop from about 3% to 2.7% between 2Q2021 and 4Q2023, with (again) BAA yields at 0.5% higher. BBB yields will be about 50 bp lower than AAA yields.

Prime Rate

Analysis

The Prime Rate has historically been very tightly coupled to very short-term Treasury Bills (specifically, very short-term 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 2022, and into 2023). However, given the Fed's stance regarding rates, ***we feel that it is possible that the Prime Rate will remain at approximately 3.25% through 3Q2022 due to its dependence on other rates & yields***.

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

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

y = 0.9931x + 3.103
R² = 0.9687
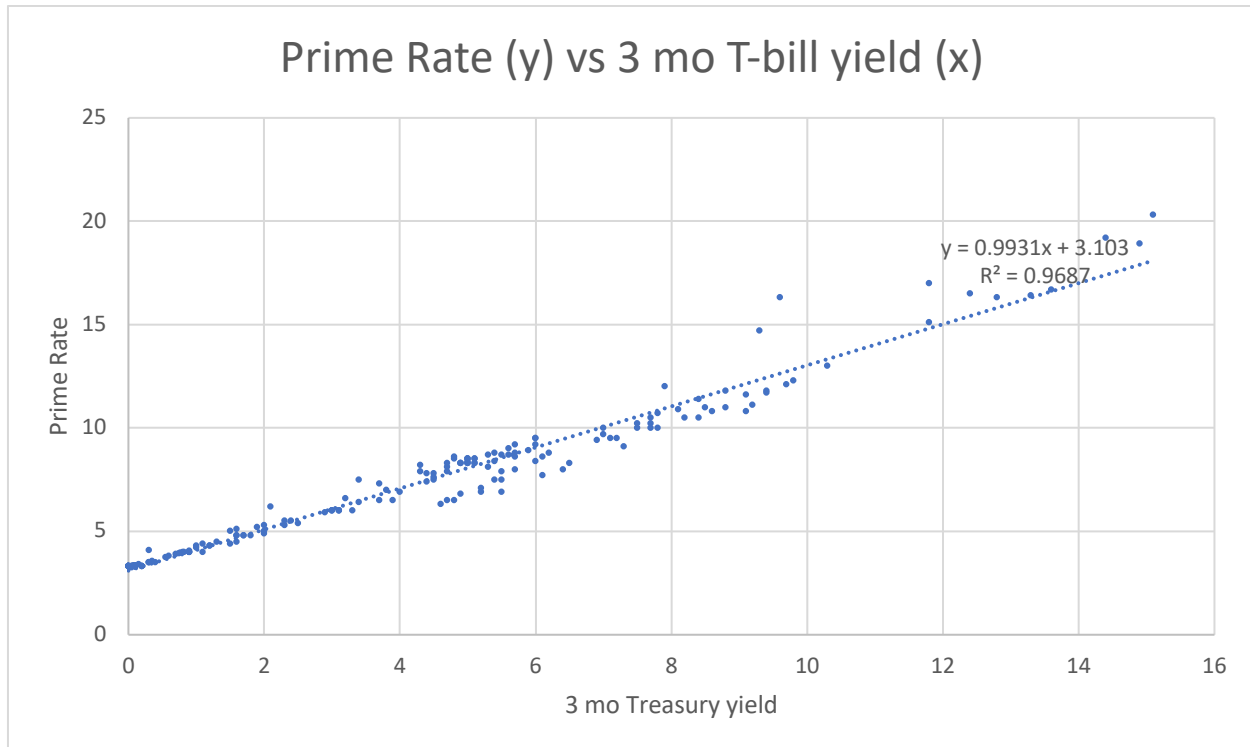
Source: Author's calculation

US Average Retail Gasoline Price

Analysis

As the US seems to emerge from its COVID-induced slumber with baited anticipation of road trips, fuel demand is already starting to increase and challenge supplies, causing increased fuel prices at the pump. Additionally, after President Biden signed an executive order to revoke the permit that was granted to TC Energy Corporation for the Keystone XL Pipeline (Phase 4) on January 20, 2021, resulting in TC Energy Corp finally abandoning the project[55]. As a result, despite the White House's "green energy" agenda, oil imports will be more important than ever in the near term, and West Texas crude oil is now selling at over $70/barrel.[56]

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[55] See https://www.reuters.com/business/energy/tc-energy-terminates-keystone-xl-pipeline-project-2021-06-09/

[56] See https://oilprice.com/oil-price-charts/45

Figure 31: Imported Price of Imported Crude Oil

Monthly Imported Crude Oil Price ($/bar)

Source: EIA Short-Term Energy Outlook, June 2021

Monthly Motor Gasoline Regular Grade Retail Price ($/gal)

Source: EIA Short-Term Energy Outlook, June 2021
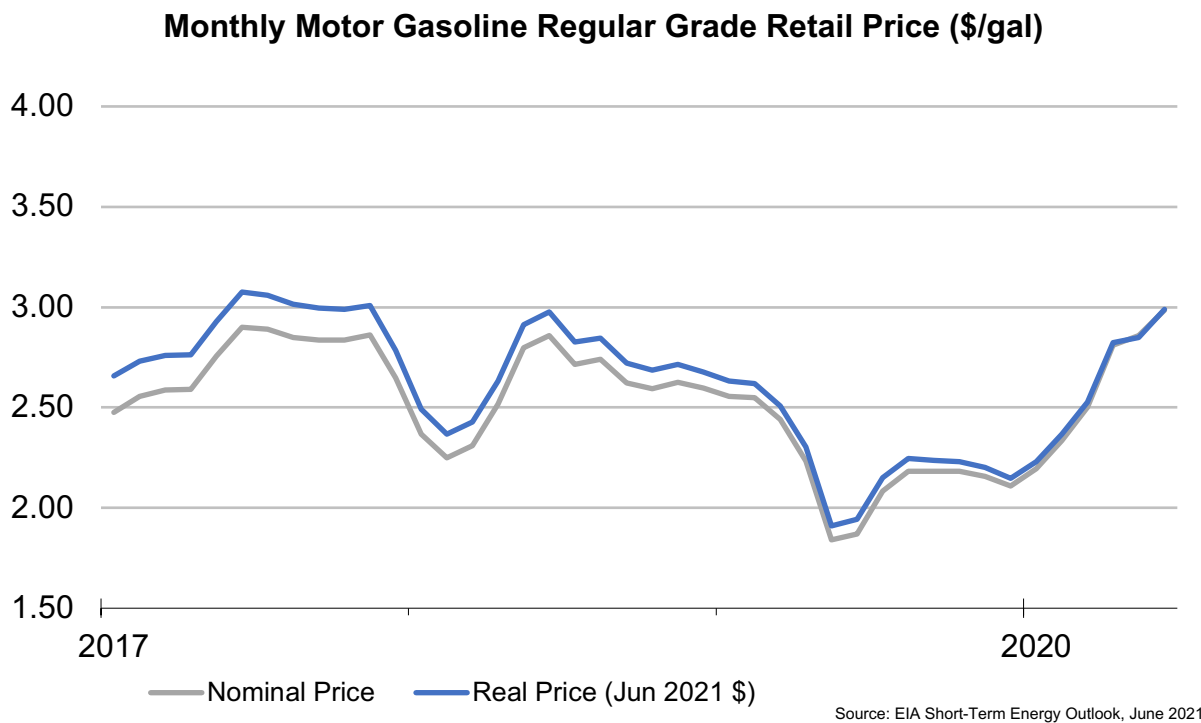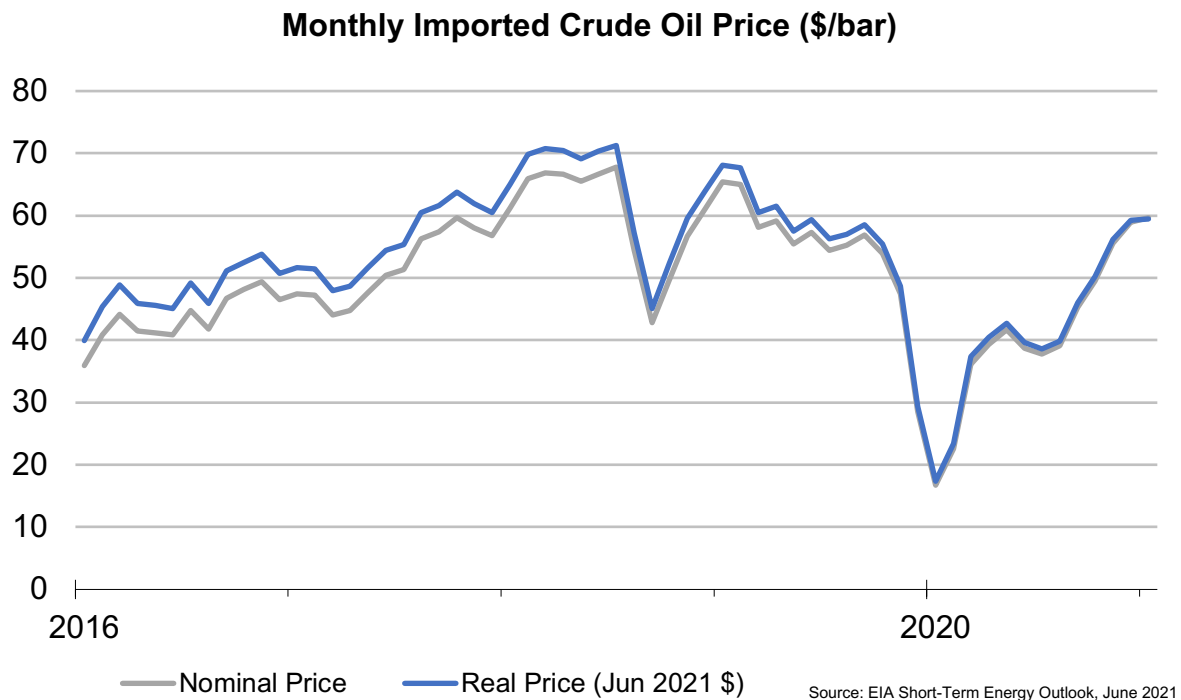
With imported crude oil slightly higher than it was pre-pandemic, OPEC+ production forecast to be cut less than expected[57], and expected increases in consumption due to workers returning to their offices and summer travel, almost all fuel prices are increasing. The national average for gasoline has topped $3/gallon. While most outlets are following the EIA's forecasts that gasoline will crest below $3.50 in the coming months[58], we are still concerned about three things:

1. As has happened several times in recent years, the 2021 hurricane season[59] may have a significant impact on the availability domestic oil (from the Gulf of Mexico) and imported oil. This coming season (2021) is expected to be an "above average" season, just as 2020 was expected to be; however, it should be noted that in 2020 the US had a record number of named storms, and 12 "direct strikes" by hurricanes.
2. Second, over the past year, the impact of COVID on the number & availability of tanker drivers has impacted the local availability of gasoline at the pumps despite its "regional" availability[60].
3. Third, the recent ransomware attack on the Colonial Pipeline may have gained the hackers more attention than they wanted[61], but the precedent that was set by Colonial paying the hackers over $4M (and the wave of "topping off" that resulted when consumers were concerned about availability[62]) could also disrupt supplies and impact prices.

We expect that gas prices in 2021 will be at $3.50/gallon by Labor Day, with a possibility of $4/gallon if there is a significant interruption in petroleum distribution.

Other Commentary

- "Now that the United States and some other parts of the world are emerging from the health crisis and people are traveling again, fuel demand is bouncing back strongly. We think gas prices could edge even higher this summer before cooling off this fall, unless oil prices happen to fall significantly. Diesel, now averaging $3.22 per gallon, is also slowly rising." (https://www.kiplinger.com/economic-forecasts/energy; June 17, 2021)
- "The national average price for a gallon of regular stands at $3.10, the highest since October 2014. The average is up just 2% since Memorial Day, but 42% from a year ago … But stations running dry has nothing to do with the price — or even the supply — of gasoline. It's the shortage of tank truck drivers coupled with rising demand that is causing supply chain

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[57] See https://oilprice.com/Latest-Energy-News/World-News/Oil-Prices-Climb-On-An-Optimistic-Outlook-From-OPEC.html

[58] See https://www.eia.gov/outlooks/steo/ and https://gasprices.aaa.com/no-freedom-from-high-gas-prices-for-the-independence-day-holiday-weekend/

[59] https://www.noaa.gov/news-release/noaa-predicts-another-active-atlantic-hurricane-season

[60] See https://www.cnn.com/2021/06/28/business/gas-station-outages/index.html

[61] See https://www.cnn.com/2021/05/08/politics/colonial-pipeline-cybersecurity-attack/index.html and https://www.msspalert.com/cybersecurity-breaches-and-attacks/ransomware/colonial-pipeline-investigation/

[62] See https://www.marketwatch.com/story/heres-what-the-shutdown-of-the-colonial-pipeline-means-for-the-gasoline-market-11620668939

bottlenecks and shortages." (per https://www.cnn.com/2021/06/28/business/gas-station-outages/index.html; June 28, 2021)

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)[63] through 2022. Based on Fed' Chairman Jerome Powell's consistent doggedness in his message, but the evolving scenario's obvious impact on the Board of Governors (see in Figure 32 and Figure 33), ***we feel that it is likely that the FOMC will hold to this position until some point during 1H2022 (at the latest)***.

The accompanying chart shows the relationship that has existed historically between the Federal Funds rate and the 3-year T-bill yield.

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

Figure 32: FOMC "Dot Plot" from March 2021 Board of Governors' Meeting
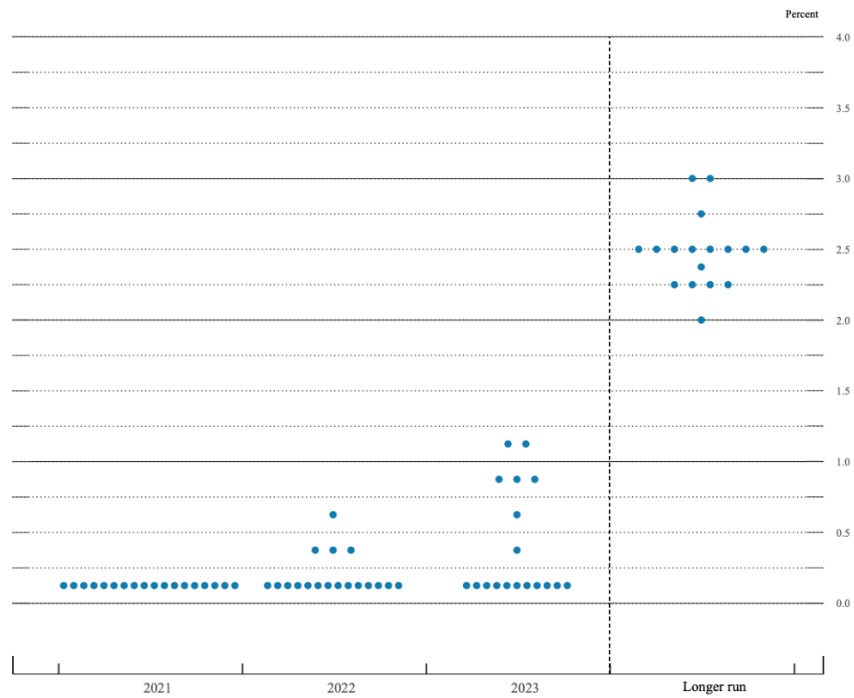
Figure 33: FOMC "Dot Plot" from June 2021 Board of Governors' Meeting

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

$y = 1.0084x - 0.599$
$R^2 = 0.9346$

Primary Credit

3 mo Treasury yield
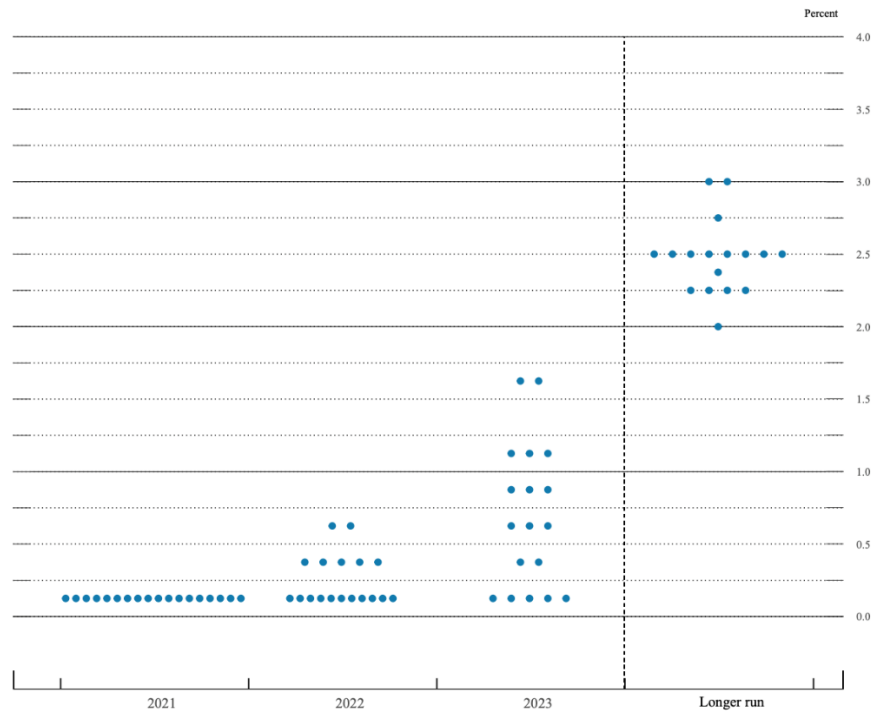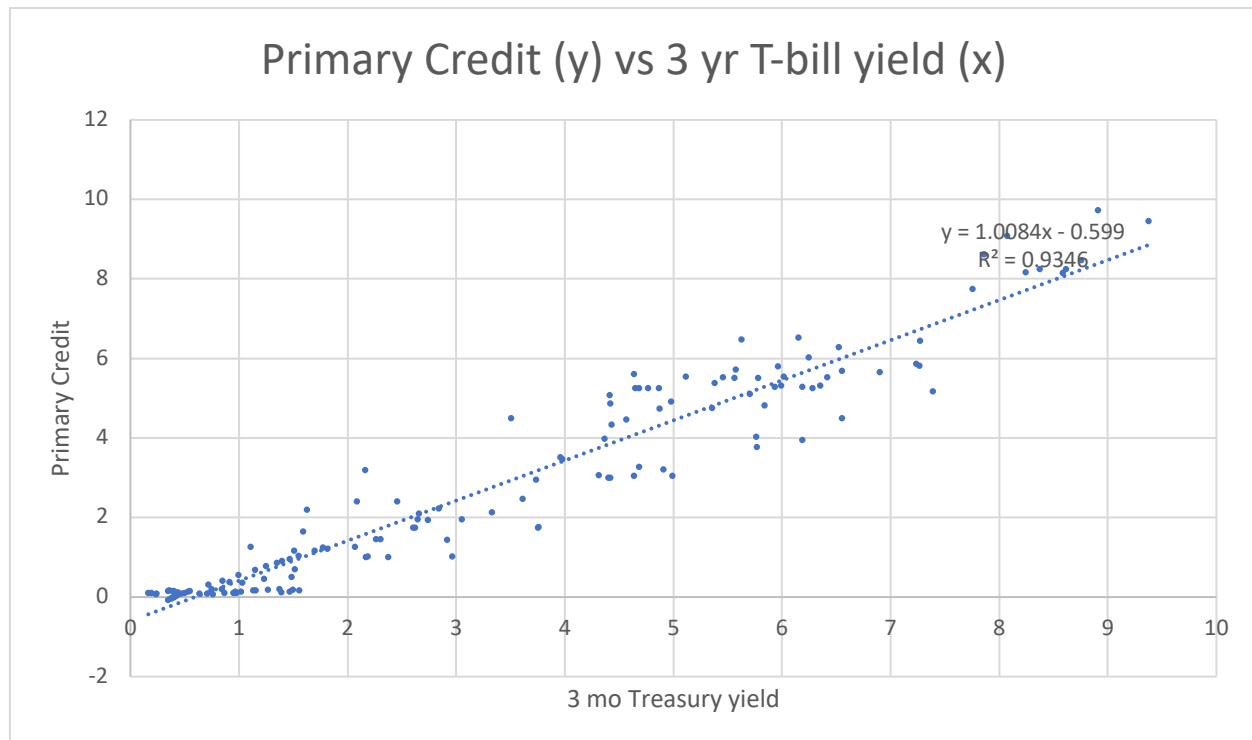
Source: Author's calculation

Other Commentary

- "Chair Jerome Powell of the Federal Reserve has said that the Fed would consider any spike up in inflation [in 2021] to be temporary. That means that the Fed will not raise short-term rates, even if inflation picks up. It remains focused on its goal of seeing a lower unemployment rate and a recovery in the labor market." (see https://www.kiplinger.com/economic-forecasts/interest-rates; June 4, 2021)
- "Federal Reserve Chairman Jerome Powell [says] there is no plan to raise interest rates until labor-market conditions are consistent with maximum employment and inflation is sustainably at 2%" (see https://www.wsj.com/articles/feds-powell-to-take-questions-on-job-market-interest-rates-bond-yields-11614872817; March 4, 2021)

House and Commercial Real Estate Price Indexes

Analysis

Not to be repetitive, but ***mortgage originators are already*** <u>***extremely***</u> <u>***selective***</u> ***of new mortgagees and their repayment ability***. Further, as businesses continue to "re-open" to a more "typical" business culture, we expect employer-funded transfers within corporations to be minimized, leaving new home

acquisitions at the risk of owners. In other words, given low mortgage rates, those who can afford it (and whose employers allow it) will drive the real estate moves to homes and areas that are desirable.

Given that point, real estate has continued to be a seller's market for far longer than anyone expected as homebuyers have scraped together liquidity in order to fuel bidding wars for new homes[64]. This trend of increasing prices is being fueled by several intersecting phenomena on both the supply and demand sides:

1. Low interest rates;
2. The concerns of another (possible) health crisis;
3. Remote work options from some employers;
4. Supply chain issues (and continued demand) affecting the availability of construction materials, e.g., lumber, copper, PVC, etc.;
5. Inconsistently available labor;
6. The Fed's Quantitative Easing program's current trend of purchasing CMOs & MBSs ($40B/month)[65]; and
7. Bidding wars that are fueling less rational actions and a "fear of missing out".

As material prices appear to be gradually returning to "normal" (with lumber down 50% from its peak, and likely bottoming out during 4Q2021 based on current expectations), we see that domestic lumber (traditionally exported for the highest return) is coming available to supplement that of Canada, Chile, Brazil, New Zealand, Germany and Sweden. Pressure-treated wood sold in the US is also traditionally imported from Canada, Honduras, & Russia. These two types of goods are primarily what is used in contemporary new-construction and renovation in the US; we emphasize their sources since outbreaks – or even micro-outbreaks – could substantially disrupt the supply of these items and cause prices to quickly increase without warning. If sites in Chile, Brazil, and Honduras are viewed as the most likely ones to experience a resurgence in COVID-19 (and its latest variants), then US availability will likely be viewed as a strong hedge that can be taken advantage of if their typical destinations are not demanding their products; the issue then becomes that domestic prices will likely remain elevated (to accommodate the domestic mills expected income) over the "normal" prices from, say, mid-2019 (or comparably "inflated" prices).

Along these lines, US suppliers and builders will need to be mindful of the sources of the goods used in construction, and the health of those countries along with the availability of supply chains: Hardwoods are usually sourced from Canada, China, Sweden, Indonesia, Brazil, & Malaysia. Copper is mined domestically in Arizona, Michigan, New Mexico & Montana, but is also imported from the most productive global sources in Chile & Peru. Cement is generally imported from Vietnam, Turkey, Thailand, Canada, and Germany. Monitoring the impact of the "Alpha", "Beta", "Delta", "Delta Plus", "Gamma", and "Epsilon" variants/mutations[66,67] of the COVID virus both domestically and

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[64] See https://www.wsj.com/articles/the-housing-market-is-crazier-than-its-been-since-2006-11617422403

[65] See https://www.economist.com/finance-and-economics/2021/07/01/does-americas-hot-housing-market-still-need-propping-up

[66] See https://www.healthline.com/health-news/delta-plus-epsilon-gamma-new-covid-19-variants-have-scientists-worried#Other-worrisome-variants and https://www.cdc.gov/coronavirus/2019-ncov/variants/variant.html

[67] See https://amp.cnn.com/cnn/2021/06/25/health/delta-plus-variant-explainer-intl-hnk-scn/index,hrml

internationally, and understanding the efficacy and penetration of treatments will be key to having a sense of what sources of materials will be available and at what costs or quantities.

The Centers for Disease Control provides a "Global Variants Report" to show the impact of different strains on parts of the globe; it may be accessed at https://covid.cdc.gov/covid-data-tracker/#global-variant-report-map.

Figure 34: Ratio of Commodity Futures Prices to Prices from mid-2019

Ratio of Commodity Futures Prices since 6/30/2019

Sources: https://www.investing.com/commodities/pvc-com-futures-historical-data, https://www.investing.com/commodities/lumber-historical-data, https://www.investing.com/commodities/steel-rebar-historical-data, & https://www.investing.com/commodities/copper-historical-data
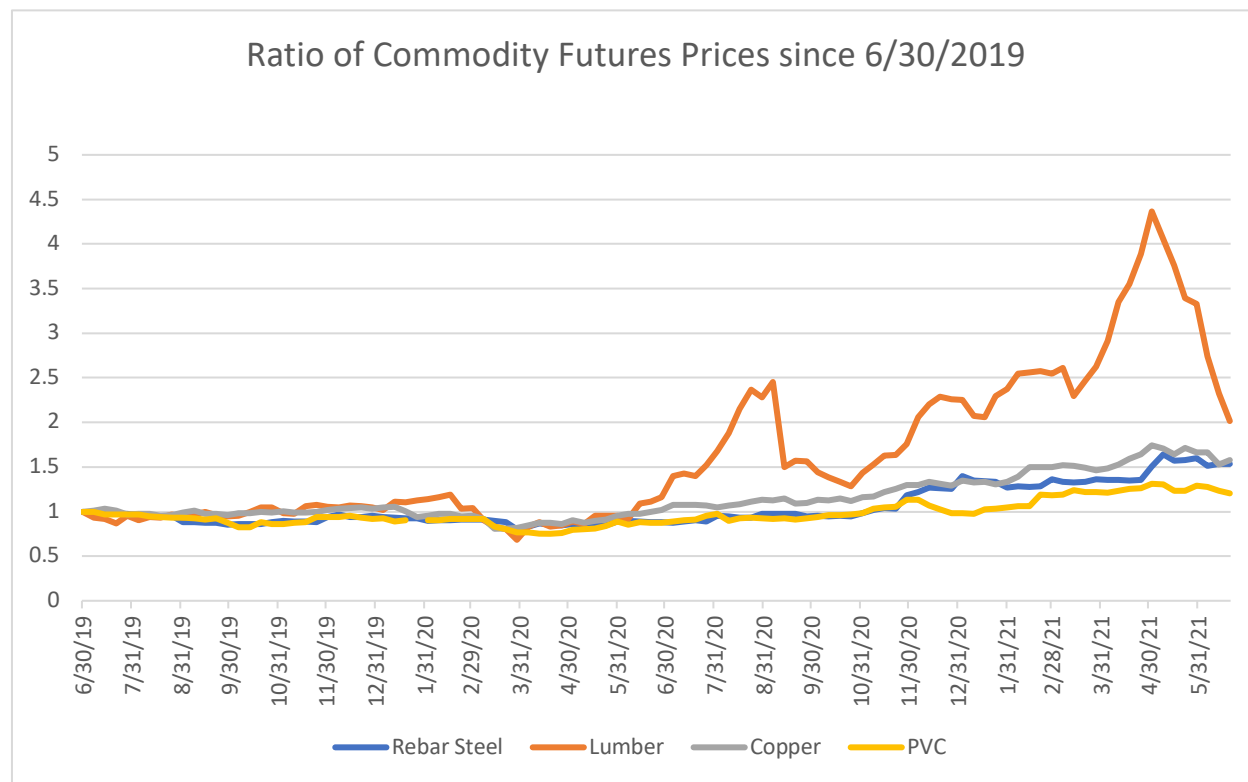
As we have mentioned in previous reports, ***we expect commercial real estate to falter as tenants re-evaluate their needs, and as investors look to repurpose assets*** to more stable purposes. While self-storage, take-out grocery/pharmacy, and professional services are stable in their footprints, most other retail, food service, multi-purpose office space, and hospitality is still significantly impaired[68], and will likely not recover to pre-pandemic levels for several years, if ever[69]. Multi-purpose office buildings will also be looking to differentiate themselves from competition with added benefits and state-of-the-art finishes & features, despite the uncertainties of the future[70]. As an example, Figure 35 shows the supply,

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[68] See https://www.cnn.com/2020/09/22/investing/commercial-real-estate-recession/index.html

[69] See https://www.cnbc.com/2020/09/27/office-real-estate-back-to-normal-in-2025-cushman-wakefield.html

[70] See https://www.cnbc.com/video/2021/06/30/nyc-office-landlords-desperately-try-to-hold-on-to-tenants.html

absorption, and vacancy rates for commercial property in Atlanta, one of the hardest-hit MSA's in the country.

The more worrisome problem is what will happen once banks acknowledge the distressed properties that are on their books, and those properties are then exposed to regulators. After a year of souring, new and attractive uses for defaulted commercial property will be the key for lenders who will become saddled with these assets; *we are expecting successful lenders to partner early with developers who excel in alternative residential (and other innovative) opportunities*[71].

The accompanying chart shows the correlation between the residential and commercial real estate indexes.
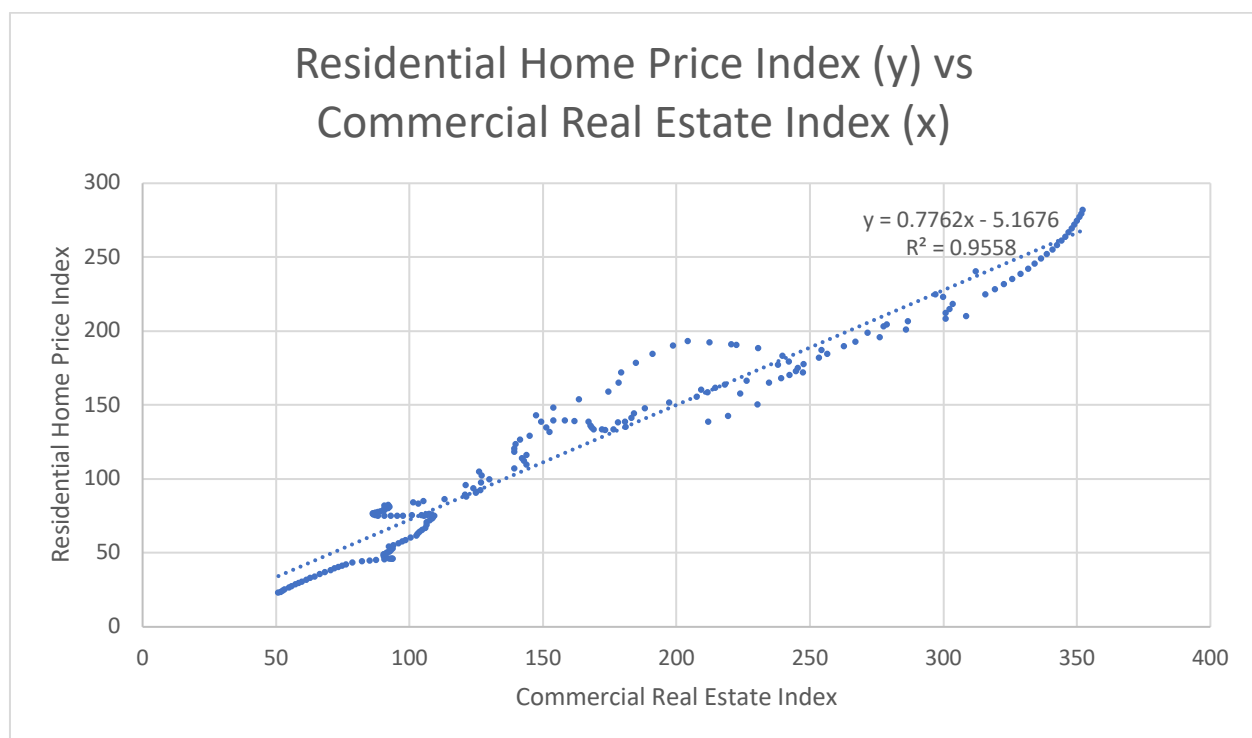
Source: Author's calculation

Other Commentary

- "A number of forces have merged to fuel the red-hot housing market, including mortgage rates dropping below 3% in July for the first time ever. Millions of millennials are aging into their prime-homebuying years in their 30s. New-home construction has lagged behind demand and

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[71] See, e.g., https://www.forbes.com/sites/forbesrealestatecouncil/2021/02/08/10-commercial-real-estate-predictions-for-2021, https://www.cpexecutive.com/post/will-2021-bring-cre-certainty/, and https://finance.yahoo.com/news/what-to-expect-from-commercial-real-estate-in-2021-210629855.html

homeowners are holding on to their houses longer." (https://www.wsj.com/articles/u-s-home-price-growth-accelerated-in-january-11617109259; March 30, 2021)

- "In 2020, Millennials and other cohorts started to move from major cities to the suburbs and from gateway markets to secondary and tertiary markets in states with lower taxes and a better quality of life. … Nearly 16 million people have left the larger cities of the country, with 14.2 million filing permanent change-of-address forms," noted Barry LePatner, a veteran real estate and construction attorney …" (https://www.cpexecutive.com/post/will-2021-bring-cre-certainty/; Feb. 5, 2021)

Figure 35: Commercial Property: Supply, Absorption, and Vacancy Rates (Atlanta)
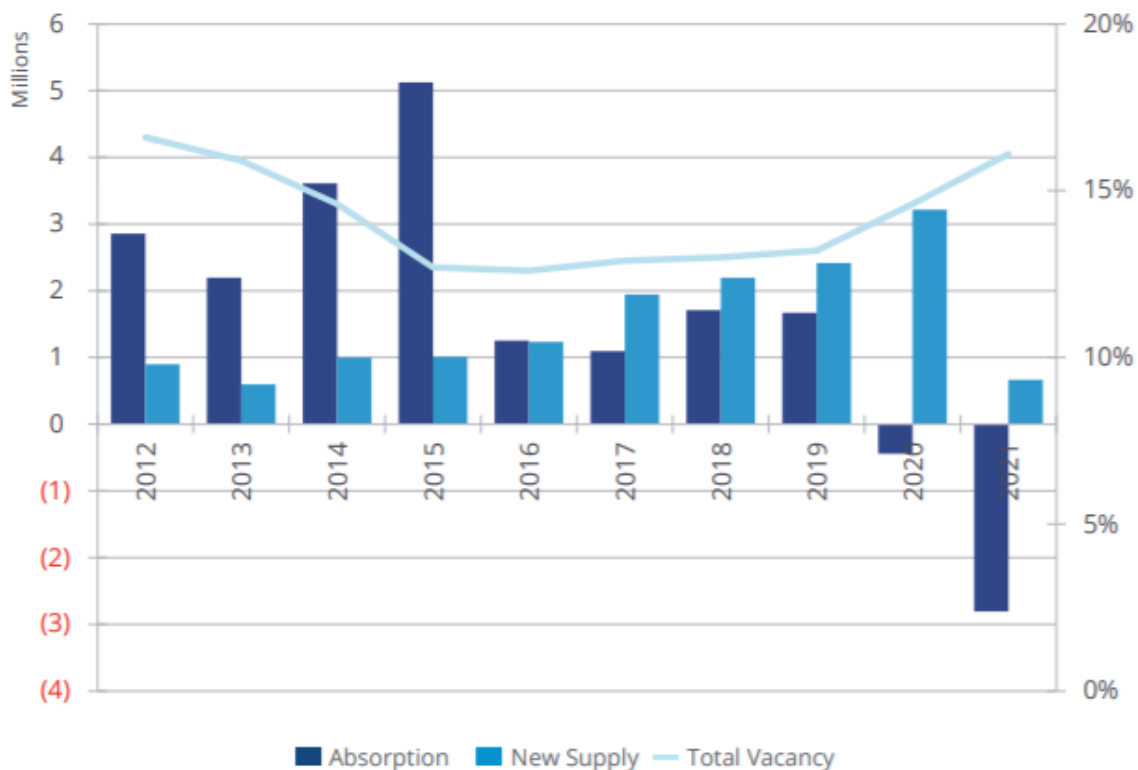
Source: Collier's Real Estate: 2021Q1OfficeReportAtlantaColliers.pdf; https://www.colliers.com/en/research/atlanta/atlanta-office-market-report-2021-q1

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

Analysis

While the Dow-Jones Total Stock Market Index was apprehensive of the change in the White House administration, going from a growth rate of almost 150 points per day to only 21 points on either side of January 20, 2021 (through 1Q2021), it appears to be picking up speed. We suspect that the markets are becoming more comfortable with the new administration's approach for addressing issues and communicating with constituents, given the dramatic change seen. Since the end of the first quarter, the market has been growing at just over 50 points per day through 2Q2021. Similarly, the SP500 grew by 7.37 points per day during 1Q2021 prior to President Biden's inauguration, then grew by only 1 point per day during the remainder of the quarter, and rose by 6.3 points per day during 2Q2021.

The following chart shows the connection between the SP500 index and the commercial real estate index previous discussed.

SP500 Total Index (y) vs Commercial Real Estate Index (x)

$y = 15.287x - 1610.5$
$R^2 = 0.9698$
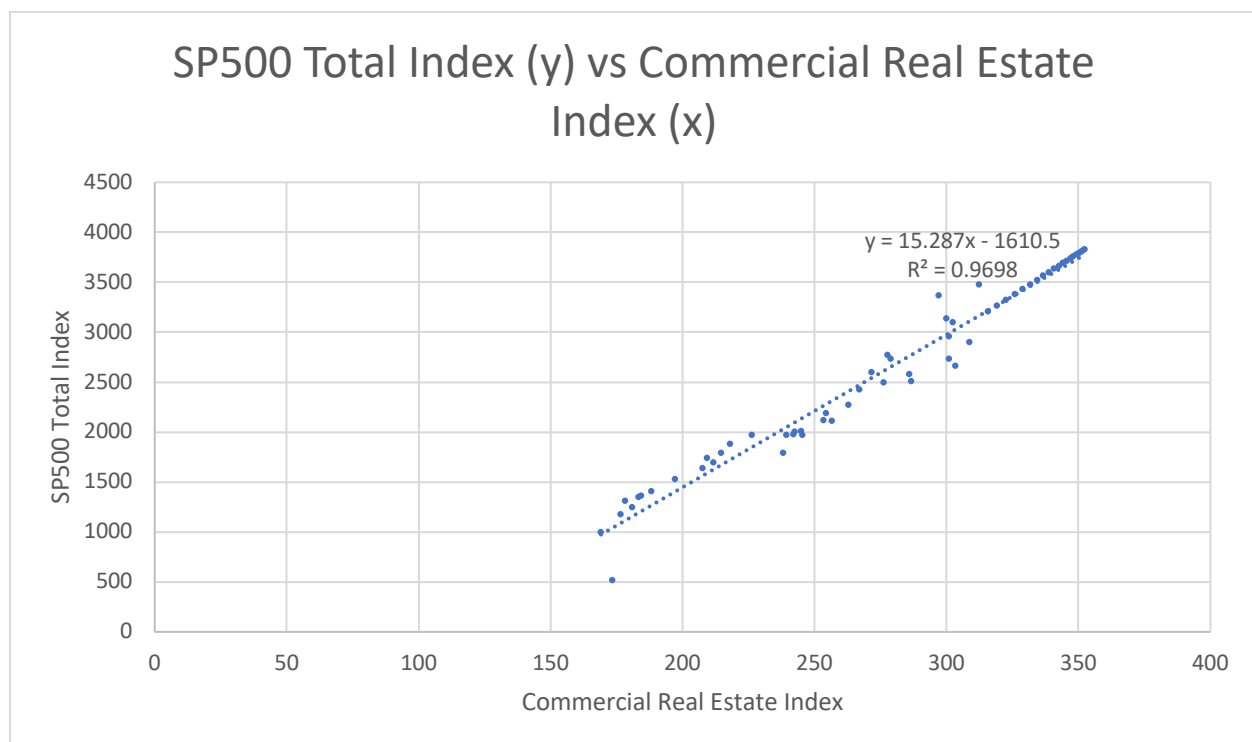
Source: Author's calculations

What we see are the signs of increased confidence in President Biden's actions, and reduced concerns surrounding virus mutations. The growth of the Treasury bond market is an indicator of the discontentment with the value of "tech stocks" now that life appears to be returning to 2019 conditions;

however, as inflation becomes an increased concern, traders are starting to divert their interests from bonds based on their projected low yields until rates grow (likely in 2022).

We believe that the VIX will stay low and the markets will remain stable provided that US leadership remains consistent in its message; virus cases (and economic channels) can be controlled through well communicated protocols; and employment & inflation remains well-managed. Investors will remain in the market, and will seek profitable opportunities. Per our previous analyses, we expect home improvement brands, energy, real estate, and banking equities to emerge from 2021 and 2022 with new opportunities. ***We expect growth in equities and indices will slow, particularly if Congress, the IRS, and/or the FTC takes the anti-trust actions that have been drafted against "high tech" conglomerates***.

Other Commentary

- "Economists at the Official Monetary and Financial Institutions Forum put it succinctly, saying that he only scenario to be genuinely fearful of is stagflation, where growth is poor but inflation is high." (https://www.wsj.com/articles/how-the-2020-qe-boom-might-trip-up-central-bankers-11609237796; Dec. 29, 2020)

Regression Analyses

The following section document the linear regression coefficients found for each of the aforementioned variables, as a function of other variables (which are not significantly correlated with the control variable). With this report, we have also included the natural log 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 2Q2011 and 1Q2021, inclusive.

Table 15: Regression Aggregate Errors for 2Q2011 through 1Q2021

Variable	Min Abs. Error	Average Error	Max Abs. Error
Real GDP Growth	38.24%	-341.55%	***
Nominal GDP Growth	122.34%	**	***
Real Disposable Income Growth	8.59%	***	***
Nominal Disposable Income Growth	3.38%	***	***
Inflation	0.00%	53.21%	***
Unemployment Rate	227.88%	***	***
1-month Treasury Yield	0.92%	26.42%	870.79%
3-month Treasury Yield	0.00%	**	***
6-month Treasury Yield	***	**	***
1-year Treasury Yield	***	**	***
3-year Treasury Yield	305.37%	**	***
5-year Treasury Yield	75.74%	-165.64%	298.42%
7-year Treasury Yield	1.70%	-53.95%	315.34%
10-year Treasury Yield	0.56%	-2.02%	89.57%
20-year Treasury Yield	0.67%	-0.34%	84.58%
30-year Treasury Yield	0.68%	2.82%	133.42%
30-year Mortgage Rate	1.02%	-10.53%	39.18%
Moody's AAA Curve	0.40%	3.72%	39.58%
Moody's BAA Curve	0.18%	1.40%	18.15%
BBB Corporate Yield	0.03%	2.48%	43.44%
Prime Rate	0.07%	0.05%	32.24%
US Average Retail Gasoline Price	0.75%	40.34%	103.96%
Cost of Federal Funds	***	**	***
Dow Jones Total Stock Market Index	3.04%	424.73%	***
S&P 500 Stock Price Index	296.74%	***	***
Commercial Real Estate Price Index	163.74%	736.16%	***
Residential Home Price Index	129.32%	597.04%	***
Market Volatility Index	327.01%	***	***

** 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	188.398 (+/- 17.436)
	$p = 0.000^{***}$
SP500 Stock Price Index	-0.014 (+/- 0.002)
	$p = 0.00001^{***}$
US Fed Reserve O-N Loan Rate	56.628 (+/- 3.855)
	$p = 0.000^{***}$
Unemployment Rate	-13.440 (+/- 0.470)
	$p = 0.000^{***}$
BBB corporate yield	15.889 (+/- 1.983)
	$p = 0.00000^{***}$
30-year Mortgage Rate	-18.968 (+/- 4.150)
	$p = 0.0003^{***}$
Market Volatility Index	0.253 (+/- 0.039)
	$p = 0.00001^{***}$
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	13.051 (+/- 1.588)
	$p = 0.00000^{***}$
LN_30-year Treasury Yield	-189.397 (+/- 23.287)
	$p = 0.00000^{***}$
LN_20-year Treasury Yield	219.886 (+/- 27.323)
	$p = 0.00000^{***}$
10-year Treasury Yield	214.180 (+/- 20.898)

	$p = 0.000^{***}$
LN_10-year Treasury Yield	-457.720 (+/- 30.522)
	$p = 0.000^{***}$
LN_1-month Treasury Yield	5.373 (+/- 1.096)
	$p = 0.0001^{***}$
7-year Treasury Yield	-207.608 (+/- 29.163)
	$p = 0.00000^{***}$
LN_7-year Treasury Yield	314.700 (+/- 34.599)
	$p = 0.00000^{***}$
5-year Treasury Yield	-131.284 (+/- 33.063)
	$p = 0.001^{***}$
6-month Treasury Yield	-56.715 (+/- 5.551)
	$p = 0.000^{***}$
LN_6-month Treasury Yield	-13.718 (+/- 2.241)
	$p = 0.00001^{***}$
3-year Treasury Yield	87.936 (+/- 19.714)
	$p = 0.0003^{***}$
3-year Treasury Yield_2	-17.929 (+/- 5.643)
	$p = 0.005^{***}$
5-year Treasury Yield_2	31.676 (+/- 8.374)
	$p = 0.002^{***}$
Observations	40
R^2	0.986
Adjusted R^2	0.971
Residual Std. Error	1.279 (df = 19)
F Statistic	67.089^{***} (df = 20; 19)

Note: *p<0.1; **p<0.5; ***p<0.01

REGRESSION FOR NOMINAL GDP GROWTH

	Dependent variable (+/- SE):
	Nominal GDP growth
Constant	64.764 (+/- 13.024)
	$p = 0.0001$[***]
SP500 Stock Price Index	-0.011 (+/- 0.002)
	$p = 0.00001$[***]
US Fed Reserve O-N Loan Rate	45.931 (+/- 4.069)
	$p = 0.000$[***]
Unemployment Rate	-12.922 (+/- 0.441)
	$p = 0.000$[***]
BBB corporate yield	15.799 (+/- 1.851)
	$p = 0.00000$[***]
30-year Mortgage Rate	-10.932 (+/- 3.539)
	$p = 0.007$[***]
LN_Market Volatility Index	6.432 (+/- 1.120)
	$p = 0.00002$[***]
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	17.244 (+/- 1.436)
	$p = 0.000$[***]
LN_30-year Treasury Yield	-127.054 (+/- 16.992)
	$p = 0.00000$[***]
20-year Treasury Yield	47.147 (+/- 8.514)
	$p = 0.00003$[***]
10-year Treasury Yield	174.127 (+/- 14.698)
	$p = 0.000$[***]
LN_10-year Treasury Yield	-378.386 (+/- 21.350)

	$p = 0.000^{***}$
LN_1-month Treasury Yield	6.333 (+/- 0.984)
	$p = 0.00001^{***}$
7-year Treasury Yield	-264.644 (+/- 22.990)
	$p = 0.000^{***}$
LN_7-year Treasury Yield	471.186 (+/- 26.199)
	$p = 0.000^{***}$
LN_5-year Treasury Yield	-159.148 (+/- 10.630)
	$p = 0.000^{***}$
6-month Treasury Yield	-77.845 (+/- 7.506)
	$p = 0.000^{***}$
LN_6-month Treasury Yield	-16.250 (+/- 1.808)
	$p = 0.00000^{***}$
3-year Treasury Yield	90.633 (+/- 9.591)
	$p = 0.00000^{***}$
1-year Treasury Yield	39.254 (+/- 9.051)
	$p = 0.0004^{***}$
3-year Treasury Yield_2	-23.227 (+/- 2.243)
	$p = 0.000^{***}$
5-year Treasury Yield_2	21.289 (+/- 2.284)
	$p = 0.00000^{***}$
Observations	40
R^2	0.993
Adjusted R^2	0.986
Residual Std. Error	0.986 (df = 18)
F Statistic	130.919*** (df = 21; 18)

Note:

$^*p<0.1; ^{**}p<0.5; ^{***}p<0.01$

REGRESSION FOR REAL DISPOSABLE INCOME GROWTH

	Dependent variable (+/- SE):
	Real disposable income growth
Constant	-49.850 (+/- 13.174)
	$p = 0.001^{***}$
Unemployment Rate	9.272 (+/- 0.965)
	$p = 0.000^{***}$
Commercial Real Estate Price Index	0.168 (+/- 0.030)
	$p = 0.00001^{***}$
20-year Treasury Yield	-41.821 (+/- 5.836)
	$p = 0.00000^{***}$
LN_10-year Treasury Yield	91.219 (+/- 11.186)
	$p = 0.000^{***}$
Observations	40
R^2	0.729
Adjusted R^2	0.698
Residual Std. Error	4.923 (df = 35)
F Statistic	23.537^{***} (df = 4; 35)
Note:	$^{*}p<0.1; ^{**}p<0.5; ^{***}p<0.01$

REGRESSION FOR NOMINAL DISPOSABLE INCOME GROWTH

	Dependent variable (+/- SE):
	Nominal disposable income growth
Constant	-36.568 (+/- 10.748)
	$p = 0.002^{***}$
SP500 Stock Price Index	0.012 (+/- 0.002)
	$p = 0.00001^{***}$
Unemployment Rate	9.607 (+/- 1.074)
	$p = 0.000^{***}$
20-year Treasury Yield	-42.539 (+/- 6.004)
	$p = 0.00000^{***}$
LN_10-year Treasury Yield	95.518 (+/- 12.098)
	$p = 0.000^{***}$
Observations	40
R^2	0.699
Adjusted R^2	0.665
Residual Std. Error	4.964 (df = 35)
F Statistic	20.363^{***} (df = 4; 35)
Note:	$^{*}p<0.1; ^{**}p<0.5; ^{***}p<0.01$

REGRESSION FOR CPI INFLATION RATE

	Dependent variable (+/- SE):
	CPI Inflation Rate
Constant	172.278 (+/- 6.258)
	p = 0.00001***
SP500 Stock Price Index	-0.025 (+/- 0.001)
	p = 0.00000***
US Fed Reserve O-N Loan Rate	29.699 (+/- 1.009)
	p = 0.00000***
Moody's AAA Curve	-5.169 (+/- 0.209)
	p = 0.00001***
Real GDP growth	-0.520 (+/- 0.053)
	p = 0.0002***
Nominal GDP growth	0.208 (+/- 0.051)
	p = 0.010***
Real disposable income growth	-0.194 (+/- 0.018)
	p = 0.0002***
Nominal disposable income growth	0.273 (+/- 0.015)
	p = 0.00001***
Unemployment Rate	-8.460 (+/- 0.231)
	p = 0.00000***
BBB corporate yield	1.569 (+/- 0.360)
	p = 0.008***
30-year Mortgage Rate	-4.716 (+/- 0.614)
	p = 0.001***
Dow Total Stock Market Index	-0.0003 (+/- 0.00004)

	$p = 0.0004^{***}$
Market Volatility Index	0.092 (+/- 0.009)
	$p = 0.0002^{***}$
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	9.625 (+/- 0.322)
	$p = 0.00000^{***}$
30-year Treasury Yield	429.227 (+/- 13.770)
	$p = 0.00000^{***}$
LN_30-year Treasury Yield	-1,102.703 (+/- 34.250)
	$p = 0.00000^{***}$
20-year Treasury Yield	-320.900 (+/- 17.783)
	$p = 0.00001^{***}$
LN_20-year Treasury Yield	732.040 (+/- 30.481)
	$p = 0.00001^{***}$
10-year Treasury Yield	-56.144 (+/- 5.342)
	$p = 0.0002^{***}$
1-month Treasury Yield	34.571 (+/- 0.962)
	$p = 0.00000^{***}$
LN_1-month Treasury Yield	-1.717 (+/- 0.195)
	$p = 0.0004^{***}$
7-year Treasury Yield	165.938 (+/- 7.641)
	$p = 0.00001^{***}$
LN_7-year Treasury Yield	-119.917 (+/- 10.714)
	$p = 0.0001^{***}$
3-month Treasury Yield	6.205 (+/- 0.974)
	$p = 0.002^{***}$
5-year Treasury Yield	-111.680 (+/- 4.518)

	$p = 0.00001^{***}$
LN_5-year Treasury Yield	117.036 (+/- 6.919)
	$p = 0.00002^{***}$
6-month Treasury Yield	-98.064 (+/- 2.741)
	$p = 0.00000^{***}$
LN_6-month Treasury Yield	5.354 (+/- 0.579)
	$p = 0.0003^{***}$
LN_3-year Treasury Yield	-34.518 (+/- 1.763)
	$p = 0.00001^{***}$
1-year Treasury Yield	62.815 (+/- 1.880)
	$p = 0.00000^{***}$
LN_1-year Treasury Yield	-9.578 (+/- 0.790)
	$p = 0.0001^{***}$
3-year Treasury Yield_2	1.495 (+/- 0.271)
	$p = 0.003^{***}$
3-month Treasury Yield_2	-3.392 (+/- 0.238)
	$p = 0.00004^{***}$
10-year Treasury Yield_2	5.632 (+/- 1.175)
	$p = 0.005^{***}$
20-year Treasury Yield_2	-6.113 (+/- 0.798)
	$p = 0.001^{***}$
Observations	40
R^2	1.000
Adjusted R^2	0.998
Residual Std. Error	0.073 (df = 5)
F Statistic	592.349^{***} (df = 34; 5)

Note: *p<0.1; **p<0.5; ***p<0.01

Unemployment Rate

REGRESSION FOR UNEMPLOYMENT RATE

	Dependent variable (+/- SE):
	Unemployment Rate
Constant	30.517 (+/- 0.073)
	$p = 0.00000^{***}$
SP500 Stock Price Index	-0.003 (+/- 0.00000)
	$p = 0.000^{***}$
US Fed Reserve O-N Loan Rate	4.195 (+/- 0.005)
	$p = 0.000^{***}$
Moody's AAA Curve	-0.513 (+/- 0.001)
	$p = 0.00000^{***}$
Real GDP growth	-0.082 (+/- 0.001)
	$p = 0.00001^{***}$
Nominal GDP growth	0.040 (+/- 0.001)
	$p = 0.00002^{***}$
Real disposable income growth	-0.033 (+/- 0.0001)
	$p = 0.00000^{***}$
Nominal disposable income growth	0.035 (+/- 0.0001)
	$p = 0.00000^{***}$
CPI Inflation Rate	-0.133 (+/- 0.0003)
	$p = 0.00000^{***}$
BBB corporate yield	0.317 (+/- 0.001)
	$p = 0.00000^{***}$
Prime Rate	-1.649 (+/- 0.012)

p = 0.00000***

Dow Total Stock Market Index — -0.0001 (+/- 0.00000)

p = 0.00000***

Commercial Real Estate Price Index — 0.004 (+/- 0.0001)

p = 0.0001***

Market Volatility Index — 0.015 (+/- 0.0001)

p = 0.00000***

LN_Market Volatility Index — -0.171 (+/- 0.003)

p = 0.00001***

US Avg Retail Gasoline Price ($-gal; all grades, all formulations) — 0.987 (+/- 0.003)

p = 0.00000***

30-year Treasury Yield — 48.085 (+/- 0.089)

p = 0.000***

LN_30-year Treasury Yield — -124.740 (+/- 0.215)

p = 0.000***

20-year Treasury Yield — -43.014 (+/- 0.093)

p = 0.00000***

LN_20-year Treasury Yield — 89.681 (+/- 0.192)

p = 0.00000***

LN_10-year Treasury Yield — -4.595 (+/- 0.023)

p = 0.00000***

1-month Treasury Yield — 6.155 (+/- 0.028)

p = 0.00000***

LN_1-month Treasury Yield — -0.216 (+/- 0.003)

p = 0.00001***

7-year Treasury Yield — 9.056 (+/- 0.083)

p = 0.00001***

LN_7-year Treasury Yield   -4.030 (+/- 0.091)

p = 0.00003***

5-year Treasury Yield   -11.150 (+/- 0.057)

p = 0.00000***

LN_5-year Treasury Yield   5.963 (+/- 0.050)

p = 0.00001***

6-month Treasury Yield   -13.818 (+/- 0.021)

p = 0.000***

LN_6-month Treasury Yield   0.576 (+/- 0.005)

p = 0.00001***

3-year Treasury Yield   -2.491 (+/- 0.011)

p = 0.00000***

1-year Treasury Yield   12.330 (+/- 0.024)

p = 0.00000***

LN_1-year Treasury Yield   -2.252 (+/- 0.005)

p = 0.00000***

1-year Treasury Yield_2   -0.688 (+/- 0.004)

p = 0.00000***

5-year Treasury Yield_2   0.282 (+/- 0.009)

p = 0.0001***

3-month Treasury Yield_2   -0.417 (+/- 0.005)

p = 0.00001***

7-year Treasury Yield_2   1.195 (+/- 0.014)

p = 0.00001***

1-month Treasury Yield_2   0.192 (+/- 0.005)

	p = 0.00004***
Observations	40
R^2	1.000
Adjusted R^2	1.000
Residual Std. Error	0.0005 (df = 3)
F Statistic	22,490,361.000*** (df = 36; 3)

Note: *p<0.1; **p<0.5; ***p<0.01

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

REGRESSION FOR 1-MONTH TREASURY YIELD

	Dependent variable (+/- SE):
	1-month Treasury Yield
Constant	-1.551 (+/- 0.120)
	p = 0.000***
Prime Rate	0.501 (+/- 0.037)
	p = 0.000***
30-year Treasury Yield	-0.150 (+/- 0.043)
	p = 0.002***
20-year Treasury Yield	0.138 (+/- 0.043)
	p = 0.004***
3-month Treasury Yield	0.412 (+/- 0.034)
	p = 0.000***
3-month Treasury Yield_2	0.050 (+/- 0.007)
	p = 0.00000***
Observations	40
R^2	1.000
Adjusted R^2	0.999
Residual Std. Error	0.018 (df = 34)
F Statistic	15,176.390*** (df = 5; 34)
Note:	*p<0.1; **p<0.5; ***p<0.01

REGRESSION FOR 3-MONTH TREASURY YIELD

	Dependent variable (+/- SE):
	3-month Treasury Yield
Constant	-1.159 (+/- 0.221)
	$p = 0.00002^{***}$
Unemployment Rate	0.016 (+/- 0.005)
	$p = 0.008^{***}$
Dow Total Stock Market Index	0.00001 (+/- 0.00000)
	$p = 0.005^{***}$
30-year Treasury Yield	2.574 (+/- 0.503)
	$p = 0.00002^{***}$
20-year Treasury Yield	-2.178 (+/- 0.471)
	$p = 0.0001^{***}$
1-month Treasury Yield	1.189 (+/- 0.037)
	$p = 0.000^{***}$
1-month Treasury Yield_2	-0.087 (+/- 0.015)
	$p = 0.00001^{***}$
20-year Treasury Yield_2	0.378 (+/- 0.088)
	$p = 0.0002^{***}$
30-year Treasury Yield_2	-0.407 (+/- 0.086)
	$p = 0.00005^{***}$
Observations	40
R^2	0.998
Adjusted R^2	0.998
Residual Std. Error	0.034 (df = 31)

F Statistic	$2{,}577.029^{***}$ (df = 8; 31)

Note:	$^{*}p<0.1; ^{**}p<0.5; ^{***}p<0.01$

REGRESSION FOR 6-MONTH TREASURY YIELD

	Dependent variable (+/- SE):
	6-month Treasury Yield
Constant	2.383 (+/- 4.136)
	p = 0.570
Moody's BAA Curve	0.440 (+/- 0.135)
	p = 0.003***
Nominal GDP growth	0.055 (+/- 0.013)
	p = 0.0004***
Real disposable income growth	0.071 (+/- 0.022)
	p = 0.004***
Nominal disposable income growth	-0.062 (+/- 0.015)
	p = 0.0004***
Unemployment Rate	0.760 (+/- 0.121)
	p = 0.00000***
Dow Total Stock Market Index	-0.0001 (+/- 0.00003)
	p = 0.0001***
Home Price Index	0.126 (+/- 0.013)
	p = 0.000***
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	0.660 (+/- 0.126)
	p = 0.00002***
30-year Treasury Yield	-51.157 (+/- 8.369)
	p = 0.00001***
LN_30-year Treasury Yield	81.869 (+/- 12.425)
	p = 0.00000***
30-year Treasury Yield_2	3.852 (+/- 0.689)

	$p = 0.00001^{***}$
Observations	40
R^2	0.943
Adjusted R^2	0.921
Residual Std. Error	0.231 (df = 28)
F Statistic	42.467^{***} (df = 11; 28)

Note:	$^{*}p<0.1; ^{**}p<0.5; ^{***}p<0.01$

REGRESSION FOR 1-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	1-year Treasury Yield
Constant	13.596 (+/- 4.702)
	p = 0.008***
SP500 Stock Price Index	0.001 (+/- 0.0005)
	p = 0.009***
Nominal GDP growth	0.079 (+/- 0.016)
	p = 0.00003***
Real disposable income growth	0.105 (+/- 0.026)
	p = 0.0005***
Nominal disposable income growth	-0.089 (+/- 0.018)
	p = 0.00003***
Unemployment Rate	1.086 (+/- 0.151)
	p = 0.00000***
Dow Total Stock Market Index	-0.0002 (+/- 0.00004)
	p = 0.00001***
Home Price Index	0.122 (+/- 0.015)
	p = 0.000***
30-year Treasury Yield	-68.907 (+/- 10.213)
	p = 0.00000***
LN_30-year Treasury Yield	109.744 (+/- 15.205)
	p = 0.00000***
30-year Treasury Yield_2	5.304 (+/- 0.835)
	p = 0.00000***

Observations	40
R^2	0.918
Adjusted R^2	0.890
Residual Std. Error	0.275 (df = 29)
F Statistic	32.545[***] (df = 10; 29)

Note: $^*p<0.1; ^{**}p<0.5; ^{***}p<0.01$

REGRESSION FOR 3-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	3-year Treasury Yield
Constant	2.106 (+/- 3.974)
	p = 0.600
Real GDP growth	0.049 (+/- 0.015)
	p = 0.003***
Real disposable income growth	0.067 (+/- 0.021)
	p = 0.005***
Nominal disposable income growth	-0.048 (+/- 0.014)
	p = 0.003***
Unemployment Rate	0.435 (+/- 0.128)
	p = 0.002***
Dow Total Stock Market Index	-0.0001 (+/- 0.00003)
	p = 0.008***
Home Price Index	0.079 (+/- 0.014)
	p = 0.00001***
30-year Treasury Yield	-30.592 (+/- 8.700)
	p = 0.002***
LN_30-year Treasury Yield	50.653 (+/- 12.925)
	p = 0.0005***
30-year Treasury Yield_2	2.327 (+/- 0.714)
	p = 0.003***
Observations	40
R^2	0.911

Adjusted R^2	0.884
Residual Std. Error	0.253 (df = 30)
F Statistic	34.101*** (df = 9; 30)

Note: *p<0.1; **p<0.5; ***p<0.01

REGRESSION FOR 5-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	5-year Treasury Yield
Constant	-2.763 (+/- 0.766)
	p = 0.001***
Real disposable income growth	0.016 (+/- 0.005)
	p = 0.002***
Nominal disposable income growth	-0.0002 (+/- 0.00004)
	p = 0.00005***
Unemployment Rate	-0.153 (+/- 0.025)
	p = 0.00000***
Home Price Index	0.014 (+/- 0.002)
	p = 0.00001***
30-year Treasury Yield	0.902 (+/- 0.094)
	p = 0.000***
Observations	40
R^2	0.895
Adjusted R^2	0.880
Residual Std. Error	0.229 (df = 34)
F Statistic	57.972*** (df = 5; 34)
Note:	*p<0.1; **p<0.5; ***p<0.01

REGRESSION FOR 7-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	7-year Treasury Yield
Constant	3.653 (+/- 0.404)
	p = 0.000***
SP500 Stock Price Index	-0.001 (+/- 0.0001)
	p = 0.0001***
Unemployment Rate	-0.151 (+/- 0.042)
	p = 0.001***
1-month Treasury Yield	0.398 (+/- 0.118)
	p = 0.002***
Observations	40
R^2	0.598
Adjusted R^2	0.564
Residual Std. Error	0.408 (df = 36)
F Statistic	17.846*** (df = 3; 36)
Note:	*$p<0.1$; **$p<0.5$; ***$p<0.01$

REGRESSION FOR 10-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	10-year Treasury Yield
Constant	-0.596 (+/- 0.133)
	p = 0.0001***
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	-0.322 (+/- 0.047)
	p = 0.00000***
30-year Treasury Yield	1.056 (+/- 0.039)
	p = 0.000***
1-month Treasury Yield	1.095 (+/- 0.194)
	p = 0.00001***
LN_1-month Treasury Yield	-0.156 (+/- 0.038)
	p = 0.0003***
1-month Treasury Yield_2	-0.264 (+/- 0.063)
	p = 0.0002***
Observations	40
R^2	0.971
Adjusted R^2	0.967
Residual Std. Error	0.111 (df = 34)
F Statistic	229.687*** (df = 5; 34)
Note:	*p<0.1; **p<0.5; ***p<0.01

REGRESSION FOR 20-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	20-year Treasury Yield
Constant	5.516 (+/- 0.482)
	p = 0.000***
SP500 Stock Price Index	-0.001 (+/- 0.0001)
	p = 0.00000***
LN_Market Volatility Index	-0.459 (+/- 0.148)
	p = 0.004***
1-month Treasury Yield	6.946 (+/- 2.064)
	p = 0.002***
3-month Treasury Yield	-6.949 (+/- 1.941)
	p = 0.002***
3-month Treasury Yield_2	3.396 (+/- 0.733)
	p = 0.0001***
1-month Treasury Yield_2	-3.236 (+/- 0.732)
	p = 0.0002***
Observations	40
R^2	0.738
Adjusted R^2	0.691
Residual Std. Error	0.341 (df = 33)
F Statistic	15.532*** (df = 6; 33)
Note:	*p<0.1; **p<0.5; ***p<0.01

REGRESSION FOR 30-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	30-year Treasury Yield
Constant	0.010 (+/- 0.459)
	p = 0.983
Real GDP growth	0.00004 (+/- 0.00001)
	p = 0.004***
Real disposable income growth	-0.006 (+/- 0.001)
	p = 0.0003***
Unemployment Rate	0.066 (+/- 0.017)
	p = 0.001***
30-year Mortgage Rate	0.231 (+/- 0.080)
	p = 0.008***
Dow Total Stock Market Index	-0.00005 (+/- 0.00001)
	p = 0.00000***
Home Price Index	0.014 (+/- 0.002)
	p = 0.00000***
10-year Treasury Yield	-1.419 (+/- 0.468)
	p = 0.006***
LN_10-year Treasury Yield	3.143 (+/- 0.421)
	p = 0.00000***
LN_5-year Treasury Yield	-0.678 (+/- 0.086)
	p = 0.00000***
3-year Treasury Yield_2	-0.058 (+/- 0.007)
	p = 0.000***
10-year Treasury Yield_2	0.256 (+/- 0.061)

	$p = 0.0003^{***}$
Market Volatility Index_2	-0.0001 (+/- 0.00001)
	$p = 0.00000^{***}$
Observations	40
R^2	0.997
Adjusted R^2	0.996
Residual Std. Error	0.041 (df = 27)
F Statistic	745.491^{***} (df = 12; 27)
Note:	$^{*}p<0.1;\ ^{**}p<0.5;\ ^{***}p<0.01$

30-year Mortgage Rate

REGRESSION FOR 30-YEAR MORTGAGE RATE

	Dependent variable (+/- SE):
	30-year Mortgage Rate
Constant	-3.570 (+/- 1.558)
	p = 0.029[**]
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	-0.208 (+/- 0.057)
	p = 0.001[***]
30-year Treasury Yield	7.972 (+/- 1.981)
	p = 0.0004[***]
LN_30-year Treasury Yield	-9.771 (+/- 2.506)
	p = 0.0005[***]
1-month Treasury Yield	1.007 (+/- 0.237)
	p = 0.0002[***]
LN_1-month Treasury Yield	-0.136 (+/- 0.045)
	p = 0.006[***]
1-month Treasury Yield_2	-0.233 (+/- 0.077)
	p = 0.006[***]
30-year Treasury Yield_2	-0.624 (+/- 0.185)
	p = 0.002[***]
Observations	40
R^2	0.933
Adjusted R^2	0.919
Residual Std. Error	0.134 (df = 32)
F Statistic	63.826[***] (df = 7; 32)

Note: *p<0.1; **p<0.5; ***p<0.01

REGRESSION FOR MOODY'S AAA CURVE

	Dependent variable (+/- SE):
	Moody's AAA Curve
Constant	4.261 (+/- 0.294)
	$p = 0.000^{***}$
SP500 Stock Price Index	-0.001 (+/- 0.0001)
	$p = 0.000^{***}$
Prime Rate	0.400 (+/- 0.090)
	$p = 0.0001^{***}$
Observations	40
R^2	0.696
Adjusted R^2	0.679
Residual Std. Error	0.350 (df = 37)
F Statistic	42.263^{***} (df = 2; 37)
Note:	$^{*}p<0.1; ^{**}p<0.5; ^{***}p<0.01$

REGRESSION FOR MOODY'S BAA CURVE

	Dependent variable (+/- SE):
	Moody's BAA Curve
Constant	1.664 (+/- 0.330)
	$p = 0.00002^{***}$
BBB corporate yield	0.809 (+/- 0.083)
	$p = 0.000^{***}$
1-month Treasury Yield	-0.184 (+/- 0.066)
	$p = 0.009^{***}$
Observations	40
R^2	0.726
Adjusted R^2	0.711
Residual Std. Error	0.323 (df = 37)
F Statistic	48.911^{***} (df = 2; 37)
Note:	$^{*}p<0.1;\ ^{**}p<0.5;\ ^{***}p<0.01$

BBB Corporate Yield

REGRESSION FOR BBB CORPORATE YIELD

	Dependent variable (+/- SE):
	BBB corporate yield
Constant	6.134 (+/- 0.880)
	$p = 0.00000^{***}$
Home Price Index	-0.016 (+/- 0.003)
	$p = 0.00001^{***}$
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	-0.564 (+/- 0.113)
	$p = 0.00002^{***}$
30-year Treasury Yield	0.736 (+/- 0.111)
	$p = 0.00000^{***}$
1-month Treasury Yield	0.353 (+/- 0.071)
	$p = 0.00003^{***}$
Market Volatility Index_2	0.0001 (+/- 0.00004)
	$p = 0.010^{***}$
Observations	40
R^2	0.861
Adjusted R^2	0.841
Residual Std. Error	0.249 (df = 34)
F Statistic	42.230^{***} (df = 5; 34)

Note: $^{*}p<0.1; ^{**}p<0.5; ^{***}p<0.01$

Prime Rate

REGRESSION FOR PRIME RATE

	Dependent variable (+/- SE):
	Prime Rate
Constant	3.532 (+/- 0.121)
	p = 0.000***
Moody's AAA Curve	0.074 (+/- 0.023)
	p = 0.003***
30-year Treasury Yield	1.547 (+/- 0.517)
	p = 0.006***
LN_30-year Treasury Yield	-4.307 (+/- 1.378)
	p = 0.004***
20-year Treasury Yield	-1.570 (+/- 0.474)
	p = 0.003***
LN_20-year Treasury Yield	3.798 (+/- 1.153)
	p = 0.003***
1-month Treasury Yield	0.944 (+/- 0.014)
	p = 0.000***
Observations	40
R^2	0.998
Adjusted R^2	0.997
Residual Std. Error	0.039 (df = 33)
F Statistic	2,277.074*** (df = 6; 33)
Note:	*$p<0.1$; **$p<0.5$; ***$p<0.01$

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	-11.313 (+/- 0.217)
	p = 0.00000***
SP500 Stock Price Index	0.002 (+/- 0.00002)
	p = 0.000***
US Fed Reserve O-N Loan Rate	-1.888 (+/- 0.017)
	p = 0.000***
Moody's AAA Curve	0.573 (+/- 0.007)
	p = 0.000***
Moody's BAA Curve	-0.155 (+/- 0.010)
	p = 0.00003***
Nominal GDP growth	0.019 (+/- 0.0004)
	p = 0.00000***
Real disposable income growth	0.010 (+/- 0.0005)
	p = 0.00001***
Nominal disposable income growth	-0.021 (+/- 0.0004)
	p = 0.00000***
Unemployment Rate	0.556 (+/- 0.007)
	p = 0.000***
CPI Inflation Rate	0.075 (+/- 0.001)
	p = 0.000***
30-year Mortgage Rate	0.633 (+/- 0.012)

	$p = 0.00000^{***}$
Prime Rate	-0.938 (+/- 0.032)
	$p = 0.00000^{***}$
Dow Total Stock Market Index	0.00002 (+/- 0.00000)
	$p = 0.0002^{***}$
Home Price Index	-0.010 (+/- 0.001)
	$p = 0.00005^{***}$
Market Volatility Index	-0.009 (+/- 0.0002)
	$p = 0.00000^{***}$
30-year Treasury Yield	-29.754 (+/- 0.559)
	$p = 0.00000^{***}$
LN_30-year Treasury Yield	78.537 (+/- 1.118)
	$p = 0.000^{***}$
20-year Treasury Yield	30.589 (+/- 0.440)
	$p = 0.000^{***}$
LN_20-year Treasury Yield	-64.630 (+/- 0.916)
	$p = 0.000^{***}$
LN_10-year Treasury Yield	6.581 (+/- 0.076)
	$p = 0.000^{***}$
1-month Treasury Yield	-0.841 (+/- 0.052)
	$p = 0.00002^{***}$
7-year Treasury Yield	-13.272 (+/- 0.181)
	$p = 0.000^{***}$
LN_7-year Treasury Yield	8.549 (+/- 0.269)
	$p = 0.00000^{***}$
3-month Treasury Yield	-0.499 (+/- 0.031)

	$p = 0.00002^{***}$
5-year Treasury Yield	12.298 (+/- 0.262)
	$p = 0.00000^{***}$
LN_5-year Treasury Yield	-14.313 (+/- 0.273)
	$p = 0.00000^{***}$
6-month Treasury Yield	4.268 (+/- 0.034)
	$p = 0.000^{***}$
3-year Treasury Yield	-4.023 (+/- 0.113)
	$p = 0.00000^{***}$
LN_3-year Treasury Yield	6.365 (+/- 0.073)
	$p = 0.000^{***}$
LN_1-year Treasury Yield	-0.538 (+/- 0.009)
	$p = 0.00000^{***}$
1-year Treasury Yield_2	-1.158 (+/- 0.012)
	$p = 0.000^{***}$
3-year Treasury Yield_2	0.514 (+/- 0.028)
	$p = 0.00001^{***}$
6-month Treasury Yield_2	0.791 (+/- 0.009)
	$p = 0.000^{***}$
5-year Treasury Yield_2	-0.378 (+/- 0.036)
	$p = 0.0002^{***}$
30-year Treasury Yield_2	-0.234 (+/- 0.036)
	$p = 0.002^{***}$
Observations	40
R^2	1.000
Adjusted R^2	1.000

Residual Std. Error	0.002 (df = 5)
F Statistic	83,466.640*** (df = 34; 5)

Note: *p<0.1; **p<0.5; ***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	-2.617 (+/- 2.332)
	p = 0.272
Moody's BAA Curve	0.566 (+/- 0.096)
	p = 0.00001***
Nominal GDP growth	0.012 (+/- 0.003)
	p = 0.001***
Nominal disposable income growth	-0.014 (+/- 0.003)
	p = 0.001***
Unemployment Rate	0.656 (+/- 0.077)
	p = 0.000***
CPI Inflation Rate	0.067 (+/- 0.024)
	p = 0.009***
Dow Total Stock Market Index	-0.0001 (+/- 0.00003)
	p = 0.00002***
Home Price Index	0.092 (+/- 0.009)
	p = 0.000***
20-year Treasury Yield	-25.464 (+/- 4.023)
	p = 0.00000***
LN_20-year Treasury Yield	41.022 (+/- 5.424)
	p = 0.00000***
20-year Treasury Yield_2	2.757 (+/- 0.405)

	$p = 0.00000^{***}$
30-year Treasury Yield_2	-0.888 (+/- 0.114)
	$p = 0.00000^{***}$
Market Volatility Index_2	-0.0002 (+/- 0.00004)
	$p = 0.00002^{***}$
Observations	40
R^2	0.966
Adjusted R^2	0.951
Residual Std. Error	0.172 (df = 27)
F Statistic	63.974^{***} (df = 12; 27)
Note:	$^{*}p<0.1; ^{**}p<0.5; ^{***}p<0.01$

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	-20,146.080 (+/- 7,370.962)
	$p = 0.011^{**}$
Nominal GDP growth	-288.644 (+/- 42.737)
	$p = 0.00000^{***}$
Real disposable income growth	-328.944 (+/- 83.443)
	$p = 0.001^{***}$
Nominal disposable income growth	325.207 (+/- 48.334)
	$p = 0.00000^{***}$
Unemployment Rate	-2,711.813 (+/- 302.430)
	$p = 0.000^{***}$
Market Volatility Index	-104.698 (+/- 14.236)
	$p = 0.00000^{***}$
30-year Treasury Yield	24,006.940 (+/- 2,807.772)
	$p = 0.000^{***}$
LN_30-year Treasury Yield	-82,250.960 (+/- 5,884.827)
	$p = 0.000^{***}$
5-year Treasury Yield	46,835.230 (+/- 5,178.954)
	$p = 0.000^{***}$
3-year Treasury Yield	38,500.710 (+/- 6,229.492)
	$p = 0.00001^{***}$
LN_3-year Treasury Yield	-36,945.720 (+/- 3,403.610)

	$p = 0.000^{***}$
1-year Treasury Yield	-4,826.866 (+/- 1,733.631)
	$p = 0.010^{***}$
5-year Treasury Yield_2	-13,482.160 (+/- 1,523.657)
	$p = 0.000^{***}$
Observations	40
R^2	0.988
Adjusted R^2	0.983
Residual Std. Error	923.282 (df = 27)
F Statistic	190.463*** (df = 12; 27)
Note:	$^{*}p<0.1; ^{**}p<0.5; ^{***}p<0.01$

REGRESSION FOR SP500 STOCK PRICE INDEX

	Dependent variable (+/- SE):
	SP500 Stock Price Index
Constant	5,006.713 (+/- 163.258)
	$p = 0.000$***
US Fed Reserve O-N Loan Rate	845.114 (+/- 25.790)
	$p = 0.000$***
Moody's AAA Curve	-231.511 (+/- 9.035)
	$p = 0.000$***
Nominal GDP growth	-10.811 (+/- 0.493)
	$p = 0.000$***
Real disposable income growth	-6.435 (+/- 0.873)
	$p = 0.00001$***
Nominal disposable income growth	12.122 (+/- 0.557)
	$p = 0.000$***
Unemployment Rate	-293.966 (+/- 4.232)
	$p = 0.000$***
CPI Inflation Rate	-30.905 (+/- 1.800)
	$p = 0.000$***
30-year Mortgage Rate	-329.280 (+/- 26.901)
	$p = 0.00000$***
Prime Rate	679.347 (+/- 37.146)
	$p = 0.000$***
Market Volatility Index	4.088 (+/- 0.259)
	$p = 0.000$***
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	435.624 (+/- 13.107)

p = 0.000***

30-year Treasury Yield — 17,089.900 (+/- 389.211)

p = 0.000***

LN_30-year Treasury Yield — -43,020.390 (+/- 909.922)

p = 0.000***

20-year Treasury Yield — -16,093.560 (+/- 421.860)

p = 0.000***

LN_20-year Treasury Yield — 34,182.280 (+/- 859.332)

p = 0.000***

LN_10-year Treasury Yield — -3,312.304 (+/- 116.149)

p = 0.000***

7-year Treasury Yield — 6,742.105 (+/- 237.193)

p = 0.000***

LN_7-year Treasury Yield — -5,108.392 (+/- 381.473)

p = 0.000***

3-month Treasury Yield — 405.321 (+/- 60.290)

p = 0.00003***

5-year Treasury Yield — -5,225.963 (+/- 214.769)

p = 0.000***

LN_5-year Treasury Yield — 7,092.386 (+/- 358.597)

p = 0.000***

6-month Treasury Yield — -1,897.305 (+/- 87.987)

p = 0.000***

3-year Treasury Yield — 1,140.624 (+/- 112.331)

p = 0.00000***

LN_3-year Treasury Yield — -2,875.090 (+/- 126.227)

	$p = 0.000^{***}$
LN_1-year Treasury Yield	260.374 (+/- 23.705)
	$p = 0.00000^{***}$
1-year Treasury Yield_2	435.783 (+/- 22.711)
	$p = 0.000^{***}$
6-month Treasury Yield_2	-297.761 (+/- 17.507)
	$p = 0.000^{***}$
Observations	40
R^2	1.000
Adjusted R^2	1.000
Residual Std. Error	7.090 (df = 12)
F Statistic	12,212.320*** (df = 27; 12)

Note: $^{*}p<0.1$; $^{**}p<0.5$; $^{***}p<0.01$

House and Commercial Real Estate Price Indexes

REGRESSION FOR HOME PRICE INDEX

	Dependent variable (+/- SE):
	Home Price Index
Constant	-86.328 (+/- 34.738)
	p = 0.021**
US Fed Reserve O-N Loan Rate	19.694 (+/- 2.568)
	p = 0.00000***
Nominal GDP growth	-0.940 (+/- 0.089)
	p = 0.000***
Real disposable income growth	-1.192 (+/- 0.182)
	p = 0.00000***
Nominal disposable income growth	1.062 (+/- 0.100)
	p = 0.000***
Unemployment Rate	-11.801 (+/- 0.648)
	p = 0.000***
30-year Treasury Yield	551.740 (+/- 45.341)
	p = 0.000***
LN_30-year Treasury Yield	-923.479 (+/- 59.286)
	p = 0.000***
LN_5-year Treasury Yield	-39.119 (+/- 11.639)
	p = 0.003***
6-month Treasury Yield	-68.931 (+/- 19.862)
	p = 0.002***
LN_3-year Treasury Yield	25.852 (+/- 8.267)

	$p = 0.005^{***}$
1-year Treasury Yield	110.974 (+/- 31.457)
	$p = 0.002^{***}$
LN_1-year Treasury Yield	-21.985 (+/- 4.502)
	$p = 0.0001^{***}$
1-year Treasury Yield_2	-16.921 (+/- 4.147)
	$p = 0.0005^{***}$
1-month Treasury Yield_2	6.530 (+/- 2.223)
	$p = 0.008^{***}$
30-year Treasury Yield_2	-39.209 (+/- 4.114)
	$p = 0.000^{***}$
Observations	40
R^2	0.997
Adjusted R^2	0.996
Residual Std. Error	1.898 (df = 24)
F Statistic	620.571^{***} (df = 15; 24)

Note: $^*p<0.1; ^{**}p<0.5; ^{***}p<0.01$

REGRESSION FOR COMMERCIAL REAL ESTATE PRICE INDEX

	Dependent variable (+/- SE):
	Commercial Real Estate Price Index
Constant	283.392 (+/- 93.876)
	$p = 0.007^{***}$
Real GDP growth	-9.531 (+/- 0.941)
	$p = 0.000^{***}$
Nominal GDP growth	8.249 (+/- 0.814)
	$p = 0.000^{***}$
Unemployment Rate	-12.222 (+/- 0.778)
	$p = 0.000^{***}$
CPI Inflation Rate	-2.919 (+/- 0.455)
	$p = 0.00001^{***}$
Prime Rate	-66.634 (+/- 21.776)
	$p = 0.006^{***}$
LN_Market Volatility Index	-14.505 (+/- 1.861)
	$p = 0.00000^{***}$
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	-26.413 (+/- 3.355)
	$p = 0.00000^{***}$
30-year Treasury Yield	539.384 (+/- 85.668)
	$p = 0.00001^{***}$
LN_30-year Treasury Yield	-934.106 (+/- 115.819)
	$p = 0.00000^{***}$
1-month Treasury Yield	106.869 (+/- 25.262)
	$p = 0.0004^{***}$
LN_1-month Treasury Yield	-25.907 (+/- 3.834)

	$p = 0.00000^{***}$
LN_6-month Treasury Yield	40.882 (+/- 10.390)
	$p = 0.001^{***}$
1-year Treasury Yield	88.412 (+/- 17.598)
	$p = 0.00005^{***}$
LN_1-year Treasury Yield	-50.884 (+/- 11.751)
	$p = 0.0003^{***}$
1-year Treasury Yield_2	-26.862 (+/- 3.626)
	$p = 0.00000^{***}$
30-year Treasury Yield_2	-37.747 (+/- 7.557)
	$p = 0.00005^{***}$
Observations	40
R^2	0.996
Adjusted R^2	0.994
Residual Std. Error	3.508 (df = 23)
F Statistic	398.279^{***} (df = 16; 23)

Note: $^{*}p<0.1; ^{**}p<0.5; ^{***}p<0.01$

Market Volatility Index

REGRESSION FOR MARKET VOLATILITY INDEX

	Dependent variable (+/- SE):
	Market Volatility Index
Constant	-935.258 (+/- 47.780)
	$p = 0.000^{***}$
SP500 Stock Price Index	0.175 (+/- 0.011)
	$p = 0.00000^{***}$
US Fed Reserve O-N Loan Rate	-188.877 (+/- 5.117)
	$p = 0.000^{***}$
Moody's AAA Curve	34.053 (+/- 3.245)
	$p = 0.00001^{***}$
Real GDP growth	2.198 (+/- 0.138)
	$p = 0.00000^{***}$
Real disposable income growth	1.198 (+/- 0.137)
	$p = 0.00002^{***}$
Nominal disposable income growth	-2.134 (+/- 0.134)
	$p = 0.00000^{***}$
Unemployment Rate	57.372 (+/- 2.590)
	$p = 0.000^{***}$
CPI Inflation Rate	6.174 (+/- 0.442)
	$p = 0.00000^{***}$
BBB corporate yield	-13.713 (+/- 3.064)
	$p = 0.002^{***}$
30-year Mortgage Rate	61.516 (+/- 4.325)

	$p = 0.00000^{***}$
Prime Rate	-79.333 (+/- 14.664)
	$p = 0.0005^{***}$
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	-79.379 (+/- 3.063)
	$p = 0.000^{***}$
30-year Treasury Yield	-2,624.742 (+/- 178.816)
	$p = 0.00000^{***}$
LN_30-year Treasury Yield	6,787.198 (+/- 445.526)
	$p = 0.00000^{***}$
20-year Treasury Yield	2,357.235 (+/- 176.772)
	$p = 0.00000^{***}$
LN_20-year Treasury Yield	-5,139.440 (+/- 372.882)
	$p = 0.00000^{***}$
LN_10-year Treasury Yield	578.339 (+/- 32.157)
	$p = 0.00000^{***}$
1-month Treasury Yield	-80.287 (+/- 20.557)
	$p = 0.004^{***}$
7-year Treasury Yield	-963.224 (+/- 81.121)
	$p = 0.00000^{***}$
LN_7-year Treasury Yield	583.900 (+/- 89.943)
	$p = 0.0002^{***}$
3-month Treasury Yield	-39.830 (+/- 9.385)
	$p = 0.003^{***}$
5-year Treasury Yield	759.525 (+/- 72.052)
	$p = 0.00001^{***}$
LN_5-year Treasury Yield	-913.803 (+/- 107.450)

	p = 0.00002***
6-month Treasury Yield	490.475 (+/- 26.273)
	p = 0.00000***
LN_6-month Treasury Yield	-12.790 (+/- 2.824)
	p = 0.002***
3-year Treasury Yield	-152.471 (+/- 26.938)
	p = 0.0004***
LN_3-year Treasury Yield	371.831 (+/- 40.387)
	p = 0.00001***
1-year Treasury Yield	-169.933 (+/- 23.890)
	p = 0.0001***
1-year Treasury Yield_2	-45.353 (+/- 4.625)
	p = 0.00001***
6-month Treasury Yield_2	35.800 (+/- 3.861)
	p = 0.00001***
Observations	40
R^2	0.999
Adjusted R^2	0.995
Residual Std. Error	0.930 (df = 9)
F Statistic	270.355*** (df = 30; 9)

Note: *p<0.1; **p<0.5; ***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 "2021 Stress Test Scenarios" (found at https://www.federalreserve.gov/newsevents/pressreleases/files/bcreg20210212a1.pdf) are listed. Please note that shaded attributes are not discussed within this report.

Table 16: Data Values and Referenced Sources

Attribute	Referenced Source[72]
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 Reserve staff based on the Svensson smoothed term structure model; see Lars E. O. Svensson (1995),

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

	"Estimating Forward Interest Rates with the Extended Nelson-Siegel Method," Quarterly Review, no. 3, Sveriges Riksbank, pp. 13–26
BBB corporate yield	Ice Data Indices, LLC, ICE BofA BBB US Corporate Index Effective Yield [BAMLC0A4CBBBEY], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/BAMLC0A4CBBBEY[73]
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 divided by 1000)[74].
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)[75].
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).

[73] Capitalytics does not have license to use the data referenced in https://www.federalreserve.gov/newsevents/pressreleases/files/bcreg20210212a1.pdf, specifically "Quarterly average of ICE BofAML U.S. Corporate 7-10 Year Yield-to-Maturity Index, ICE Data Indices, LLC, used with permission. (C4A4 series.)", but we use the referenced series as a proxy.

74 Capitalytics accesses this series from the data provided at https://www.quandl.com/data/FED/FL075035243_Q-Interest-rates-and-price-indexes-owner-occupied-real-estate-CoreLogic-national-SA-Quarterly-Levels-NSA

[75] Capitalytics accesses this series from the data provided by https://www.quandl.com/data/FED/FL075035503_Q-Interest-rates-and-price-indexes-commercial-real-estate-price-index-Quarterly-Levels-NSA

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.
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/files/2021-table_1a_historic_domestic.csv and https://www.federalreserve.gov/supervisionreg/files/2021-table_1b_historic_international.csv (shown below, as of Feb 2021) by clicking the links marked "2021 Historical Domestic (CSV)" and "2021 Historical International (CSV)". Alternatively, downloading the files at https://www.federalreserve.gov/supervisionreg/files/2021-table_1a_historic_domestic.csv and https://www.federalreserve.gov/supervisionreg/files/2021-table_1b_historic_international.csv using HTTP client software will also download the official datasets[76].

Since the CCAR dataset is only released annually (through 4Q2020 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) 4Q2020.

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

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)
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	https://www.quandl.com/data/FED/FL075035243_Q-Interest-rates-and-price-indexes-owner-occupied-real-estate-CoreLogic-national-SA-Quarterly-Levels-NSA

Commercial Real Estate Price Index	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 at https://www.federalreserve.gov/supervisionreg/files/2021-table_1a_historic_domestic.csv and

https://www.federalreserve.gov/supervisionreg/files/2021-table_1b_historic_international.csv, 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) 4Q2020.

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[77] "forecast" package[78]; specifically, the "ets" function (see p.39 of https://cran.r-project.org/web/packages/forecast/forecast.pdf)[79] 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)[80], and the determined parameters. While fitting forecasts to previous values,

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[77] As of this writing, v.4.1.0 of the "R" language is available at https://cran.r-project.org/.

[78] As of this writing, v.8.14 of the forecast package is available at https://CRAN.R-project.org/package=forecast.

[79] 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.

[80] 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

- "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)[81].

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

   …


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

---

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 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.

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

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[82];
   - 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[83].

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

---

[82] 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.

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

Appendix C: Variable Correlations

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

Table 19: Correlation Factors found as of 1Q2021

Variable 1	Variable 2	Correlation
S&P 500 Stock Price Index	Moody's AAA Rate	-0.718827
S&P 500 Stock Price Index	Moody's BAA Rate	-0.798109
S&P 500 Stock Price Index	BBB Corporate Yield	0.630304
S&P 500 Stock Price Index	Dow Jones Total Stock Market Index	-0.948541
S&P 500 Stock Price Index	**Home Price Index**	**-0.976337**
S&P 500 Stock Price Index	**Commercial Real Estate Price Index**	**-0.961036**
S&P 500 Stock Price Index	US Average Retail Gasoline Price	-0.696715
S&P 500 Stock Price Index	30-year Treasury Yield	-0.705489
S&P 500 Stock Price Index	20-year Treasury Yield	-0.607598
Primary Credit	Moody's AAA Rate	0.803511
Primary Credit	Moody's BAA Rate	0.742419
Primary Credit	BBB Corporate Yield	-0.80086
Primary Credit	30-year Fixed Mortgage Rate	-0.825175
Primary Credit	Prime Rate	-0.835965
Primary Credit	Dow Jones Total Stock Market Index	0.642222
Primary Credit	Home Price Index	0.677947
Primary Credit	Commercial Real Estate Price Index	0.641674
Primary Credit	US Average Retail Gasoline Price	-0.619024
Primary Credit	20-year Treasury Yield	0.790805
Primary Credit	10-year Treasury Yield	-0.811185
Primary Credit	**1-month Treasury Yield**	**0.993018**
Primary Credit	7-year Treasury Yield	0.893063
Primary Credit	3-month Treasury Yield	-0.821661
Primary Credit	5-year Treasury Yield	-0.834628
Primary Credit	**6-month Treasury Yield**	**0.994224**
Primary Credit	**3-year Treasury Yield**	**0.955438**
Primary Credit	**1-year Treasury Yield**	**0.987692**
Moody's AAA Rate	**Moody's BAA Rate**	**0.977604**
Moody's AAA Rate	BBB Corporate Yield	-0.843854
Moody's AAA Rate	30-year Fixed Mortgage Rate	-0.92437
Moody's AAA Rate	Prime Rate	-0.791485
Moody's AAA Rate	Dow Jones Total Stock Market Index	0.856016
Moody's AAA Rate	Home Price Index	0.853763
Moody's AAA Rate	Commercial Real Estate Price Index	0.870512
Moody's AAA Rate	US Average Retail Gasoline Price	-0.719666
Moody's AAA Rate	**30-year Treasury Yield**	**0.961442**
Moody's AAA Rate	**20-year Treasury Yield**	**0.984114**

|		
Moody's AAA Rate	10-year Treasury Yield	-0.927874
Moody's AAA Rate	**7-year Treasury Yield**	**0.967562**
Moody's AAA Rate	3-month Treasury Yield	-0.812869
Moody's AAA Rate	5-year Treasury Yield	-0.906704
Moody's AAA Rate	6-month Treasury Yield	0.816816
Moody's AAA Rate	3-year Treasury Yield	0.905904
Moody's AAA Rate	1-year Treasury Yield	0.834872
Moody's BAA Rate	BBB Corporate Yield	-0.787029
Moody's BAA Rate	30-year Fixed Mortgage Rate	-0.883864
Moody's BAA Rate	Prime Rate	-0.770985
Moody's BAA Rate	Dow Jones Total Stock Market Index	0.830264
Moody's BAA Rate	Home Price Index	0.832467
Moody's BAA Rate	Commercial Real Estate Price Index	0.850169
Moody's BAA Rate	US Average Retail Gasoline Price	-0.678717
Moody's BAA Rate	30-year Treasury Yield	0.807193
Moody's BAA Rate	20-year Treasury Yield	0.930365
Moody's BAA Rate	10-year Treasury Yield	-0.896227
Moody's BAA Rate	7-year Treasury Yield	0.917607
Moody's BAA Rate	3-month Treasury Yield	-0.796171
Moody's BAA Rate	5-year Treasury Yield	-0.878749
Moody's BAA Rate	6-month Treasury Yield	0.754083
Moody's BAA Rate	3-year Treasury Yield	0.847187
Moody's BAA Rate	1-year Treasury Yield	0.77258
Real GDP Growth Rate	**Nominal GDP Growth Rate**	**1**
Real GDP Growth Rate	Real Disposable Income Growth Rate	0.938857
Real GDP Growth Rate	**Nominal Disposable Income Growth Rate**	**0.999987**
Nominal GDP Growth Rate	Real Disposable Income Growth Rate	0.938872
Nominal GDP Growth Rate	**Nominal Disposable Income Growth Rate**	**0.999988**
Real Disposable Income Growth Rate	Nominal Disposable Income Growth Rate	0.940428
BBB Corporate Yield	30-year Fixed Mortgage Rate	0.938079
BBB Corporate Yield	Prime Rate	0.740454
BBB Corporate Yield	Dow Jones Total Stock Market Index	-0.816038
BBB Corporate Yield	Home Price Index	-0.796917
BBB Corporate Yield	Commercial Real Estate Price Index	-0.761078
BBB Corporate Yield	US Average Retail Gasoline Price	0.760432
BBB Corporate Yield	20-year Treasury Yield	-0.829162
BBB Corporate Yield	10-year Treasury Yield	0.921843
BBB Corporate Yield	7-year Treasury Yield	-0.864495
BBB Corporate Yield	3-month Treasury Yield	0.759847
BBB Corporate Yield	5-year Treasury Yield	0.882571
BBB Corporate Yield	6-month Treasury Yield	-0.810308
BBB Corporate Yield	3-year Treasury Yield	-0.845536
BBB Corporate Yield	1-year Treasury Yield	-0.818781
30-year Fixed Mortgage Rate	Prime Rate	0.854573
30-year Fixed Mortgage Rate	Dow Jones Total Stock Market Index	-0.797607
30-year Fixed Mortgage Rate	Home Price Index	-0.813394
30-year Fixed Mortgage Rate	Commercial Real Estate Price Index	-0.811754
30-year Fixed Mortgage Rate	US Average Retail Gasoline Price	0.796446
30-year Fixed Mortgage Rate	30-year Treasury Yield	-0.715144
30-year Fixed Mortgage Rate	20-year Treasury Yield	-0.894667

30-year Fixed Mortgage Rate	**10-year Treasury Yield**	**0.993421**
30-year Fixed Mortgage Rate	7-year Treasury Yield	-0.918106
30-year Fixed Mortgage Rate	3-month Treasury Yield	0.87921
30-year Fixed Mortgage Rate	**5-year Treasury Yield**	**0.981012**
30-year Fixed Mortgage Rate	6-month Treasury Yield	-0.831442
30-year Fixed Mortgage Rate	3-year Treasury Yield	-0.888663
30-year Fixed Mortgage Rate	1-year Treasury Yield	-0.845211
Prime Rate	US Average Retail Gasoline Price	0.64821
Prime Rate	20-year Treasury Yield	-0.671431
Prime Rate	10-year Treasury Yield	0.836951
Prime Rate	7-year Treasury Yield	-0.814857
Prime Rate	**3-month Treasury Yield**	**0.992195**
Prime Rate	5-year Treasury Yield	0.907534
Prime Rate	6-month Treasury Yield	-0.833486
Prime Rate	3-year Treasury Yield	-0.842384
Prime Rate	1-year Treasury Yield	-0.840748
Dow Jones Total Stock Market Index	Home Price Index	0.863334
Dow Jones Total Stock Market Index	Commercial Real Estate Price Index	0.908501
Dow Jones Total Stock Market Index	US Average Retail Gasoline Price	-0.66436
Dow Jones Total Stock Market Index	30-year Treasury Yield	0.789015
Dow Jones Total Stock Market Index	20-year Treasury Yield	0.854602
Dow Jones Total Stock Market Index	10-year Treasury Yield	-0.810336
Dow Jones Total Stock Market Index	7-year Treasury Yield	0.831281
Dow Jones Total Stock Market Index	5-year Treasury Yield	-0.717715
Dow Jones Total Stock Market Index	6-month Treasury Yield	0.661665
Dow Jones Total Stock Market Index	3-year Treasury Yield	0.752033
Dow Jones Total Stock Market Index	1-year Treasury Yield	0.67763
Home Price Index	**Commercial Real Estate Price Index**	**0.961503**
Home Price Index	20-year Treasury Yield	0.862839
Home Price Index	10-year Treasury Yield	-0.82791
Home Price Index	7-year Treasury Yield	0.847391
Home Price Index	5-year Treasury Yield	-0.760598
Home Price Index	6-month Treasury Yield	0.699386
Home Price Index	3-year Treasury Yield	0.784423
Home Price Index	1-year Treasury Yield	0.71628
Commercial Real Estate Price Index	US Average Retail Gasoline Price	-0.620417
Commercial Real Estate Price Index	30-year Treasury Yield	0.665272
Commercial Real Estate Price Index	20-year Treasury Yield	0.916927
Commercial Real Estate Price Index	10-year Treasury Yield	-0.835871
Commercial Real Estate Price Index	7-year Treasury Yield	0.847345
Commercial Real Estate Price Index	5-year Treasury Yield	-0.761816
Commercial Real Estate Price Index	6-month Treasury Yield	0.663544
Commercial Real Estate Price Index	3-year Treasury Yield	0.767539
Commercial Real Estate Price Index	1-year Treasury Yield	0.684039
US Average Retail Gasoline Price	20-year Treasury Yield	-0.698764
US Average Retail Gasoline Price	10-year Treasury Yield	0.761472
US Average Retail Gasoline Price	7-year Treasury Yield	-0.742818
US Average Retail Gasoline Price	3-month Treasury Yield	0.647953
US Average Retail Gasoline Price	5-year Treasury Yield	0.724477
US Average Retail Gasoline Price	6-month Treasury Yield	-0.642046

US Average Retail Gasoline Price	3-year Treasury Yield	-0.725135
US Average Retail Gasoline Price	1-year Treasury Yield	-0.664094
30-year Treasury Yield	**20-year Treasury Yield**	**0.990614**
30-year Treasury Yield	10-year Treasury Yield	-0.748177
30-year Treasury Yield	7-year Treasury Yield	0.872779
30-year Treasury Yield	3-year Treasury Yield	0.636643
20-year Treasury Yield	10-year Treasury Yield	-0.901491
20-year Treasury Yield	**7-year Treasury Yield**	**0.972063**
20-year Treasury Yield	3-month Treasury Yield	-0.687899
20-year Treasury Yield	5-year Treasury Yield	-0.838653
20-year Treasury Yield	6-month Treasury Yield	0.809775
20-year Treasury Yield	3-year Treasury Yield	0.902818
20-year Treasury Yield	1-year Treasury Yield	0.8335
10-year Treasury Yield	7-year Treasury Yield	-0.914939
10-year Treasury Yield	3-month Treasury Yield	0.86538
10-year Treasury Yield	**5-year Treasury Yield**	**0.982081**
10-year Treasury Yield	6-month Treasury Yield	-0.816375
10-year Treasury Yield	3-year Treasury Yield	-0.878236
10-year Treasury Yield	1-year Treasury Yield	-0.830814
1-month Treasury Yield	7-year Treasury Yield	0.755931
1-month Treasury Yield	**6-month Treasury Yield**	**0.995227**
1-month Treasury Yield	3-year Treasury Yield	0.925656
1-month Treasury Yield	**1-year Treasury Yield**	**0.988037**
7-year Treasury Yield	3-month Treasury Yield	-0.820513
7-year Treasury Yield	5-year Treasury Yield	-0.899118
7-year Treasury Yield	6-month Treasury Yield	0.91239
7-year Treasury Yield	**3-year Treasury Yield**	**0.977582**
7-year Treasury Yield	1-year Treasury Yield	0.928452
3-month Treasury Yield	5-year Treasury Yield	0.933359
3-month Treasury Yield	6-month Treasury Yield	-0.817607
3-month Treasury Yield	3-year Treasury Yield	-0.835034
3-month Treasury Yield	1-year Treasury Yield	-0.826011
5-year Treasury Yield	6-month Treasury Yield	-0.833633
5-year Treasury Yield	3-year Treasury Yield	-0.87998
5-year Treasury Yield	1-year Treasury Yield	-0.845709
6-month Treasury Yield	**3-year Treasury Yield**	**0.973242**
6-month Treasury Yield	**1-year Treasury Yield**	**0.998066**
3-year Treasury Yield	**1-year Treasury Yield**	**0.983504**

Appendix D: Follow-up on Previous Charts

In our previous reports, we have focused on the US' unemployment rate, and its "K-recovery". As some of these metrics have changed, and readers may be interested in their evolution despite the fact that we have not provided any significant additional conclusions (from our previous reports), we are including updated charts here.

Figure 36: US National Unemployment Rate
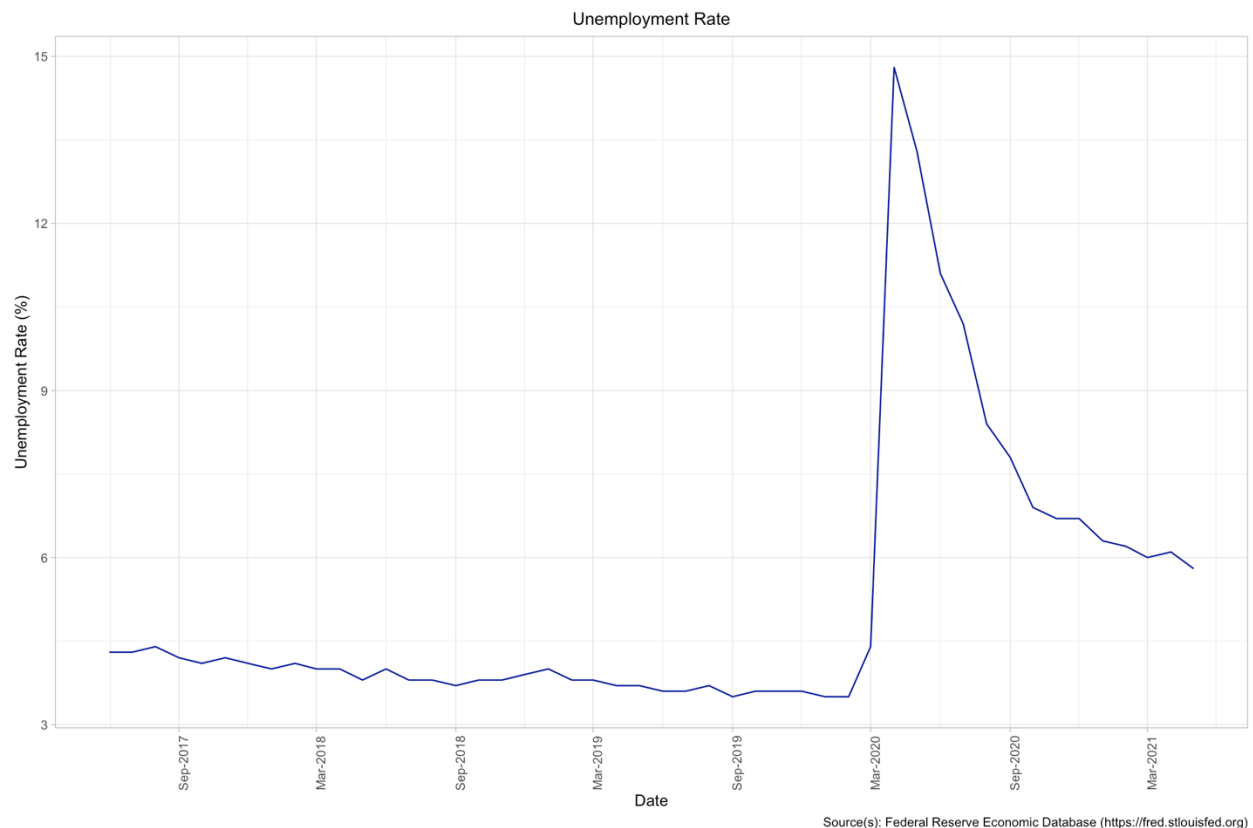
As seen in Figure 36, the national unemployment rate continues at a level close to that from YE2013. Although it is still declining, it appears that the number of people employed is actually relatively consistent. This point is discussed later in this report.

Prior to the pandemic, the weekly number of people filing initial unemployment claims hovered around 250,000; currently, the number of initial unemployment claimants is vacillating between 600,000 and 750,000 – a notable reduction from previous reports. (See Figure 37.)

Figure 37: Initial Unemployment Claims
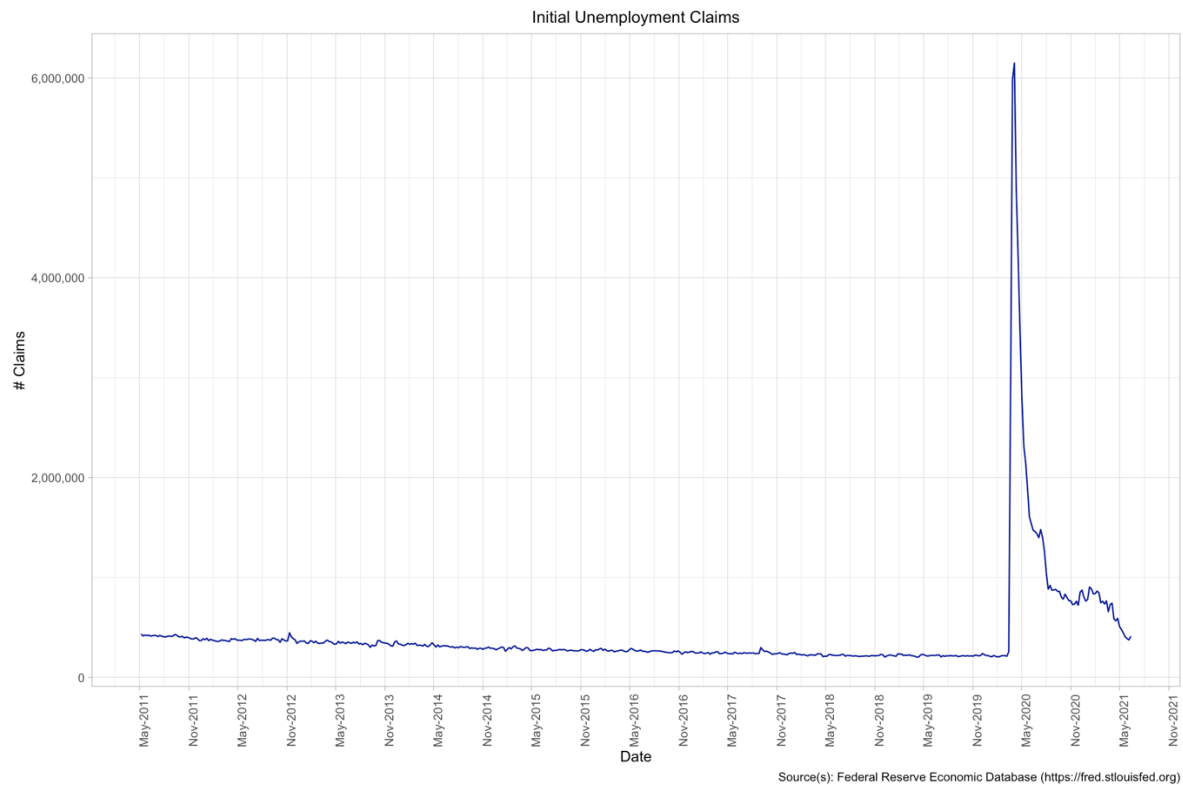
Figure 38: Job Gains and Losses by Sector betw. April & May 2021

Source: https://www.bls.gov/web/empsit/ceshighlights.pdf
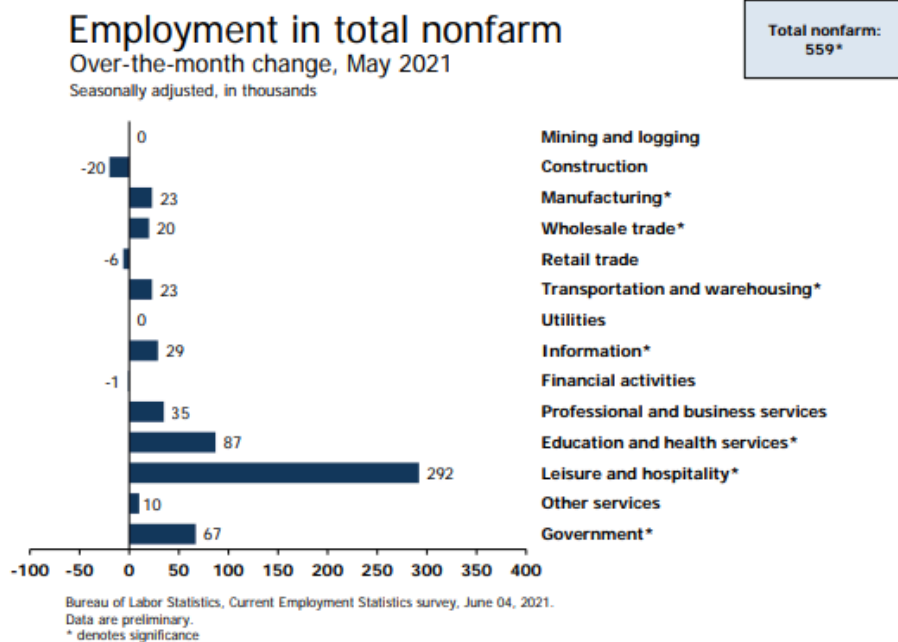
Figure 39: Unemployment Rate by Industry
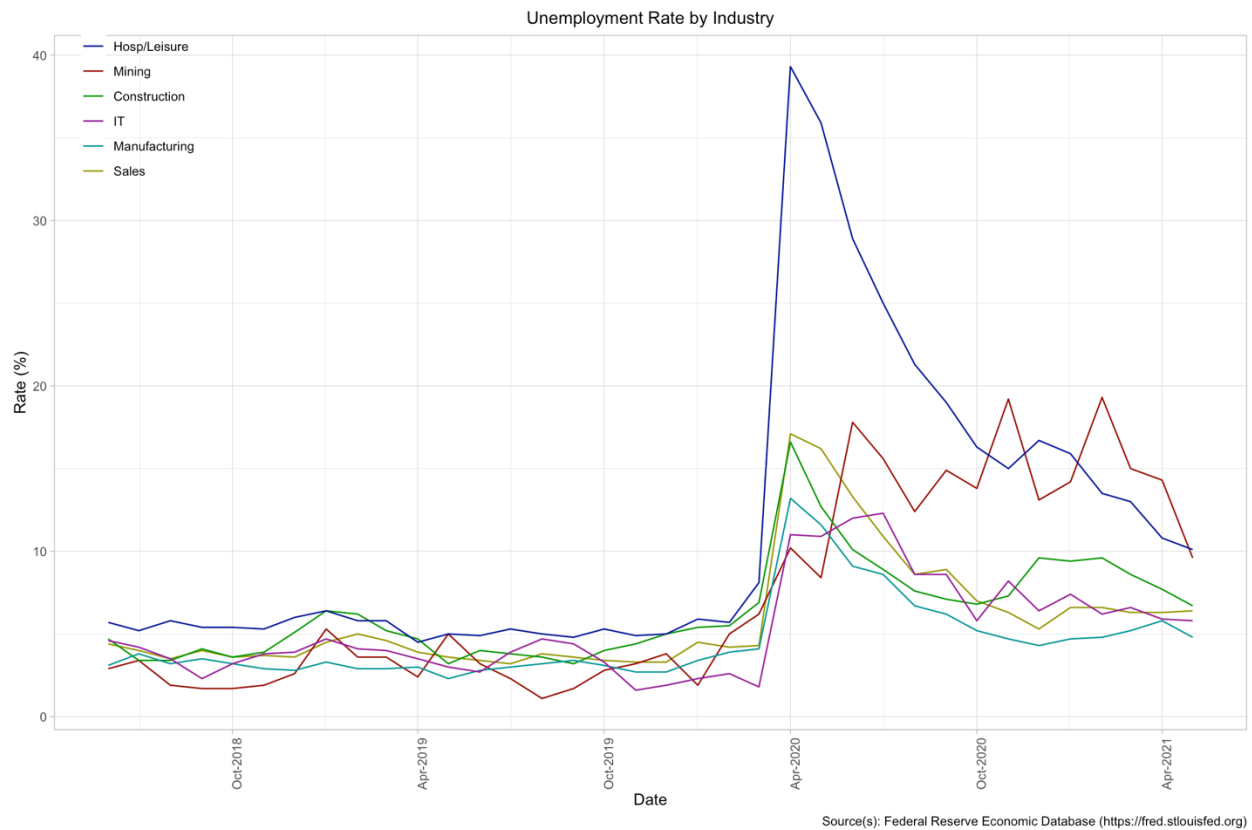
Obviously, not all sectors have recovered equally over the past several months. Leisure & hospitality has finally seen some noteworthy gains as Florida, Nevada, and California have "fully opened". Mining experienced substantial unemployment during the winter and spring of 2021 due to changes in investments and the presidential administration's policies. "White collar" segments saw approximately 100,000 new employees between January and February. (See Figure 38 & Figure 39.)

Figure 40 shows that there are still approximately 3 million people identifying as unemployed.

Figure 40: Continued Unemployment Claims
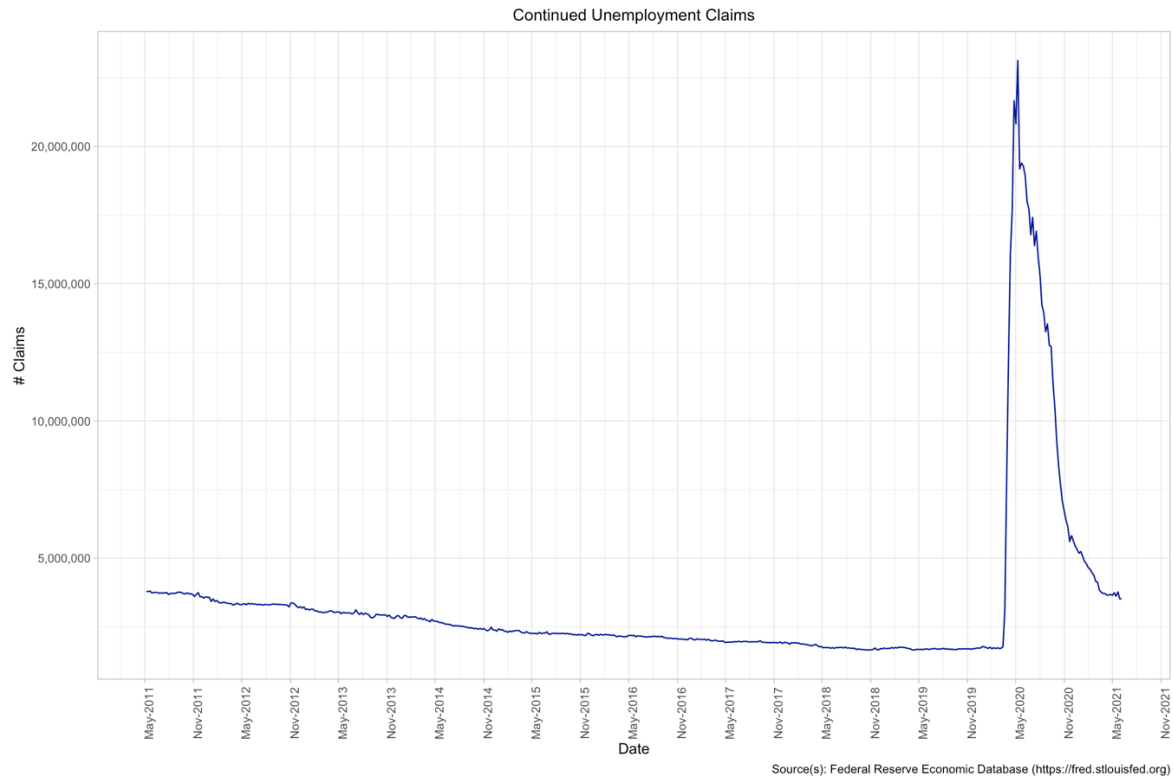
Figure 41: Employment-Population Ratio
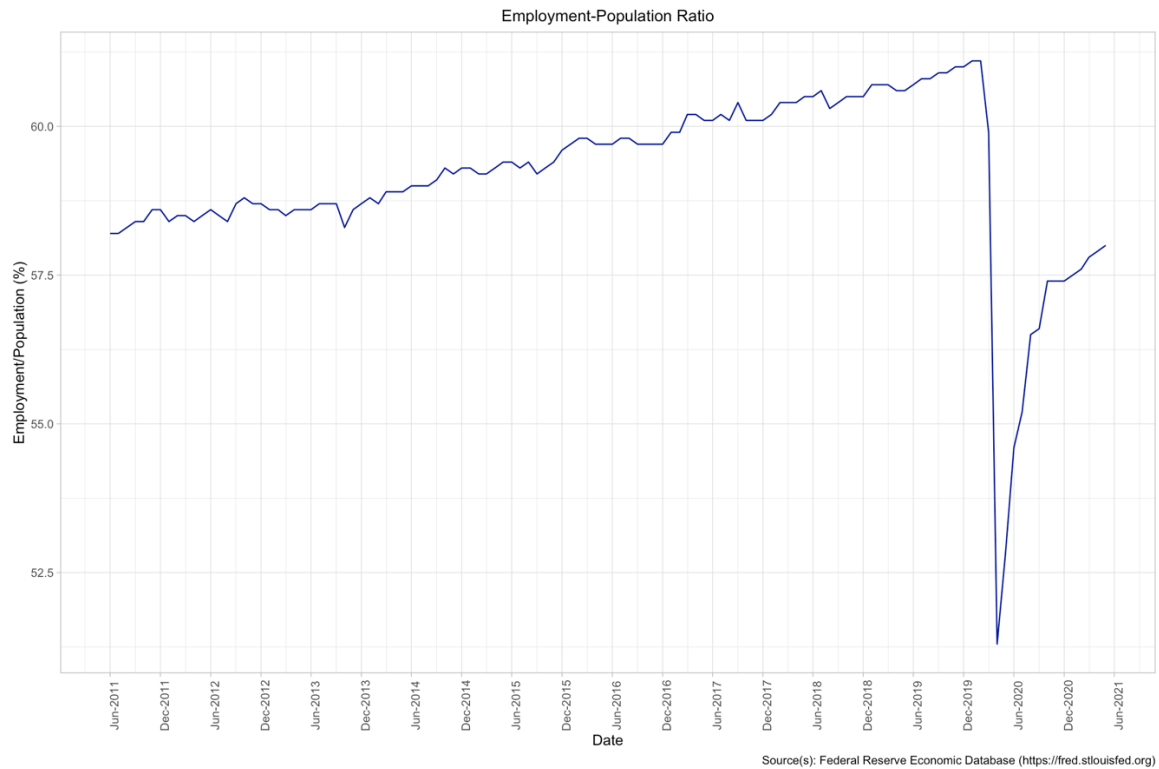
Another indication of the weakened economy is the trend in the employment to population ratio. (See Figure 41.) Prior to the lock-down the employment-population ratio was over 60%. The pandemic pushed the ratio to below 52%. The ratio has been increasing steadily during the last 9 months, though its rate of improvement has slowed considerably of late.

Per Figure 42 and Figure 43, the capacity utilization and the industrial production index both show similar trends. The decrease in capacity utilization and industrial production indicate the manufacturers modified their output in response to soft consumer demand. The upward trend in both these indicators in the last 12 months suggests a positive response by manufacturers to continued spending demand.

We've described the current recovery as being "K-shaped", with different portions of the economy being impacted in different ways. One of trends we've seen is the differentiation of the unemployment rate by race. (See Figure 44.) The unemployment rate for Blacks and Hispanics reached over 15% back in April 2020 and have not recovered at the same pace as unemployment for Whites. When examining these rates by race and gender (see Figure 45), 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.
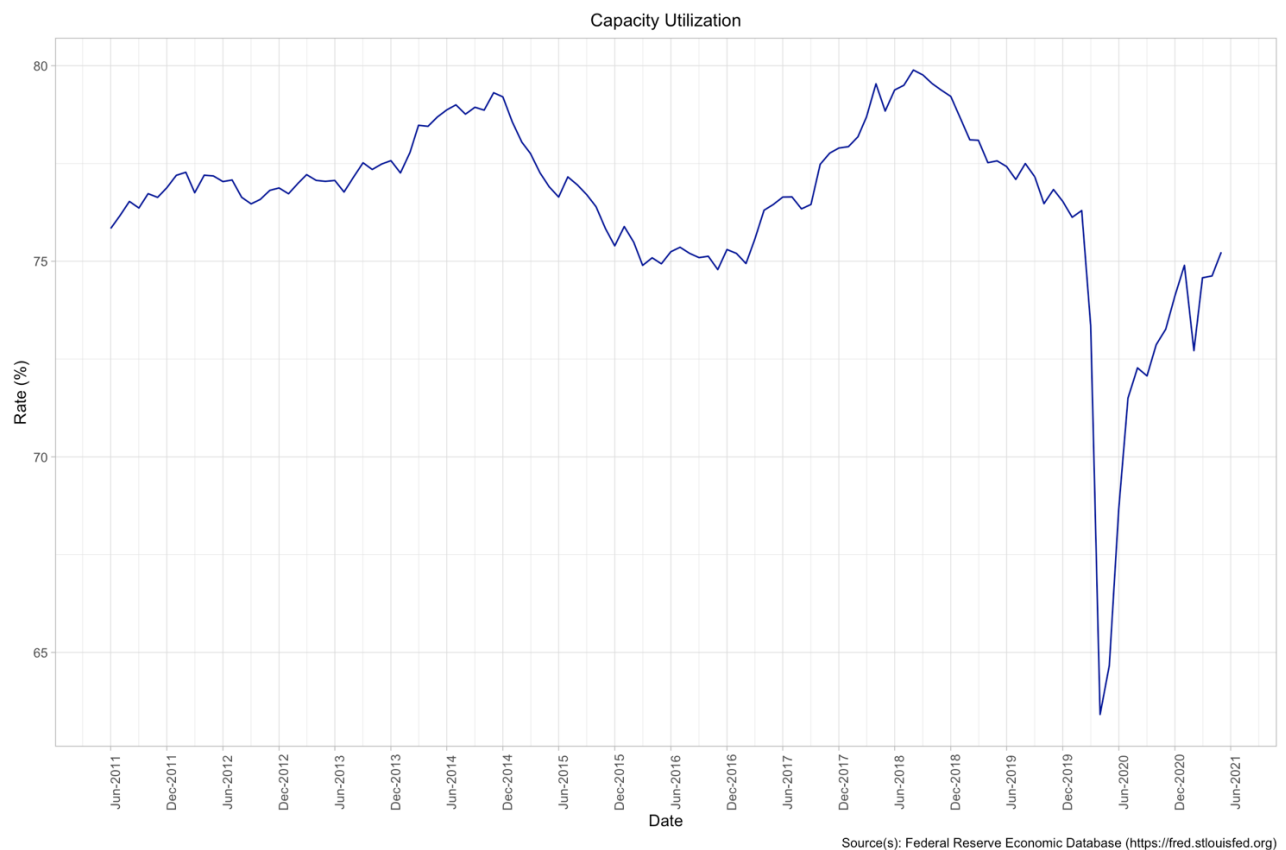
Figure 42: Capacity Utilization

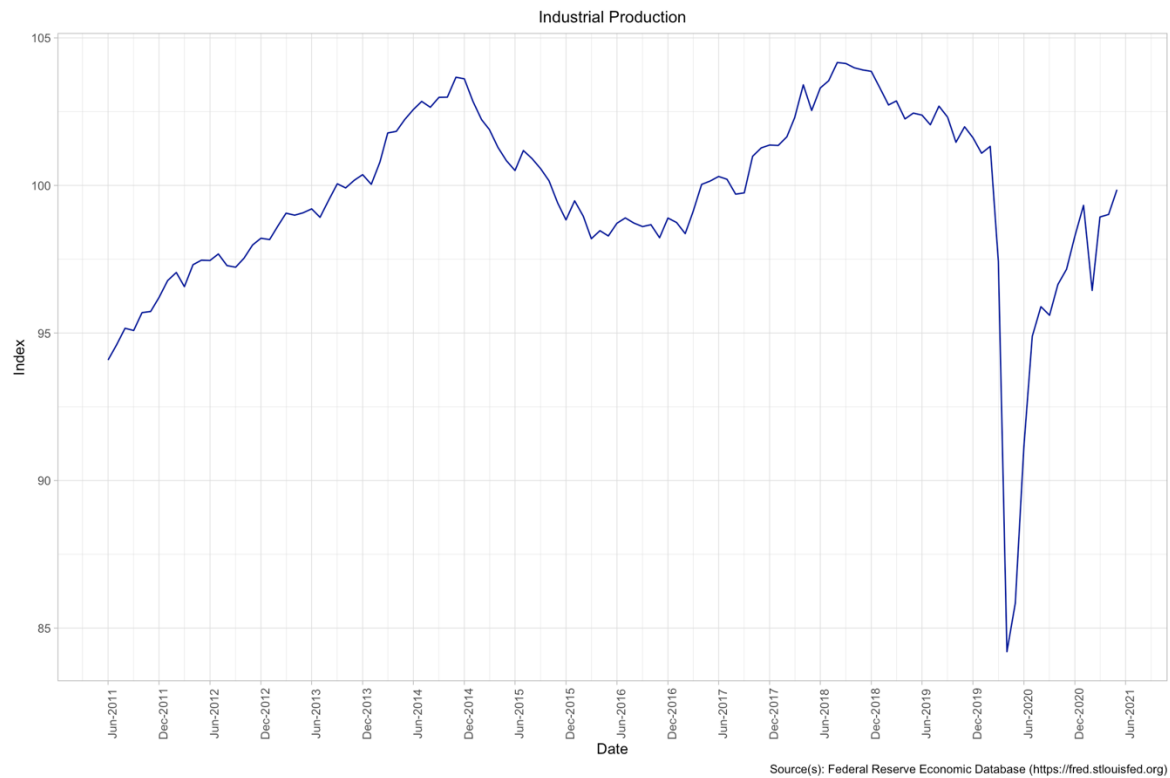Source(s): Federal Reserve Economic Database (https://fred.stlouisfed.org)

Figure 43: Industrial Production

Source(s): Federal Reserve Economic Database (https://fred.stlouisfed.org)

Figure 44: Unemployment Rate by Race

Source(s): Federal Reserve Economic Database (https://fred.stlouisfed.org)
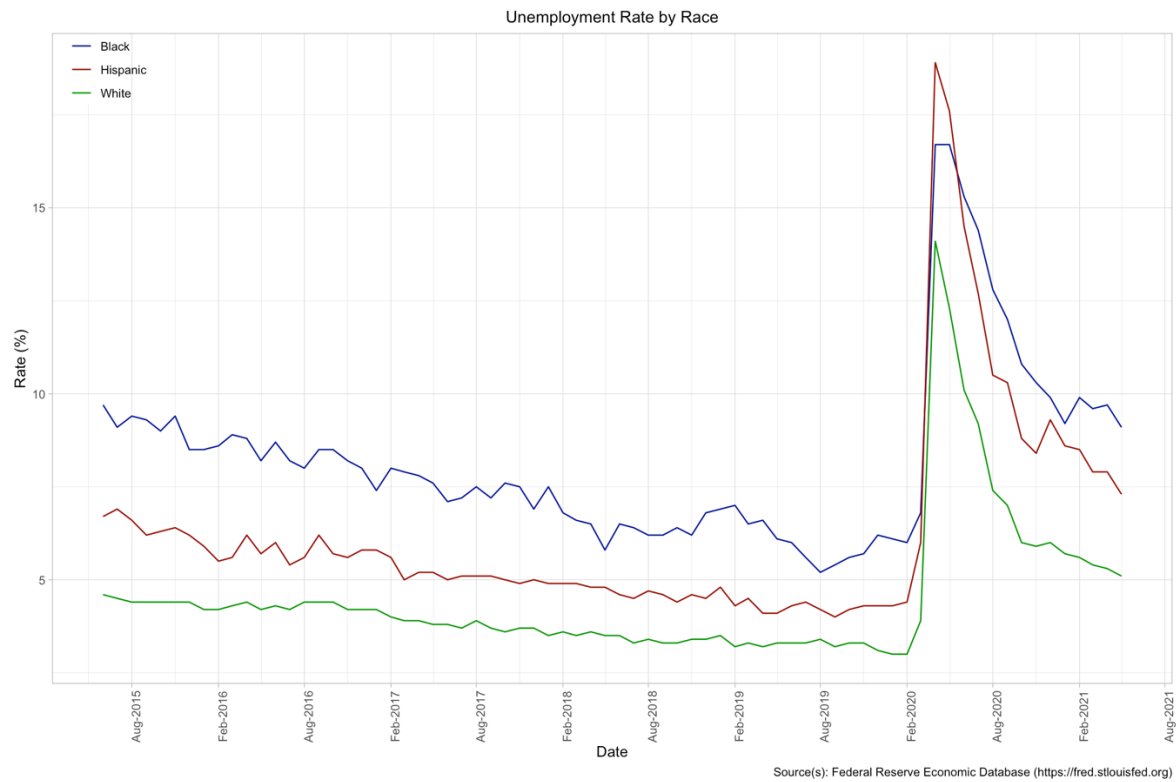
Figure 45: Unemployment Rate Race and Gender

Unemployment Rate by Race & Gender (20 yrs & Over)

Source(s): Federal Reserve Economic Database (https://fred.stlouisfed.org)
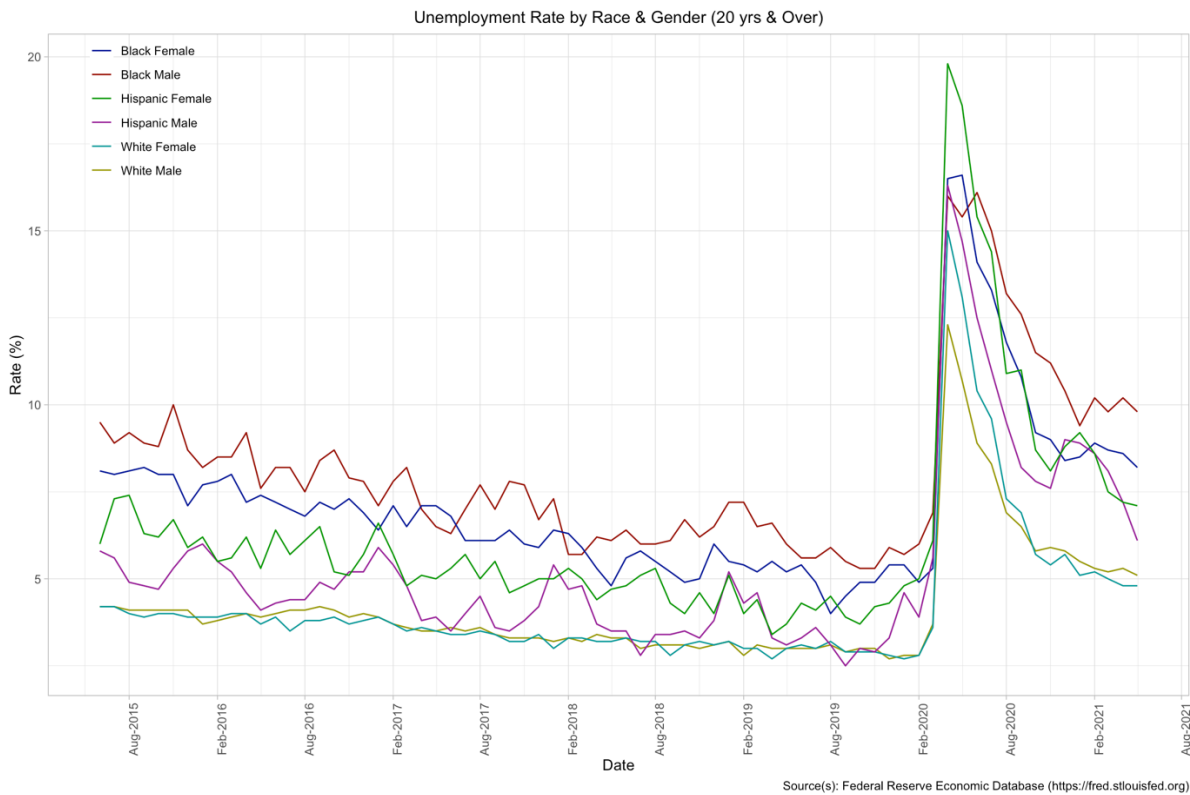
Figure 46: Labor Force Participation Rate by Gender

Labor Force Participation Rate by Gender

Source(s): Federal Reserve Economic Database (https://fred.stlouisfed.org)
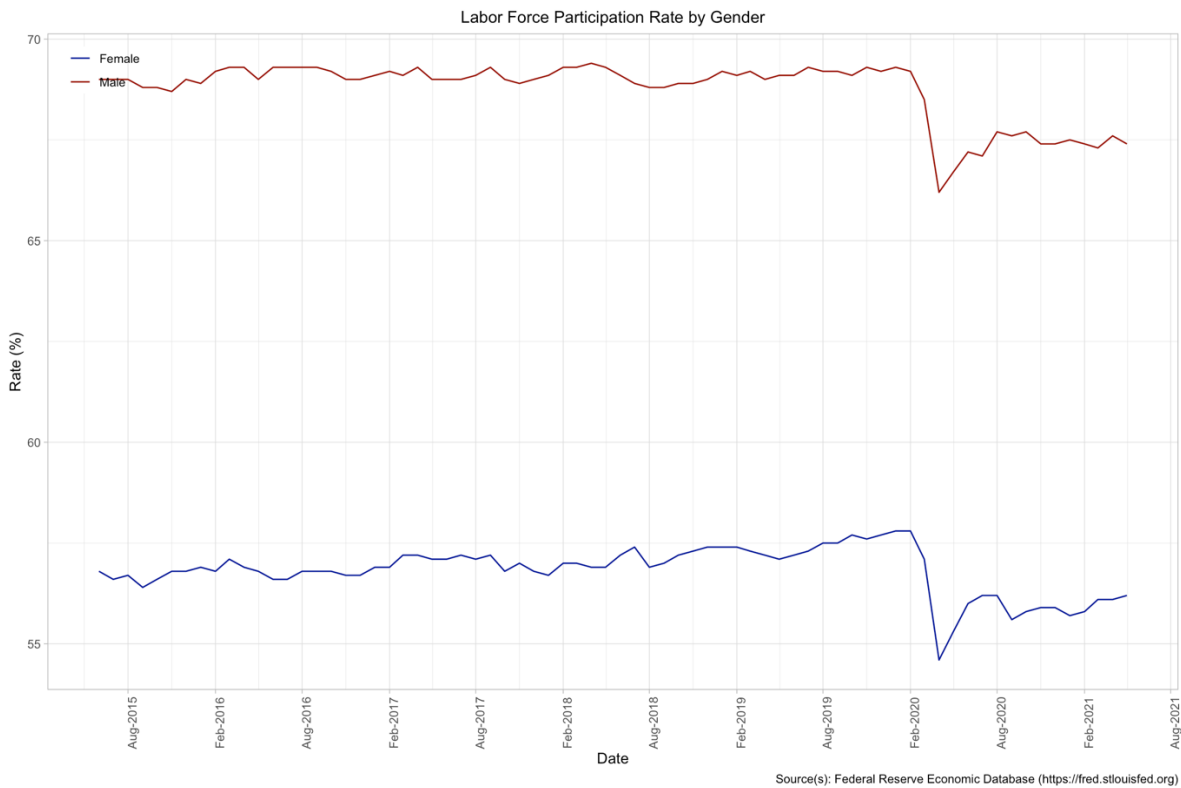
Figure 47: Labor Force Participation Rate by Race and Gender
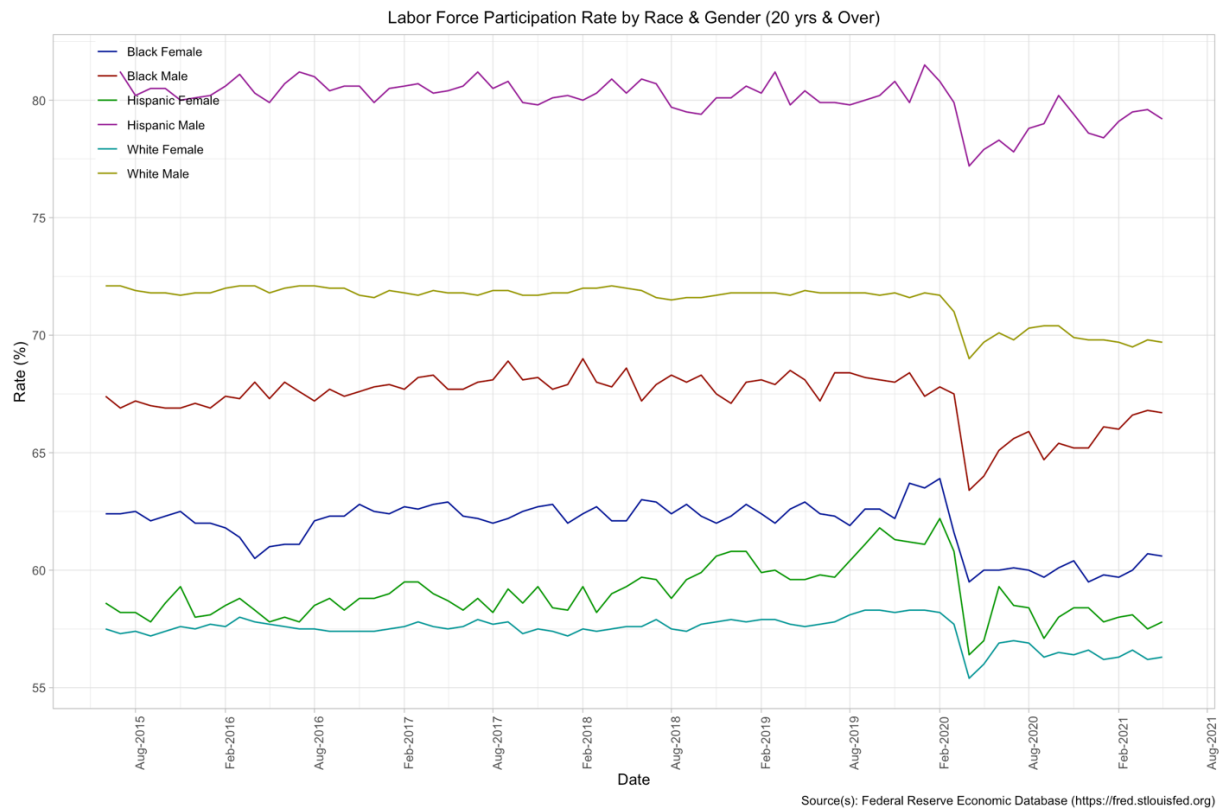
When examining the unemployment trends by MSA (per Figure 48), we see that nearly all the major cities we've analyzed are seeing declining unemployment rates. New Orleans, LA, saw the highest spike in unemployment and is seeing a small up-tick in unemployment rates between October and November. This increase in unemployment rate and spike in initial unemployment claims (see Figure 49) correspond to an increase in COVID-19 cases in New Orleans. Figure 49, Figure 50, Figure 51, and Figure 52 show the initial and continued unemployment claims for several southeastern states.

Figure 48: Unemployment Rate by MSA
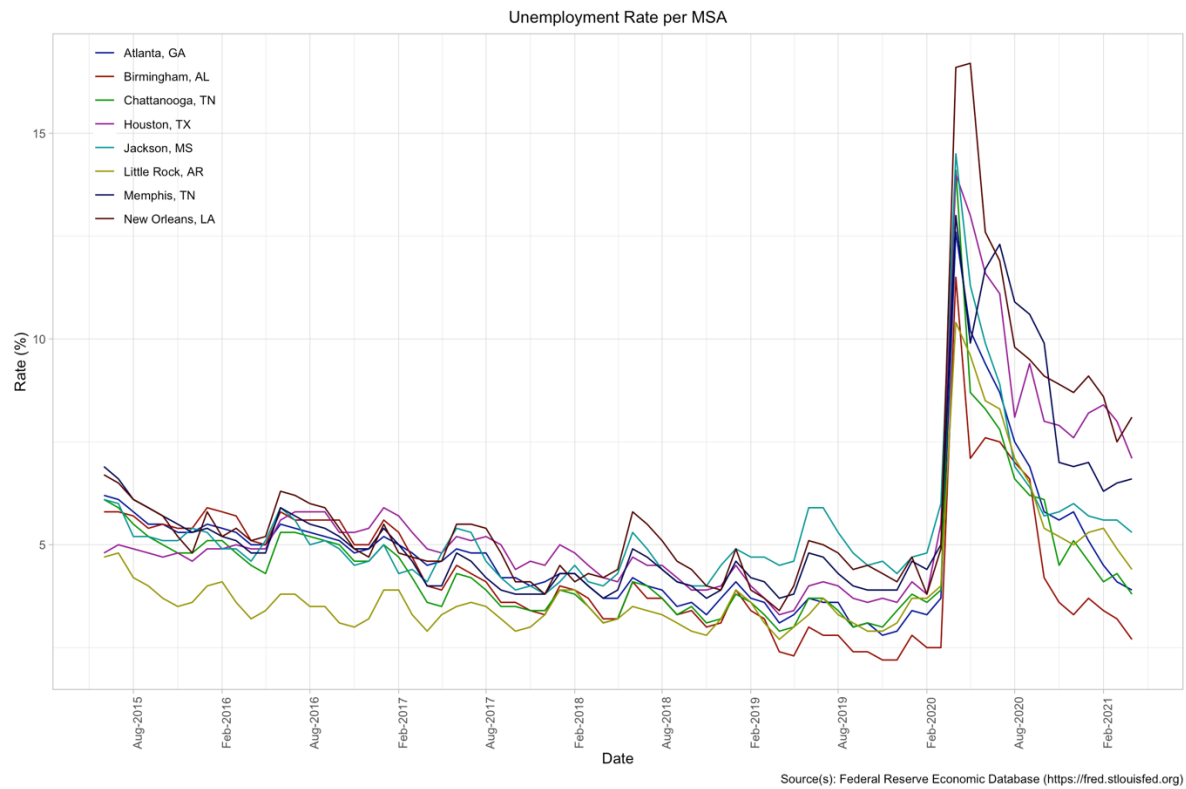
Figure 49: Initial Unemployment Claims: AL, AR, LA, MS, TN
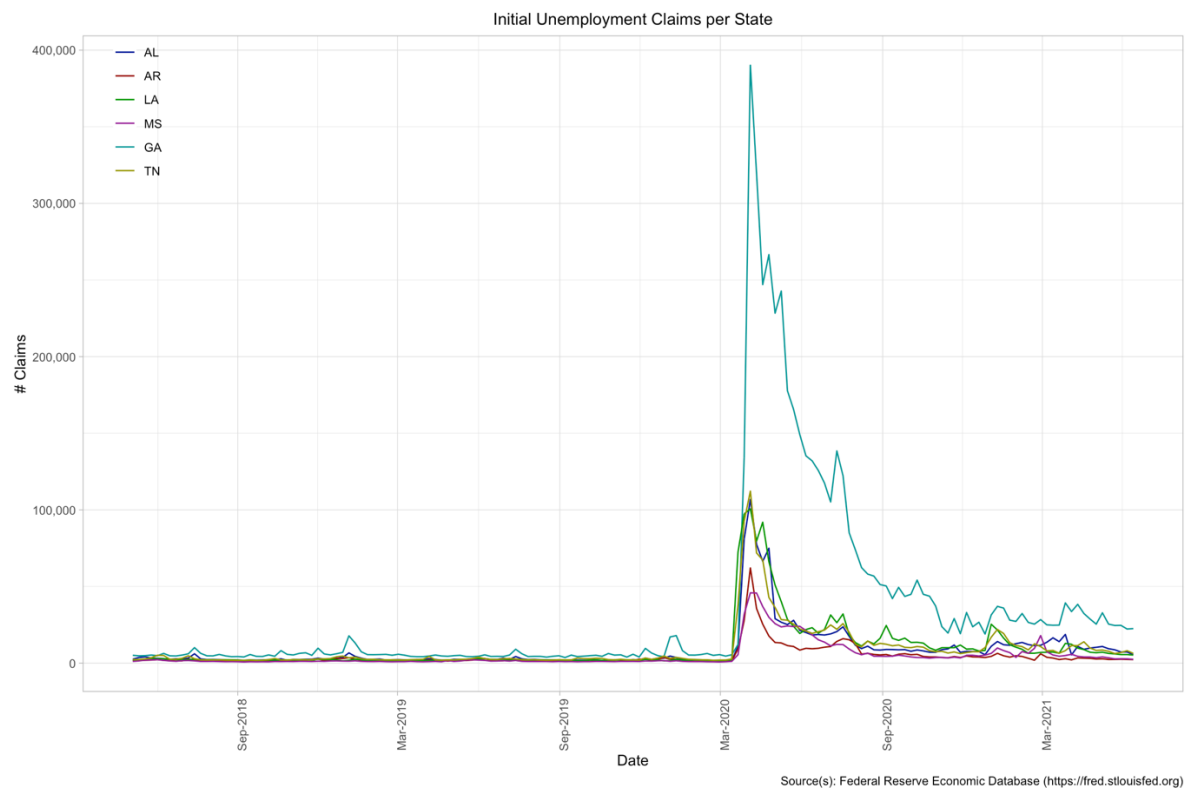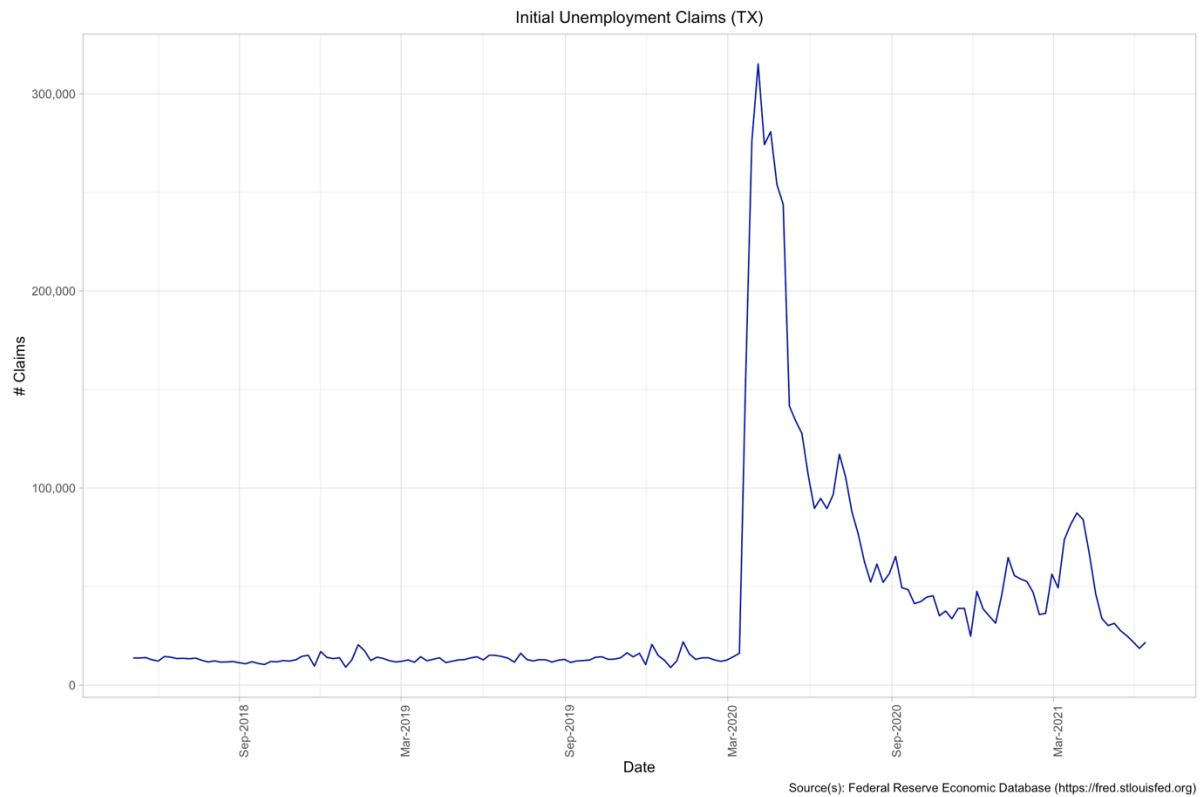
Figure 50: Initial Unemployment Claims TX

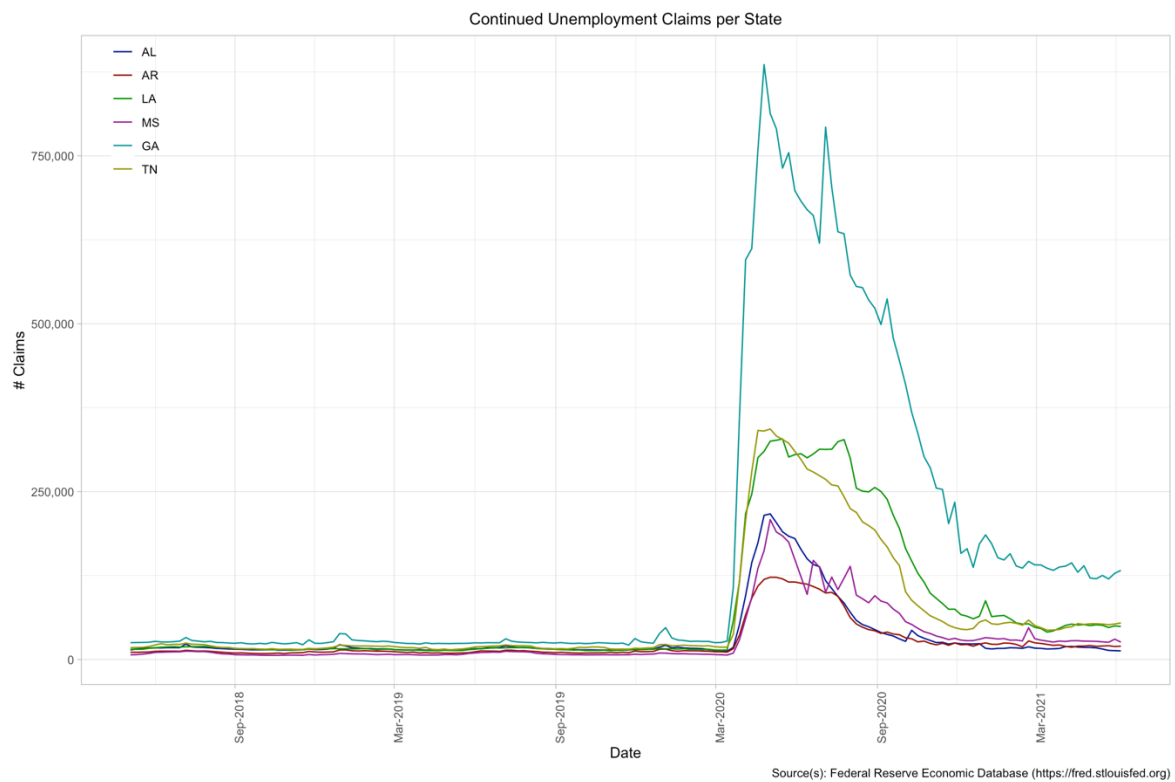*Figure 51: Continued Unemployment Claims: AL, AR, LA, MS, TN*
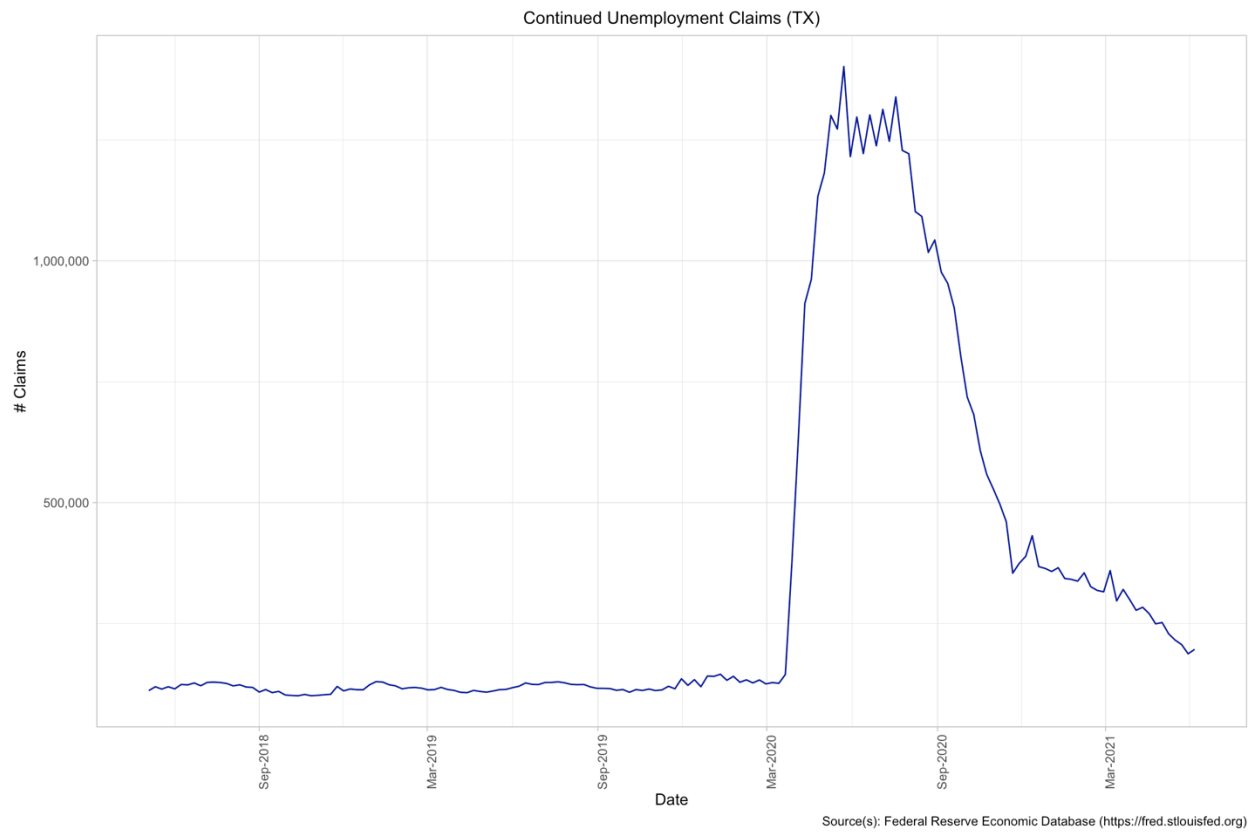
Figure 52: Continued Unemployment: TX

Continued Unemployment Claims (TX)

Source(s): Federal Reserve Economic Database (https://fred.stlouisfed.org)
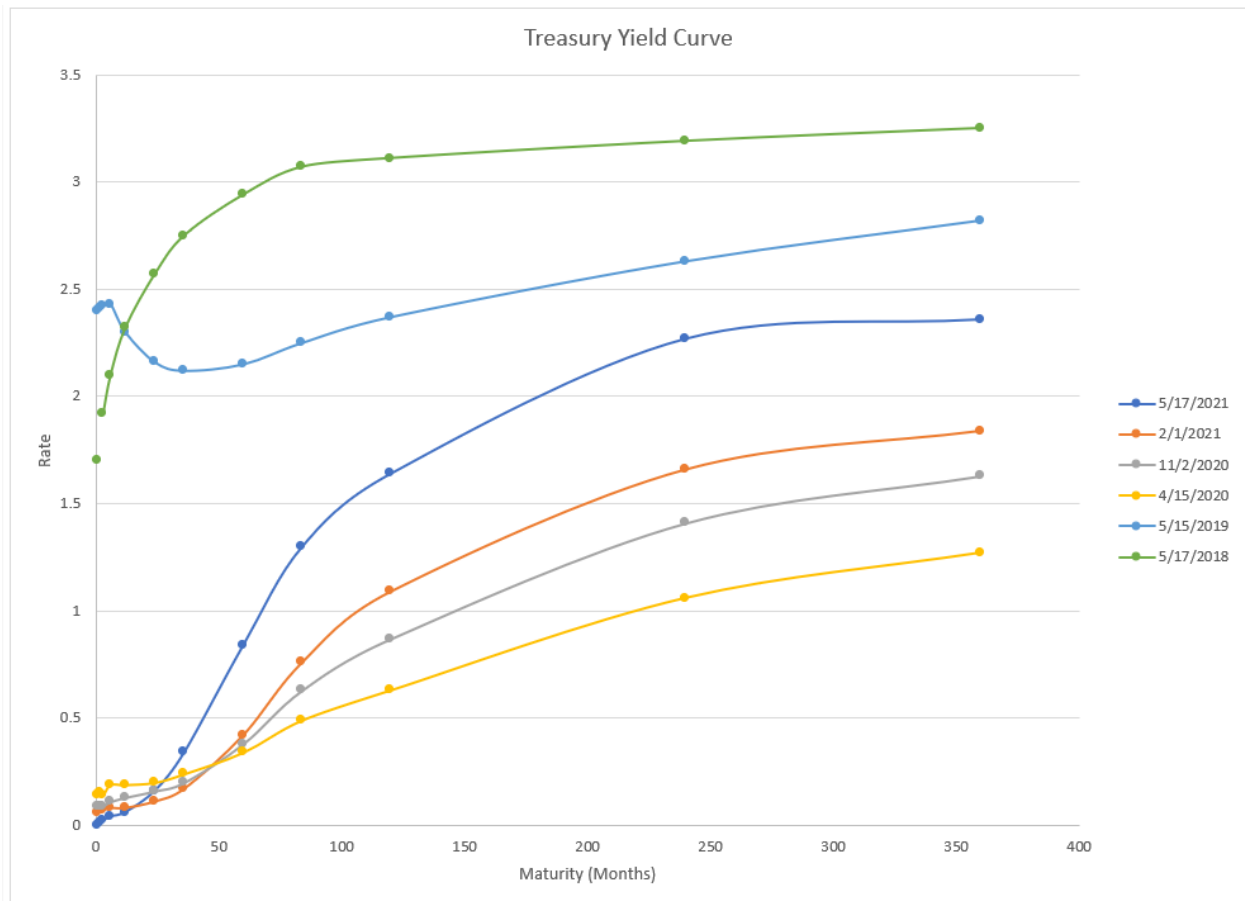
Figure 53: Historical Yield Curves

Source: US Treasury

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