Macroeconomic Forecasts, 4Q2021

Domestic Metrics

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Table of Contents

Summary

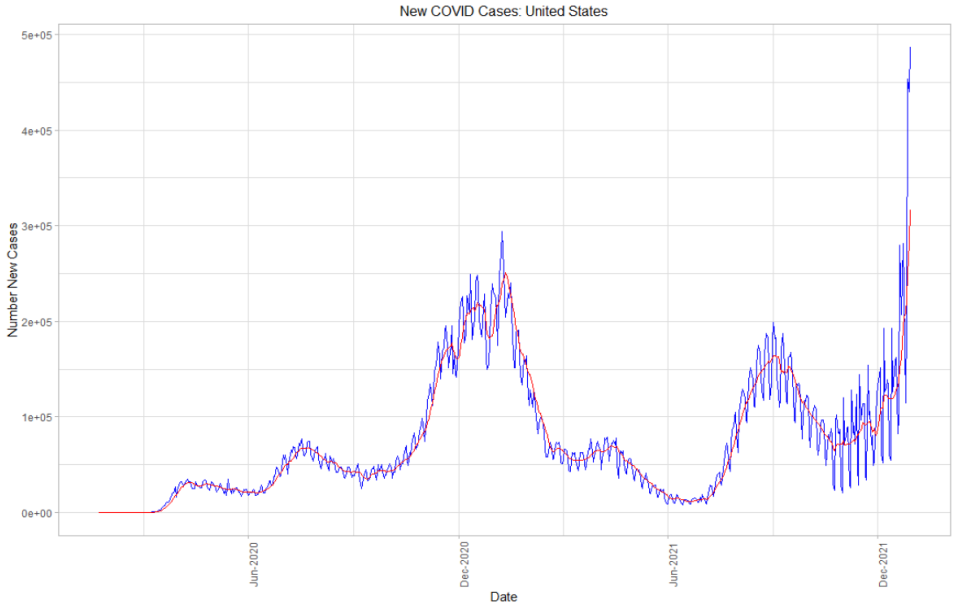
The economic condition of the United States seems to be at a new crossroads every week. A look back at the last few outbreak "bumps" suggest that we should expect a very troubling 2022. The current "Omicron" variant appears to be much easier to transmit and, although the death rate appears to be lower, the numbers do not ultimately work in our favor (a lower percentage of hospitalizations and/or deaths of a much larger number still translates into many more deaths and hospitalizations). The mis-match in the labor market (including a record number of persons quitting their jobs[1]), the 7% annual rate of inflation, the lack of momentum in additional fiscal policies, and our forecast of a slew of business failures points to, at best, very little economic growth for 2022 and, at worst, another economic recession coming into its own by YE2022.

[1] https://www.bls.gov/news.release/jolts.t04.htm

State of Affairs

The economy is still extremely sensitive to the state of COVID, COVID infections, vaccine mandates and vaccination rates. Per Figure 1, the number of daily new cases seems to be setting a record every few days. The newly rampant "Omicron" variant of the COVID-19 virus appears to spread between people with greater ease than the "Delta" variant[2]. Although the previous "spikes" in the number of cases have lasted approximately 6-8 weeks, it is not clear if this spike will be shorter lived.

Figure 1: Daily and Weekly Average of New COVID Cases in the United States



Source: Centers for Disease Control & Prevention (https://www.cdc.org)

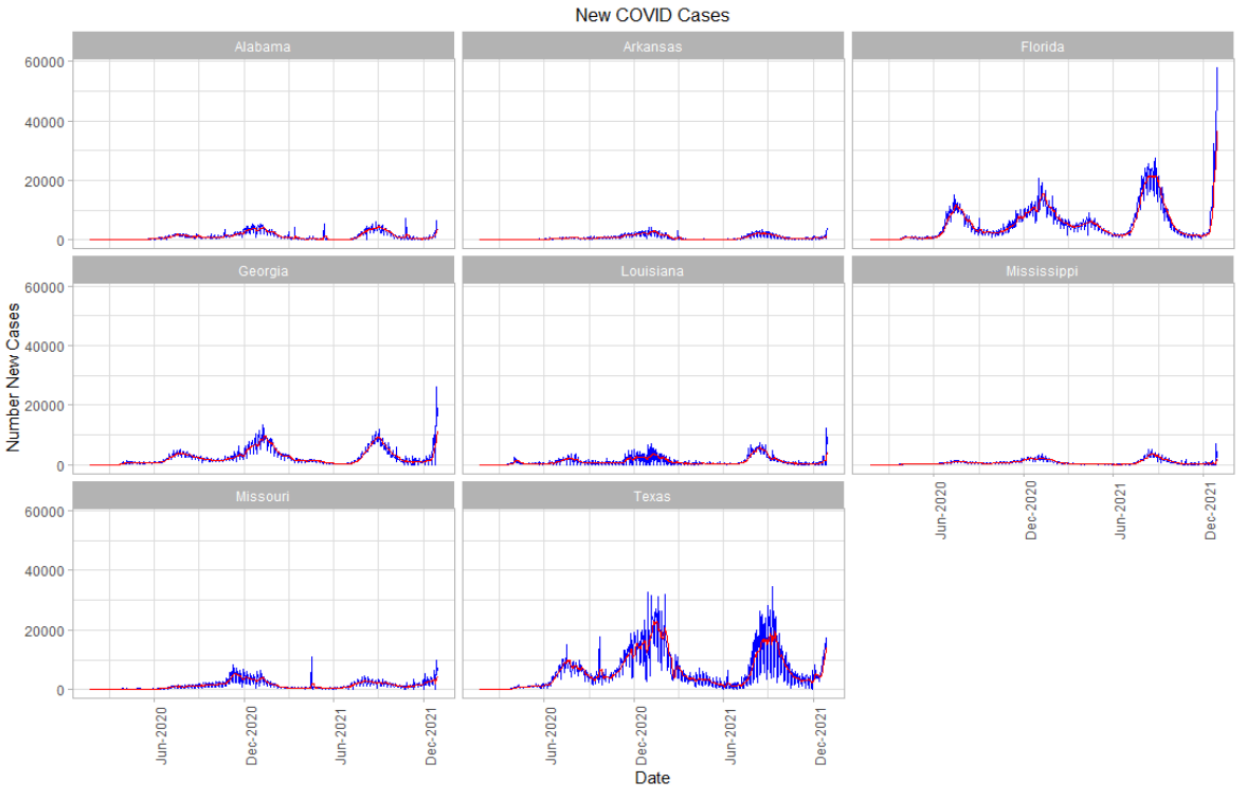
Many states in the Southeastern U.S. (e.g., Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, Missouri, and Texas) have experienced record-breaking spikes in cases during the recent holiday season. (See Figure 2.) Florida and Georgia, for example, are both experiencing spikes in cases that are nearly double what these states experienced this past summer. Texas, on the other hand, is seeing a spike that is roughly half of the number of cases that state experienced this past summer.

One of the principal concerns regarding COVID is the vaccination hesitancy and the differences in vaccination rates across populations and states. (See Figure 3.) Approximately 62% of the US population

[2] https://www.cdc.gov/coronavirus/2019-ncov/variants/omicron-variant.html

is fully vaccinated against COVID[3]. Some states, Maine[4], for example, have a greater share of their population vaccinated (75%), while other states, Mississippi[5], for example, have smaller shares of their population fully vaccinated against COVID (49%).

Figure 2: Daily and Weekly Average Number of new COVID Cases for Select States

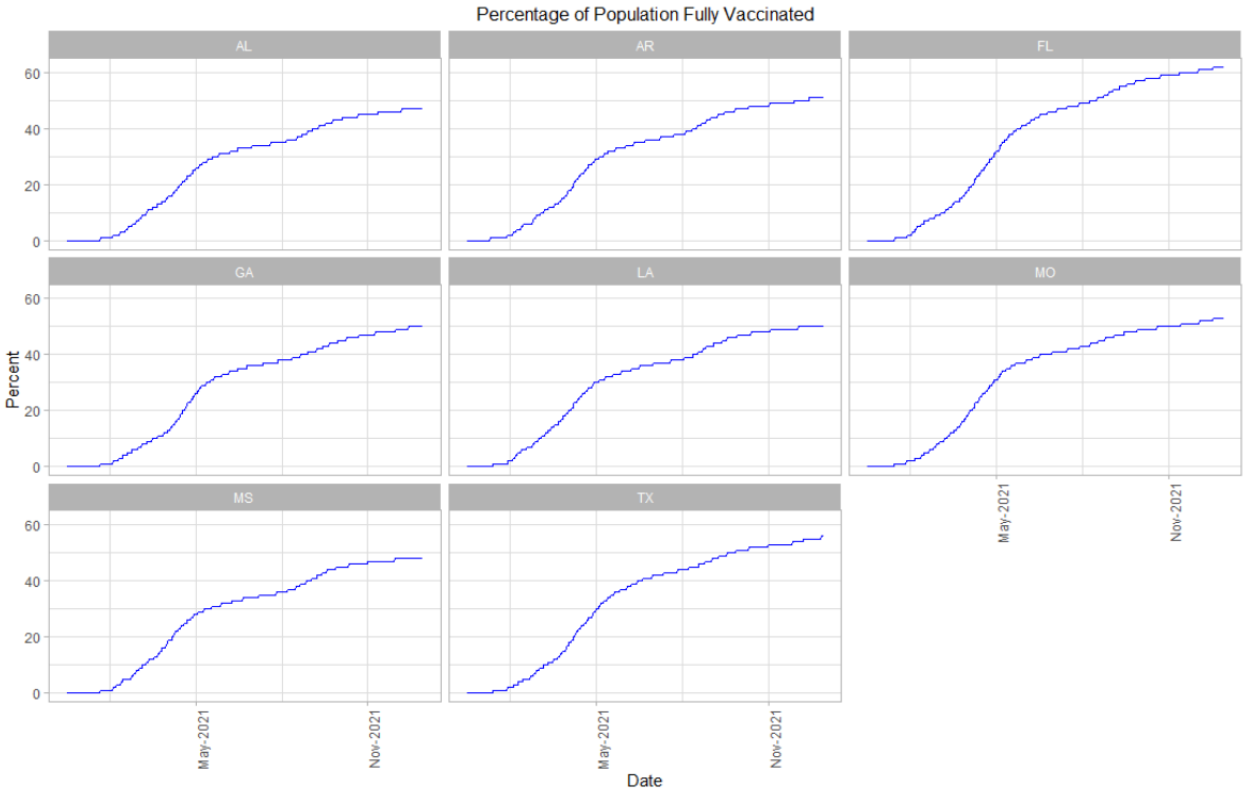


Source: Centers for Disease Control & Prevention (https://www.cdc.org)

We do see that the unemployment rate of each state is positively correlated to the vaccination rate in each state; states with higher vaccination rates are experiencing higher unemployment rates. However, states with lower vaccination rates are also experiencing lower rates of labor force participation. Given the current mismatch[6] between employers and employees – the disequilibrium between the number of job openings available and the number of employees willing to occupy those jobs – it is likely that the lower labor force participation rates in the lower-vaccinated states will exacerbate the dis-equilibrium.

[3] https://www.cdc.gov/coronavirus/2019-ncov/variants/omicron-variant.html
[4] https://www.mayoclinic.org/coronavirus-covid-19/vaccine-tracker
[5] ibid
[6] https://www.sbam.org/the-great-job-mismatch/

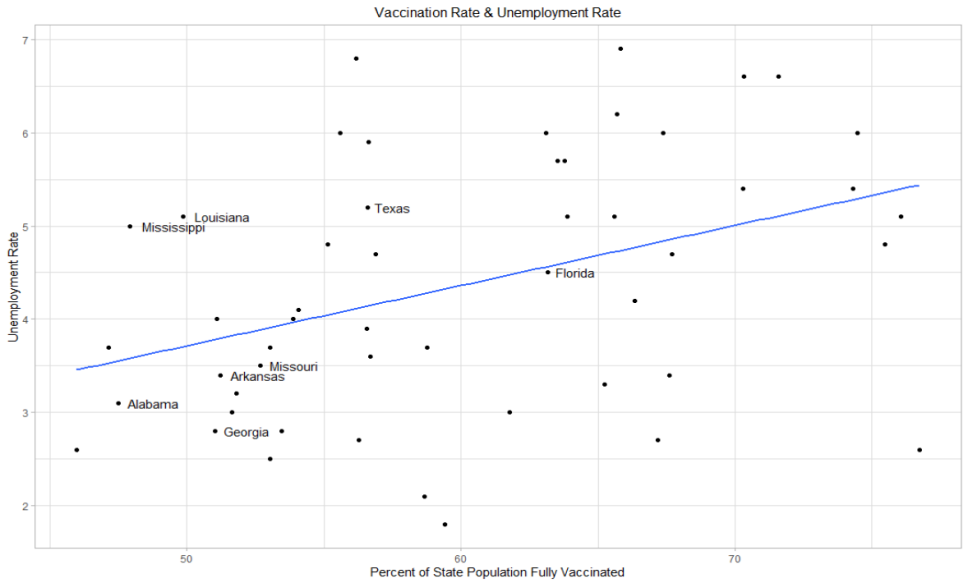
Figure 3: Percentage of the Population of Select States that are Fully Vaccinated



Source: Centers for Disease Control & Prevention (https://www.cdc.org)

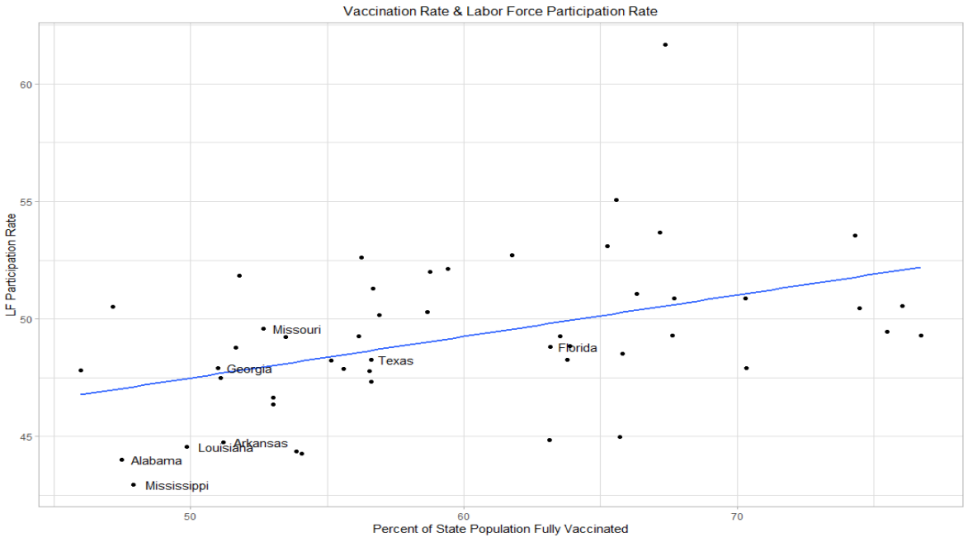
Notice that, per Figure 5, four of the states previously mentioned have some of the lowest labor force participation rate in the country and some of the lowest vaccination rates in the country. This relationship fuels the concern that these states will continue to have mismatches in the labor market, shut-downs resulting from labor shortages, and disruptions in business operations.

Figure 4: Correlation (per State) of Unemployment Rate to Percentage of Fully Vaccinated Population



Sources: Federal Reserve Economic Database (https://fred.stlouisfed.org); Centers for Disease Control & Prevention (https://www.cdc.org); US Census Bureau (https://www.census.gov); and Bureau of Labor Statistics (https://www.bls.gov)

Figure 5: Correlation (per State) of Labor Force Participation Rate to Percentage of Fully Vaccinated Population

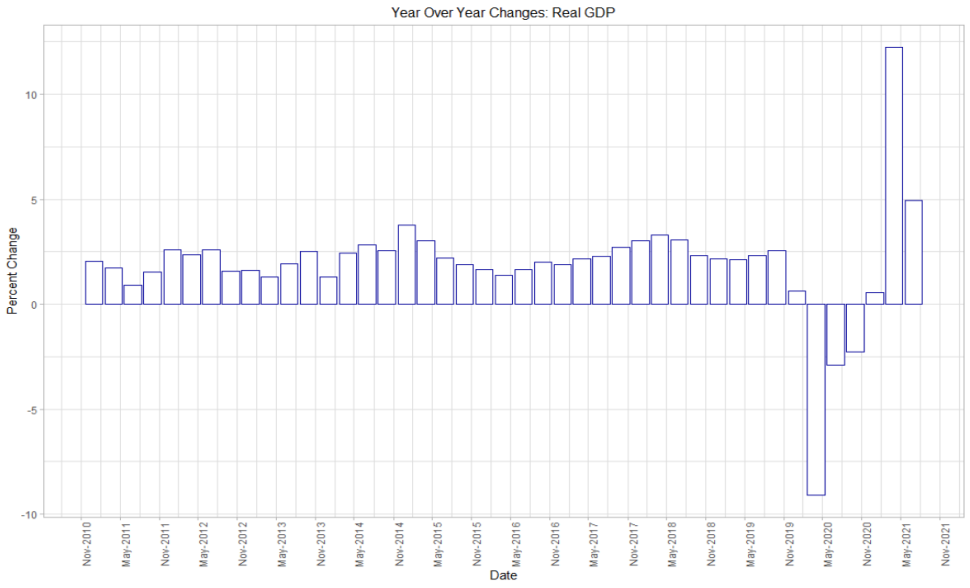


Sources: Federal Reserve Economic Database (https://fred.stlouisfed.org); Centers for Disease Control & Prevention (https://www.cdc.org); US Census Bureau (https://www.census.gov); and Bureau of Labor Statistics (https://www.bls.gov)

Current Economic Climate

The current state of the economy and the movement of the economy in the last two quarters might best be described as steady economic growth with an employment gap, inflationary pressures, and continued supply-chain disruptions.

Figure 6: Y/Y Percent Change in Real GDP



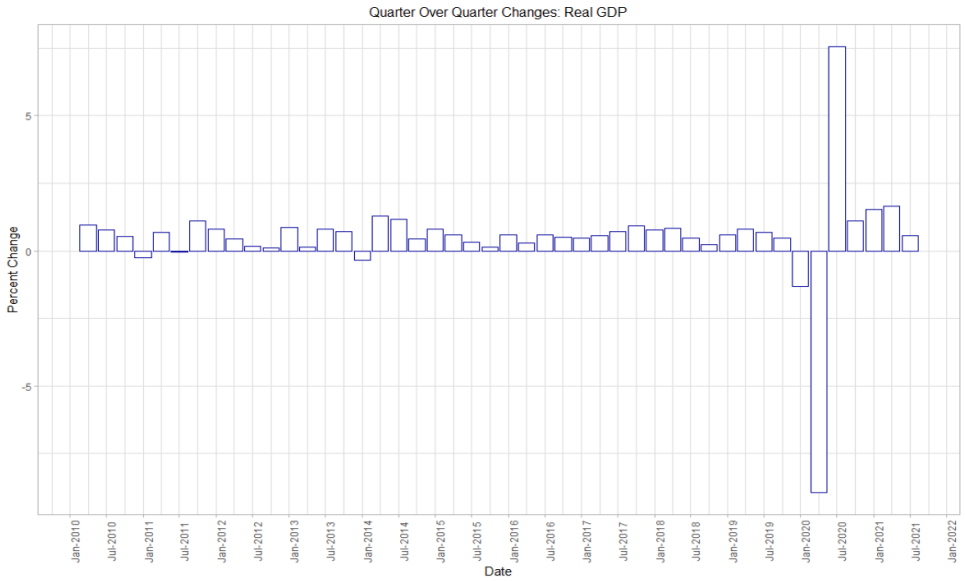
Source: Federal Reserve Economic Database (https://fred.stlouisfed.org)

Real GDP has been growing consistently over the last two quarters. The year-over-year growth of real GDP was approximately 12% from 1Q2020 to 1Q2021, and 5% for 2Q2020 to 2Q2021. (See Figure 6.) ***We anticipate the year-over-year growth for 3Q2021 and 4Q2021 will be closer to 2.5% growth***.

Real GDP captures growth in the value of final goods and services while accounting for movements in the overall price level. We see in Figure 7 that quarter-over-quarter growth of Real GDP was just above 0.5% for 2Q2021 to 3Q2021. The increase in Real GDP -- combined with the stalled gains in the employment picture -- could be a signal that the US has entered into a growth recession. Typically, the Fed's response to a recession is to drop interest rate targets and engage in quantitate easing. In fact, the Fed's policies have been consistent with this line of thinking for the last 20 months. However, a set of announcements by the Federal Reserve Chair[7] recently has signaled that the Fed's attention has shifted from unemployment and GDP to the threats of inflation, leading to a near-term curtailing of expansionary monetary policy (perhaps within the next month.)

[7] https://www.cnbc.com/2021/12/15/follow-along-to-real-time-updates-of-the-big-fed-decision-and-powells-press-conference.html

Figure 7: Q/Q Percent Change in Real GDP



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

Evolving Monetary Policy & Inflation (Including Energy Prices)

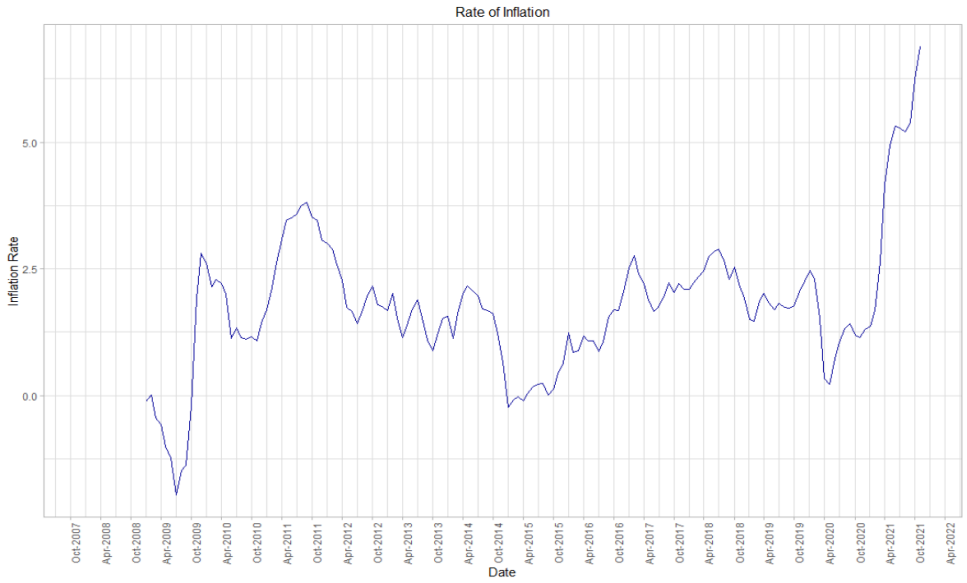
As we have written in previous reports, inflation is, historically, a monetary phenomenon, driven by expansionary monetary policy and quantitative easing. The easy money policies have contributed to near record inflation.

The current level of annual (year-over-year) inflation is 6.8% (November 2021), a level unseen since the early 1980s. (See Figure 8.) The Federal Reserve Bank announced that it is in the process of winding down bond purchases, and will continue to closely monitor the inflation circumstances[8]. The statement from the Fed' indicated that the Fed' would be willing to make monetary adjustments to maintain its goal of stable prices and high employment[9]. With inflation hitting nearly 7% (and likely breaking the 7% mark for December 2021), we anticipate the Fed' will increase its Federal Funds target rate starting in Q1, 2022, and ***will likely make three to four 25 bp adjustments to the Federal Funds target rate and the discount rate during 2022***. Regardless of the number of adjustments, we have some confidence that ***the Fed will increase the Federal Funds Rate target by 100 bp over 2022***.

[8] https://www.federalreserve.gov/newsevents/pressreleases/monetary20211215a.htm

[9] ibid

Figure 8: US Inflation Rate

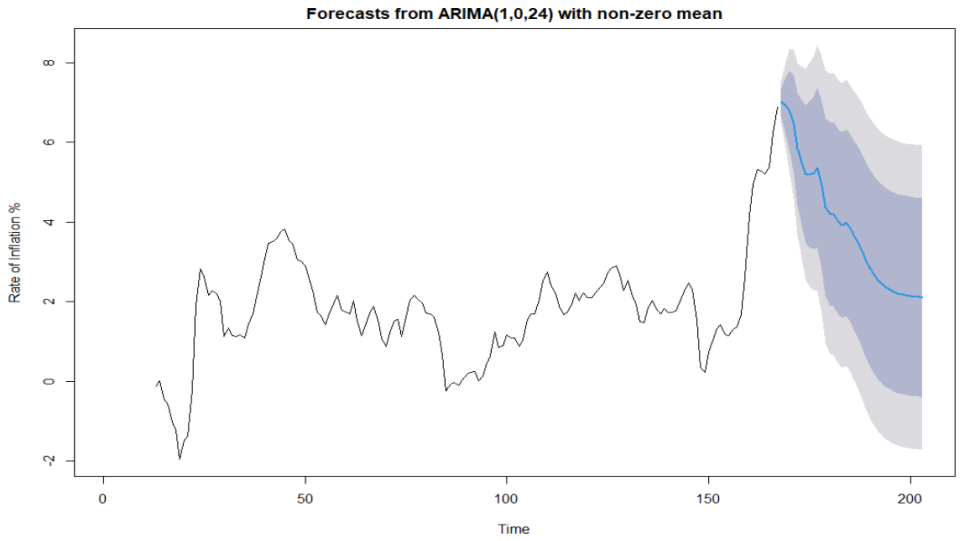


Source: Federal Reserve Economic Database (https://fred.stlouisfed.org)

Our forecasting models, shown below, still suggest moderate inflation through most of 2022; ***we estimate inflation rates between 4 – 5.5% during most of 2022 and then solidifying around 3% for 2023***.

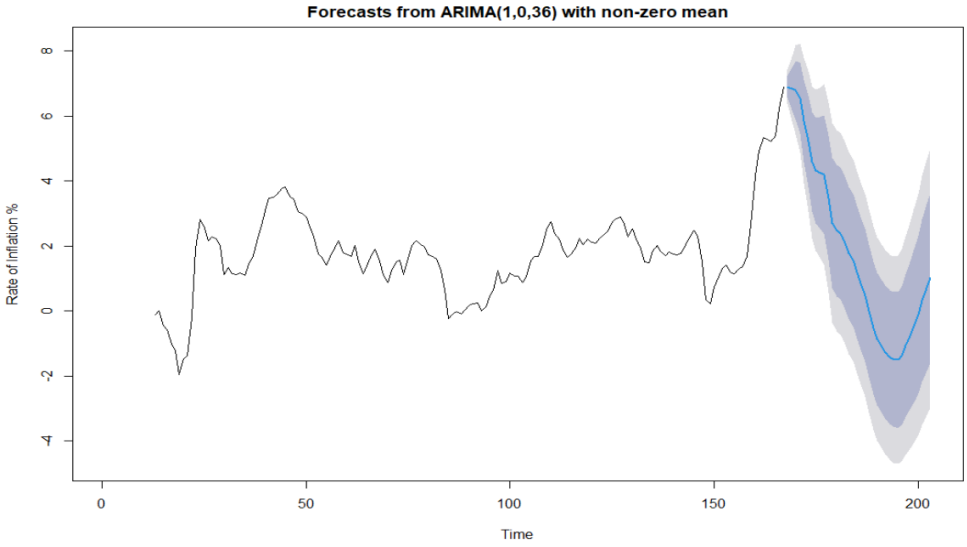
We have previously shown more confidence in our 36-month ARIMA model. However, since the Fed' is making it clear that it is taking the threat of inflation seriously and is positioning itself to engage in contractionary policy, we are now favoring our 24-month ARIMA model (per Figure 9). The difference in forecasts for these two models is the aggressiveness of the Fed's policy and the long-run implications of the Fed's adjustments. The 36-month ARIMA suggests that the economy will return to 2% inflation more quickly (than the 24-month model) and fall into a deflationary zone. (ref. Figure 10) In contrast, we believe that the near-term future will be better estimated by our 24-month ARIMA, which suggests dramatic movements occurring sooner and potentially followed by smaller, more frequent adjustments.

Figure 9: 24-month ARIMA Model for US Inflation



Source: Authors' calculations based on CPI

Figure 10: 36-month ARIMA Model for US Inflation

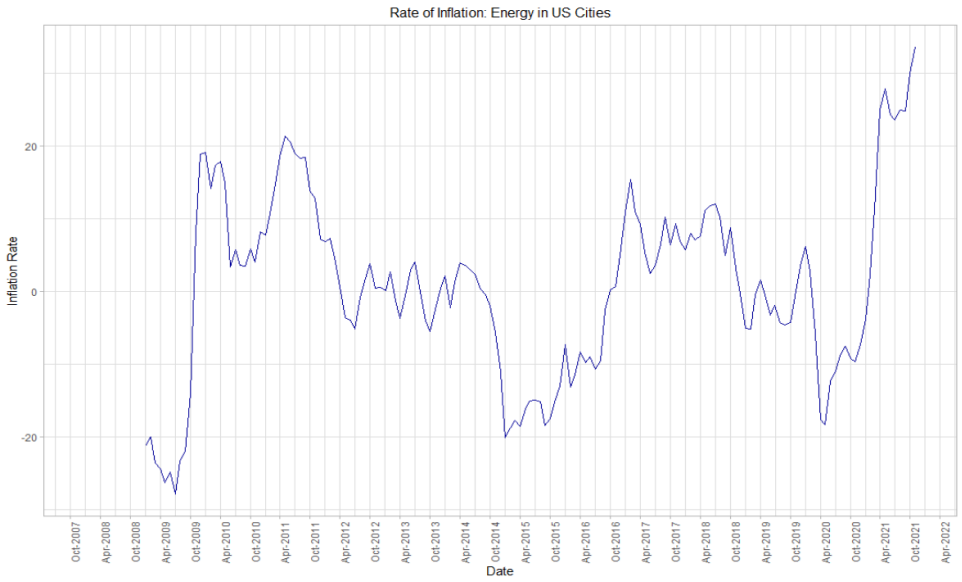


Source: Authors' calculations based on CPI

We now turn our attention to energy prices. Consider Figure 11. Consumers in cities with large footprints and less access to public transportation are particularly susceptible to increases in gas and energy prices[10]. The decrease in gas and energy prices early in the pandemic acted, in some ways, as an additional tax break. However, with the increase in demand for gasoline corresponding to the increase in driving miles and airline travel miles, energy prices have seen a sharp increase. The current year-over-year inflation for energy is above 30%.

[10] https://www.wsj.com/articles/soaring-energy-prices-raise-concerns-about-u-s-inflation-economy-11633870800

Figure 11: Inflation for Energy Products, in US Urban Areas

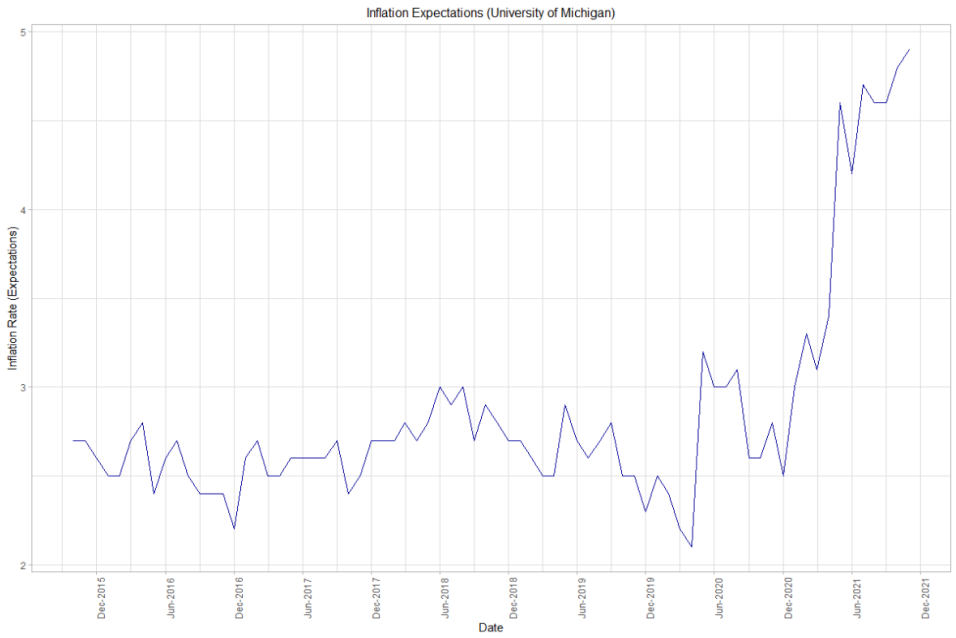


Source: Federal Reserve Economic Database (https://fred.stlouisfed.org)

Inflations & Real Wages

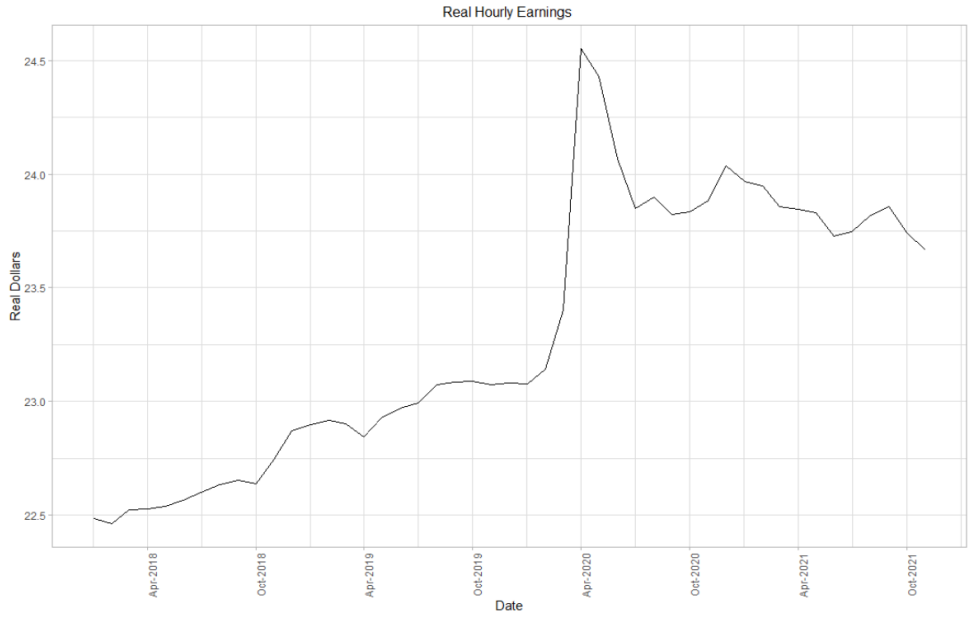
Although nominal wages have been increasing, real earnings have decreased during the last quarter of 2021. Real wages for workers in manufacturing, construction, information & technology services, transportation, and mining are below real wages prior to the pandemic. Real wages for professional services and hospitality & leisure are slightly higher than in March 2020, but lower than the peak in April and May 2020. Combining these points with our previous discussion regarding inflation, leads us to the fact that the current increase in inflation will likely connect with consumers more concretely than unemployment due to the day-to-day impact of changing prices throughout the marketplace. We believe that the increase in inflation, and the decrease in real wages, are the primary forces driving down consumer confidence. (See Figure 12, Figure 13, and Figure 14.)

Figure 12: Consumer Expectations for Inflation



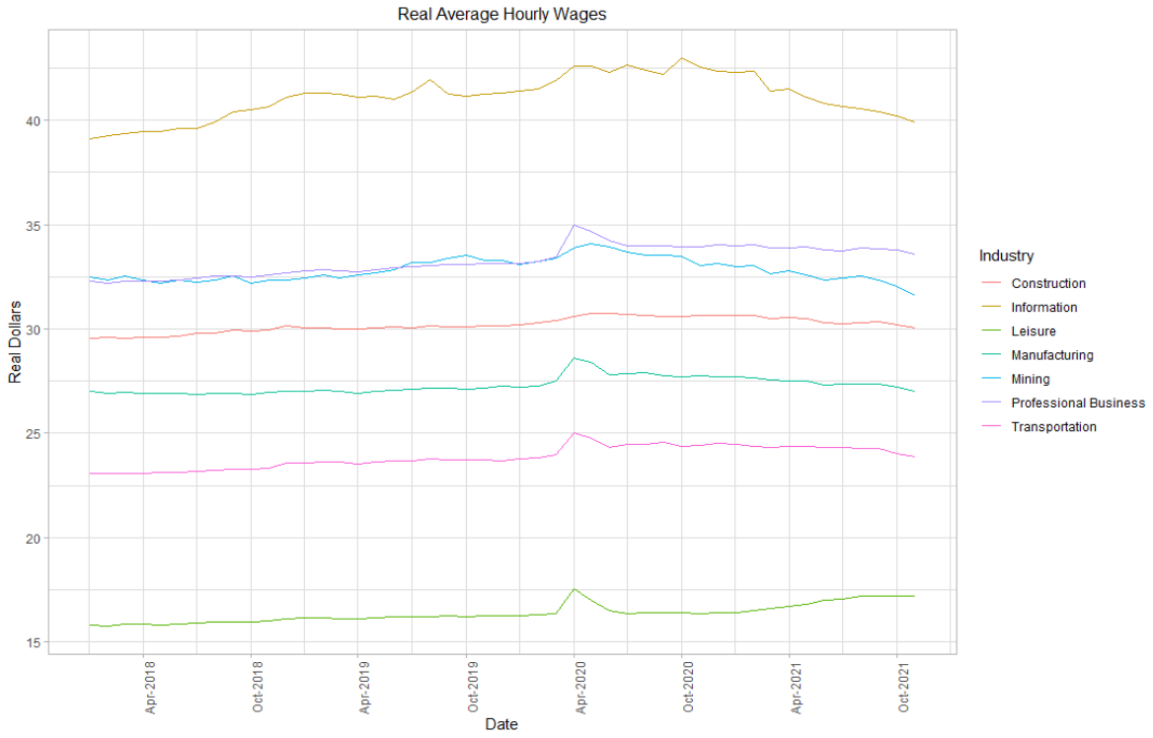
Source: Federal Reserve Economic Database (https://fred.stlouisfed.org)

Figure 13: Real Hourly Wages (Nationwide)



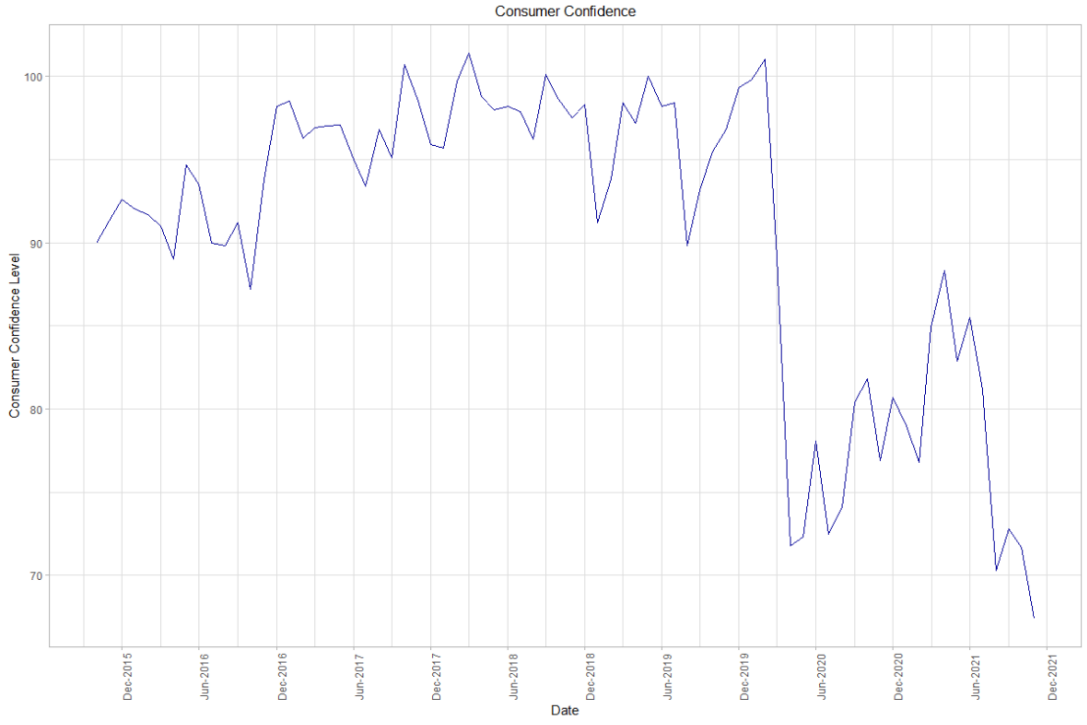
Source: Federal Reserve Economic Database (https://fred.stlouisfed.org)

Figure 14: Real Hourly Wages for Select Industries (Nationwide)



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

Figure 15: US Consumer Confidence



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

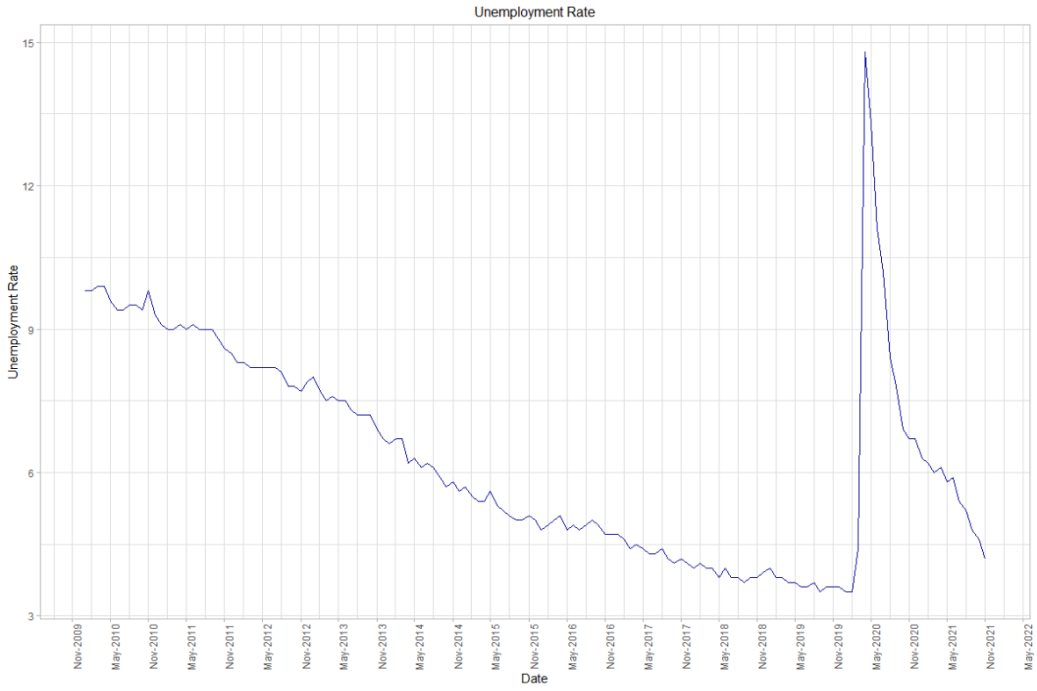
Consumer's expectations of inflation are more than 1.5 times what they were during Summer 2020. (Figure 15.) The concern with rising consumer expectations of inflation is that, while deflationary expectations can decrease consumer's engagement with the market, high inflationary expectations can increase engagement in the market. With current supply-chains strained and an overall low supply of goods in the market, an increase in consumer demand (consistent with long-run inflationary trends) will likely have the impact of pushing up prices (i.e., creating the problem that consumers are anticipating, or, colloquially, a "self-fulfilling prophecy").

Labor Force Participation

The second force that is pushing against economic gains is the employment gap and the lagging participation in the workforce (see Figure 16 through Figure 19).

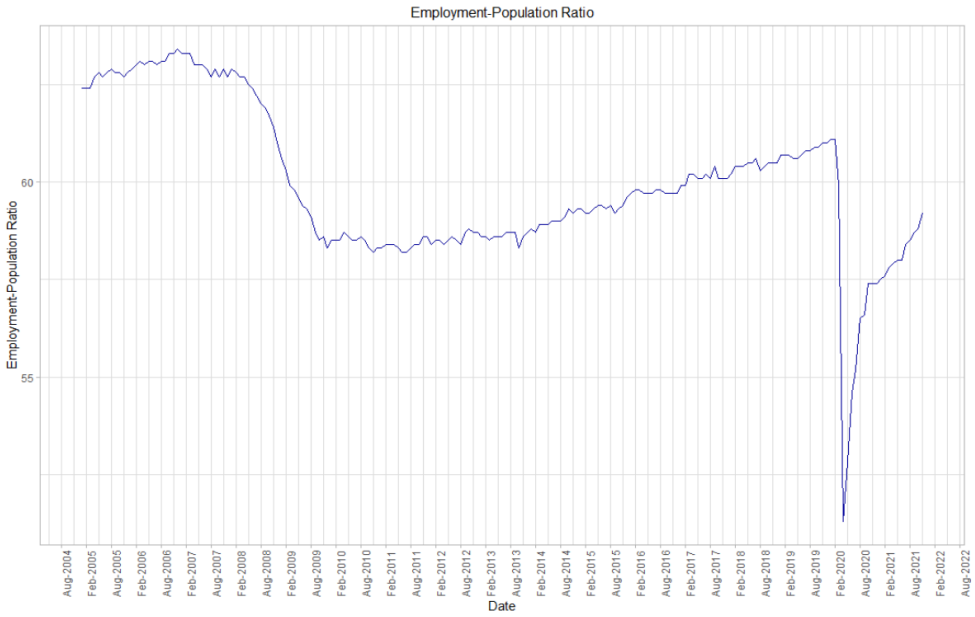
Per Figure 17, the employment-to-population ratio was approximately 62% prior to the recession. Although the ratio of persons in the labor market to the population has made significant gains since the end of the recession (May 2020), the economy is still experiencing a gap of nearly 600 basis points relative to the start of the recession and could be as large as 750 basis points relative to where the employment-population ratio would be counter-factual to the pandemic.

Figure 16: Unemployment Rate (Nationwide)



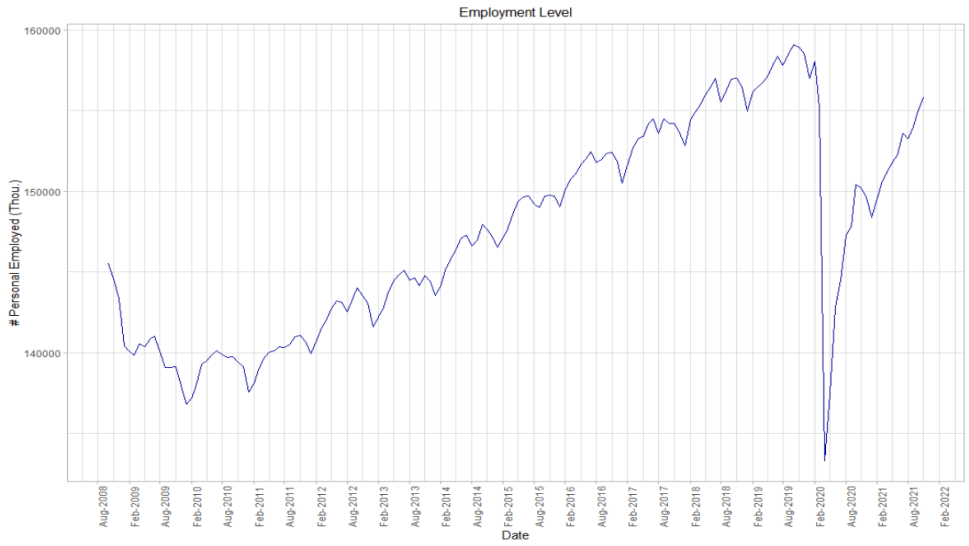
Source: Federal Reserve Economic Database (https://fred.stlouisfed.org)

Figure 17: Employment to Population Ratio (Nationwide)



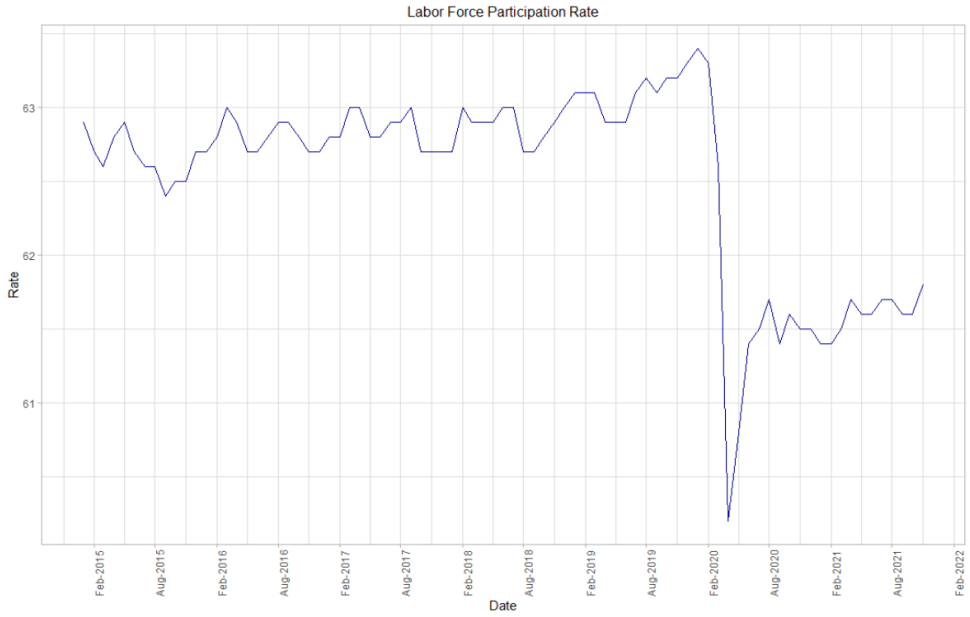
Source: Federal Reserve Economic Database (https://fred.stlouisfed.org)

Figure 18: Employment Level (Nationwide)



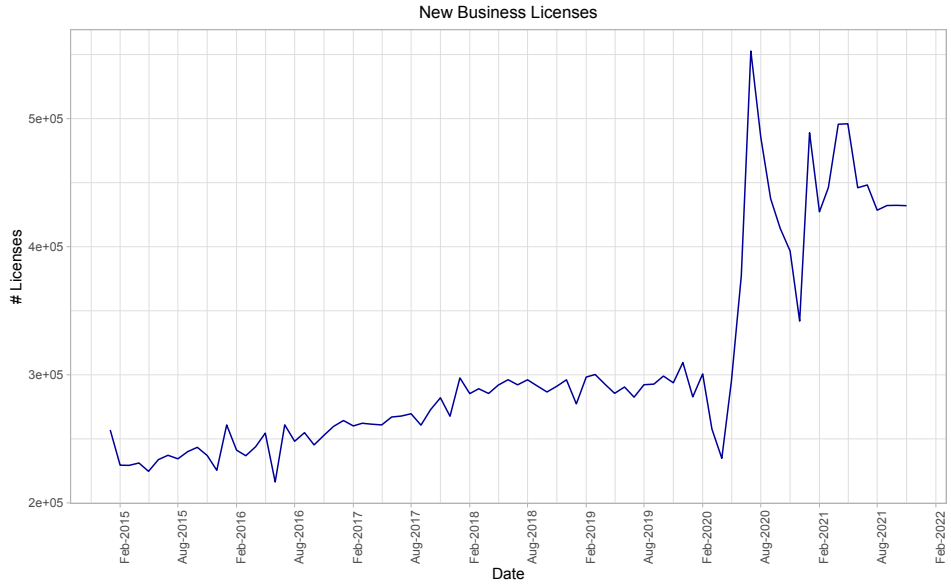
Source: Federal Reserve Economic Database (https://fred.stlouisfed.org)

Figure 19: Labor Force Participation Rate (Nationwide)



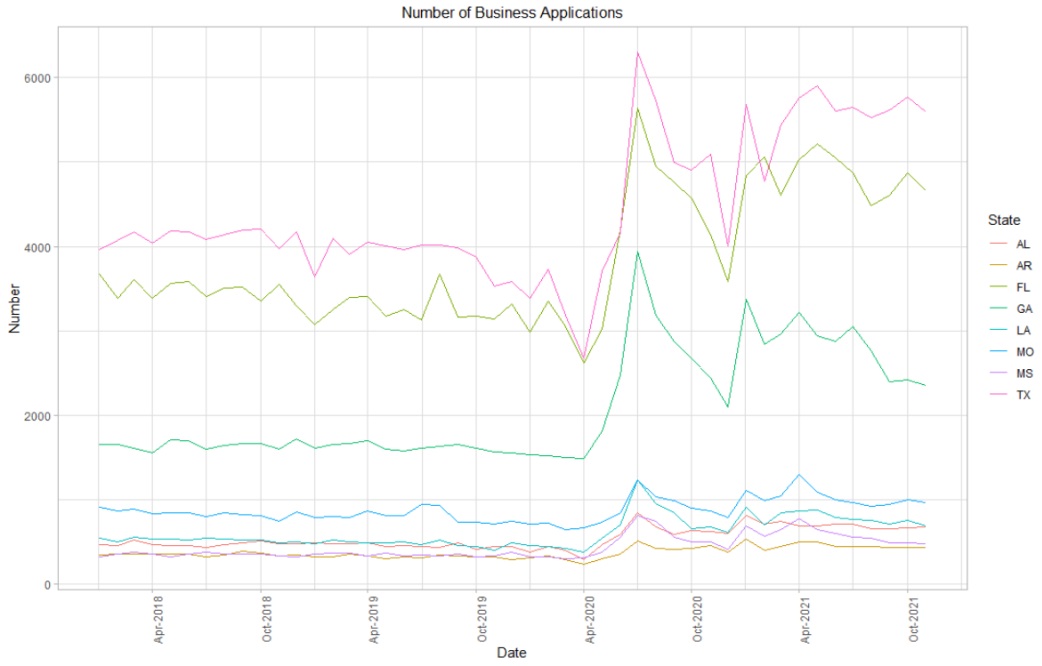
Source: Federal Reserve Economic Database (https://fred.stlouisfed.org)

Figure 20: Number of New Business Licenses (per month, Nationwide)



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

Figure 21: Number of New Business License Applications for Selected States



Source: US Census Bureau (https://www.census.gov)

The number of new business licenses per month (by state) increased significantly in Alabama, Florida, and Georgia. (See Figure 21.) Alabama and Georgia have consistently found a place on the list of most business-friendly states in the country. Florida has no state personal income tax – making it an attractive destination for sole proprietorships.

Inflation, Employment Gaps, and New Businesses: Take-Aways

When government mandated "lockdowns" were implemented in Spring 2020, and many businesses were forced to close temporarily or permanently, several million people left the labor market. Many of these people have not returned. A sizable share of (former) employees started their own business (see Figure 20). We know that, in some industries, the likelihood of small business success is not promising (e.g., the restaurant industry[11]). ***We anticipate that the collision of inflation, the employment gap, and the Omicron variant will push 25-35% of these new businesses into failure by the end of CY2022***[12]. With 400,000 new business applications per month for 2021, nearly 5 million new business have entered the economy in the last year. If 25% of these businesses fail, we will see 1.25 million business exit the market and between 1.5 million and 2 million people (having expended a significant portion of their capital and/or savings on the failed venture) re-entering the labor force. This trend will drive up the unemployment rate, and signal another recession. ***We are forecasting an increase in the***

[11] https://home.binwise.com/blog/restaurant-failure-rate

[12]Normally, we see 20% of new businesses fail within the first two years. https://www.lendingtree.com/business/small/failure-rate/

unemployment rate by the end of 1Q2022; additionally, we are forecasting the start of a new recession before the end of calendar year 2022. We believe that the mis-match in the labor market, combined with supply-chain issues and the Fed's almost certain contraction policies, will push the economy into another recession.

Unfortunately, with the volume of fiscal policy that the US economy has undertaken since the pandemic began, there is little appetite for additional fiscal relief (as we've seen with the current stalled Build Back Better plan).

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, "Omicron")

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

2. Disinformation Campaigns: A staple of international conflicts (both military and otherwise), organized campaigns based on disinformation or propaganda have been around for hundreds of years. Most recently, the US has made allegations against foreign governments that there has been interference in federal elections (and caused social unrest) by using freely available social networks[13]. 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."[14] 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)[15]. And, just to add an interesting twist, ransomware is now even offered as a *service* in which a criminal may sell a *license* to a (software) ransomware variant to another criminal, who will then infect a system and demand a fee for the decryption key. As our society becomes

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

more dependent on automated systems, disruptions to those systems will have an increasing impact on us.

4. Societal Unrest, including Domestic Social Changes and Terrorism: 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.[16]

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 (assumedly) Vice President Harris may be necessary before the next inauguration 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[17] and wage protection[18], but we are most concerned about how she will be perceived on the international stage in negotiations with, e.g., Saudi Arabia, and countries in the Far East.

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[19]. 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 of global liquified natural gas; and the Malacca Strait carries 40% of all global trade (including 16M barrels of oil per day).[20]

7. With the increasing visibility of distributed cryptocurrencies, several countries are currently investigating the benefits of implementing their own cryptocurrencies based on their own hard currencies. Over the past few years, several Caribbean countries have launched successful

[16] 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/

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

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

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

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

cryptocurrencies, including the Bahamas, Grenada, and St. Kitt's & Nevis[21]. Ecuador, Senegal, and China have canceled or withdrawn their currencies[22].

Mr. Powell and Ms. Yellen have stated that the US is currently investigating the opportunity to issue a cryptocurrency that is backed by the US Dollar; however, for the US to undertake issuing its own cryptocurrency, there are significant risks. First, cybercurrencies are inherently distributed and not centrally controlled; the security of an online cryptocurrency would have to be absolute, for if it were to be breached, the availability of truly "perfect counterfeit currency" would be the "brass ring" for criminals and states that would like to undermine the US economy. The US currently has over $2T of currency in circulation (and over $120T of wealth), and being able to potentially dilute that through cyber-based initiatives (versus traditional counterfeiting efforts) is potentially the most significant concerns. Aside from the security of the currency, public acceptance of a digital currency that may be subject to government control (as evidenced by China's brief use[23]) would also hamper its usefulness. Finally, assuming that there would exist a transition period during which the cybercurrency would coexist with paper currencies, it would be virtually impossible to ensure that the two currencies would retain identical values in the world markets[24]; the risks of a virtual currency taking on negative value compared to its paper counterpart cannot be understated, since that phenomena would lead to hoarding of the paper dollar (that would likely retain its "original" value, in comparison), thereby undermining the project.

[21] https://www.atlanticcouncil.org/cbdctracker/

[22] Ibid.

[23] https://www.wsj.com/articles/china-creates-its-own-digital-currency-a-first-for-major-economy-11617634118

[24] See https://www.wsj.com/articles/digital-currencies-pave-way-for-deeply-negative-interest-rates-11631091581

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[25]:

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

[25] 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 117 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**[26]
6-month Treasury yield		3-year Treasury yield*
Prime rate	**… depends on …**	3-month Treasury yield
1-month Treasury yield		1-year Treasury yield
3-year Treasury yield		1-year Treasury yield
7-year Treasury yield		3-year Treasury yield*

[26] 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*
US Residential Home Price Index		Commercial Real Estate Price index
Primary Credit rate		3-year Treasury yield*

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

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.

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

Analysis

Ordinarily, GDP is driven by several factors:

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

Real GDP increased at an annualized rate of 6.7% during 2Q2021, and then dropped to 2.1% during 3Q2021[27]. As mentioned, previously, labor force participation (for services) and import routes (for non-domestic goods) continue to be the key issues facing the market. Unfortunately, the capital that the administration and the Federal Reserve pumped into the economy in order to ensure its sustainability during 2020 and 2021 is now one of two stumbling blocks that prevents markets from recovering as

[27] https://www.bea.gov/data/gdp/gross-domestic-product

quickly as they could. (The second block being the collective beliefs and willingness to work in the minds of prospective workers.)

We cannot underscore the issue of labor force participation enough at this time. For many small businesses, employers are being compelled to increase wages to maintain their labor footprint, to invest in ensuring the safety of their workplace, and to address employees' child/elder-care issues and/or competitive offers, resulting in businesses passing on price increases that are eventually borne at the register. The net of the cycle increases inflation and devalues the wage increases that were originally demanded. As a result, while there is demand for products and services, businesses are not able to generate real returns through their investment. We project that this trend to continue for several years while employers and employees work to re-join each other at an acceptable point.

Expectations of inflation have been thoroughly validated over the past several months, with the coming winter continuing to help prices increase. Per the WSJ[28], inflation like that seen in November 2021 had not been seen in the US for almost 40 years, with consumer prices increasing 6.8% Y/Y; further, producers' prices increased 9.6% Y/Y during November[29]. Price increases have become pervasive, and, while the expectation is that increases will gradually slow over time[30], there is no expectation of the numbers on price tags actually decreasing.

Q/Q spending continued to increase in 3Q2021 by over $270B to almost $16T[31]. ***We expect for this trend to continue as the country continues to try to return to its nominal point of operation, and given the expected inflation rate during 2022***. In fact, the only moderating force that we see for this figure is labor force participation, which will act as a limiting factor for the "velocity" of money in the US' economic system. As the globe grapples with the inflation that has taken hold as we (hopefully) exit from the COVID crisis, we expect that many nations will experience similar issues.

The US' demand for foreign products increased very slightly in Q3. Since the US has recovered from the COVID pandemic more rapidly than other countries (not only recovering from the "delta" strain, but also increasing the immunization rate and generally adapting culture to accommodate the near term coexistence with the COVID variants), the change in demand for foreign products was more than offset by the increase of US exports, resulting in a significant drop in the US' trade deficit (from $81B during 2Q to $67B during Q3)[32]. Reflecting on the adaptations already made by various cultures in the first-world countries, and the concerns regarding many internationally developed vaccines' (poor) efficacies towards the Omicron variant, ***we believe that it is likely that the US' exports will try to increase faster than imports during much of 2022***, resulting in a temporary erosion of the quarterly net trade deficit during that period. By 2Q2022, the same phenomena (a US recovery, in parallel with an international malaise) could also result in stifled productivity due to "back-pressure" in the supply chain (i.e., diminished demand due to lower productivity abroad, despite a desire by US companies to export their products).

[28] https://www.wsj.com/articles/inflation-is-near-a-40-year-high-heres-what-it-looks-like-11639737004

[29] https://www.wsj.com/articles/u-s-producer-prices-climbed-sharply-in-november-11639500799

[30] https://www.bloomberg.com/news/articles/2021-11-30/powell-ditches-transitory-inflation-tag-paves-way-for-rate-hike

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

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

Further, we expect ***government spending will continue to increase*** through 2022. President Biden and Congressional Democrats have lobbied strongly for his "Build Back Better" framework[33], having already passed a one-time $1.9T stimulus plan that resulted in substantial aid being distributed to portions of the population. Democrats have been touted as having an opportunity to force their agenda through Republicans, given the blue control of both sides of Congress and the White House. However, the disparate degrees of progressiveness that is held by the left-wing representatives, along with the slim allowable margin for disagreement in the Senate, has turned into a sticking point for Pres. Biden's proposal; while the Democrats in the House of Representatives appear fairly unified under Nancy Pelosi, Sen. Chuck Schumer has not been able to drive the party's agenda as successfully. As a result, many of the thrusts of the overall proposal have been (a) restructured in order to navigate the various members who disagree with the respective planks, and (b) turned into budgetary "reconciliation" matters that must navigate a less-traveled path of parliamentarian procedure (thereby allowing those matters to be passed with less stringent requirements)[34]. We expect that some of the progressive planks of the White House's proposal will eventually be passed, even despite rising inflation, but we also think that, in the net, President Biden will have expended a substantial amount of political capital in Congress, his party, and his grass-roots supporters.[35]

Returning to our discussion of supply chain issues, 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 are hopeful that competitive pressures will eventually return and force consumers' (real) 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 to increase prices as demand picks up. In previous reports, we have discussed that prices for US produced products and services will eventually need to be reconciled with those of reliably delivered, internationally generated alternatives; however, it does not seem that we (as a global marketplace) are yet to that point. We acknowledge that the Omicron variant will likely extend the period until this "reconciliation" occurs.

At this point, we continue to believe that ***the global economy will remain in a state of flux until mid-2024 or later***. Significant supply chain issues 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. Additionally, we have previously commented on the strength of consumer spending during 2021 given the availability of capital. ***We still expect that price changes will be significant & erratic through 2023***. ***We expect that inflation will be reported as***

[33] https://www.whitehouse.gov/briefing-room/statements-releases/2021/10/28/president-biden-announces-the-build-back-better-framework/

[34] https://www.wsj.com/articles/democrats-struggle-to-find-path-forward-on-2-trillion-plan-11639694428

[35] It is noted that, at the time of this writing (late December 2021), the current incarnation of President Biden's "Build Back Better" Act has been dealt a harsh blow that has been attributed to Senator Joe Manchin (D, WVa.). Per https://www.economist.com/united-states/2021/12/19/joe-manchin-kills-the-build-back-better-act-joe-bidens-ambitious-legislative-package, "For [President] Biden, this is the latest blow in a miserable streak of months." Not to go on a political tangent, the concern that we have is the continued polarization of US culture will make it increasingly difficult for Congress and the White House to agree on legislation enough to not only help the country, but also to negotiate effectively on the international stage.

increasing by over +/-4% annualized through YE2022, and the ***real GDP growth rates during 2022 will most likely come in at no more than 0.5% (Q/Q), and possibly negative.***

Other Commentary

- "Senator Joe Manchin's opposition to the Build Back Better Act prompted Goldman Sachs to swiftly dim its US economic outlook. … Citing the 'apparent demise' of Build Back Better, Goldman Sachs now expects GDP to grow at an annualized pace of 2% in the first quarter, down from 3% previously. … 'With headline CPI reaching as high as 7% in the next few months in our forecast before it begins to fall, the inflation concerns that Sen. Manchin and others have already expressed are likely to persist, making passage more difficult,' Goldman Sachs economists wrote. 'The Omicron variant is also likely to shift political attention back to virus-related issues and away from long-term reforms.' " (https://www.cnn.com/2021/12/19/economy/goldman-sachs-joe-manchin-build-back-better/index.html; Dec. 20, 2021)
- "The Conference Board forecasts that US Real GDP growth will rise to 6.5 percent (annualized rate) in Q4 2021, vs. 2.1 percent growth in Q3 2021, and that 2021 annual growth will come in at 5.6 percent (year-over-year). Looking further ahead, we forecast that the US economy will grow by 3.5 percent (year-over-year) in 2022 and 2.9 percent (year-over-year) in 2023. This forecast is an upgrade for growth in Q4 2021, but a downgrade for growth momentum in 2022. … While our forecast does include spending associated with the recently approved bipartisan infrastructure package, it does not yet incorporate the Build Back Better (BBB) social and climate package. The size, composition, and timing of BBB are still uncertain as is the Congress' ability to pass the legislation. However, if the version of the bill reviewed by the Congressional Budget Office is passed and implemented in Q1 2022 we estimate that outlays would begin in Q2 2022, and that GDP growth in 2022 would rise an additional 0.4 percent (year-over-year). However, we also estimate that the package would add to inflation rates in 2022 and 2023." (see https://www.conference-board.org/research/us-forecast; Dec. 15, 2021)
- "U.S. wage increases may slow in the future, but once employers start paying a lot more for labor, it's gonna take a while to normalize. To keep pace, companies either have to automate more of the process or pay for the labor and pass along the cost to consumers." (see https://fortune.com/2021/12/03/inflation-no-longer-transitory-higher-prices-fed-chair-powell-treasury-yellen/; Dec. 3, 2021)
- "Inflation at the end of next year should be about 2.7%, down from 6.6% at the end of 2021. It's expected that an easing of supply chain shortages next year will bring some price relief, especially to sky-high motor vehicle prices. But, these shortages are expected to only gradually resolve during 2022. … So, inflation should remain higher than its 1.7% average over the past ten years. And, while the rate of price increases next year is likely to ease, those smaller gains will be on top of this year's painfully large increases." (https://www.kiplinger.com/economic-forecasts/inflation; Nov. 11, 2021)

- "Overall, we forecast real personal consumption expenditure (PCE) to rise 8.1% this year, rebounding strongly from a 3.8% contraction in 2020. With economic fundamentals expected to improve steadily through the medium term, PCE growth is expected to remain healthy. The nature of consumer spending in the next few years will, however, vary compared to 2020–2021, with spending on durables giving way to services." (https://www2.deloitte.com/us/en/insights/economy/spotlight/consumer-spending-forecast-2021.html; Oct. 27, 2021)

Employment

Analysis

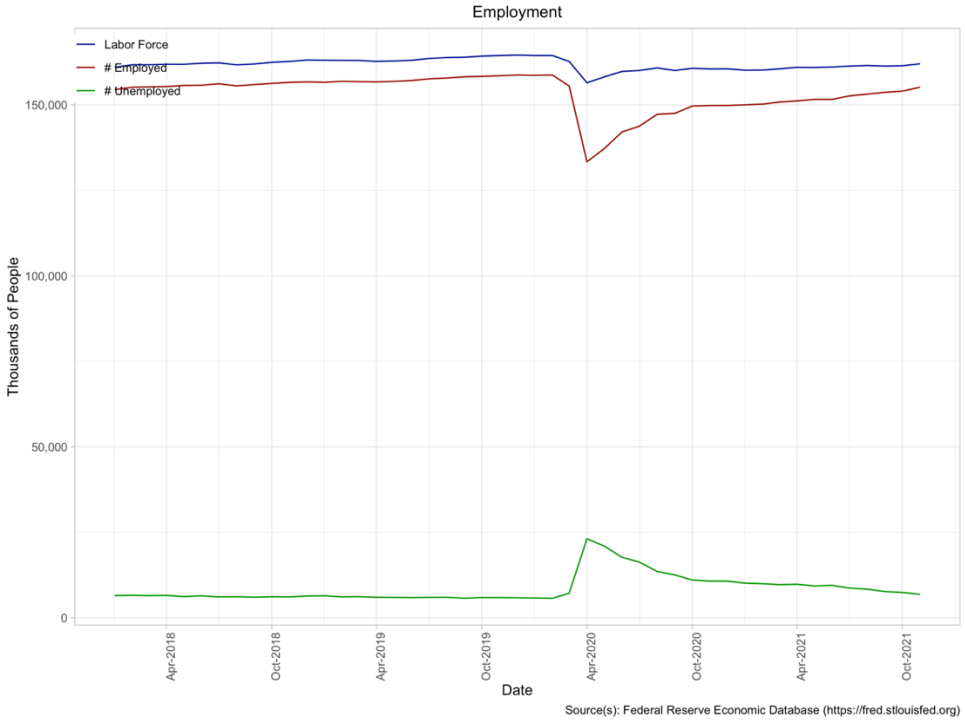
Recently, the general perception has been that the US has been experiencing a crisis in employment: people have generally been refusing to return to work, and, as a result, the country has not been able to return to the prosperous times that we remember as existing prior to the COVID-19 pandemic. What's going on?

Figure 22 shows the labor force size, along with the number of employed and unemployed workers in the United States from January 2018 through November 2021. Interestingly, the country is currently in an extremely comparable position in this respect to that during 1Q2018. Consider the information in Table 1 from the Federal Reserve Bank of St. Louis. The employment, unemployment, and labor force levels are all extremely comparable. The key difference between the two periods are that, over a span of 45 months, including about 20 months of the COVID-19 pandemic, the US civilian population level has grown by a net of 5 million people (i.e., growth of approximately 2%, or 0.052% per year), but only 300,000 of them are in the labor force. Yet, the perception is that the country is experiencing a crisis in its labor force participation rate.

Table 1: US Employment Measures, Feb 2018 vs Nov 2021

	Civilian Pop' (thou.)	Labor Force (thou.)	Labor Force Participation Rate	# Employed (thou.)	# Unemployed (thou.)	Unemployment Rate
February 2018	256,934	161,764	63.0%	155,174	6,590	4.1%
November 2021	262,029	162,052	61.8%	155,175	6,877	4.2%

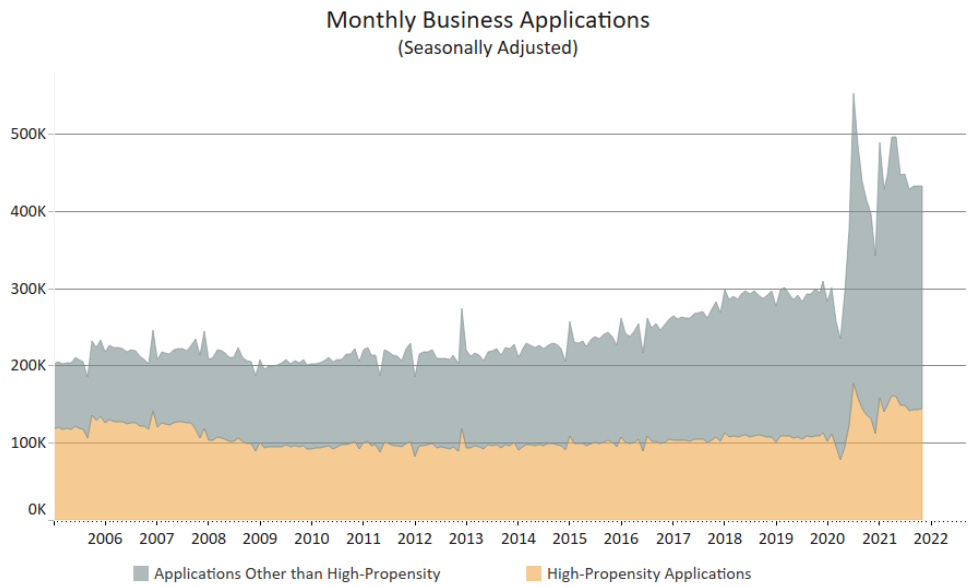
Figure 22: US Employment & Unemployment Levels



The issue comes in the form of the competition for employees. Consider Figure 23 (copied from https://www.census.gov/ecom/bfs/index.html). This chart highlights the number of new business entities that have been formed as a result of businesses that were operating during 1Q2020 laying off employees, and determining how they would weather the crisis. In other words, the peak of new business licenses has been the result of employees either being laid off, or deciding to become "the master of their own destinies". Facetiousness aside, one could characterize the drivers behind the trend as a split between both a need to survive and a liberal dose of peer pressure during 2020 & 2021.

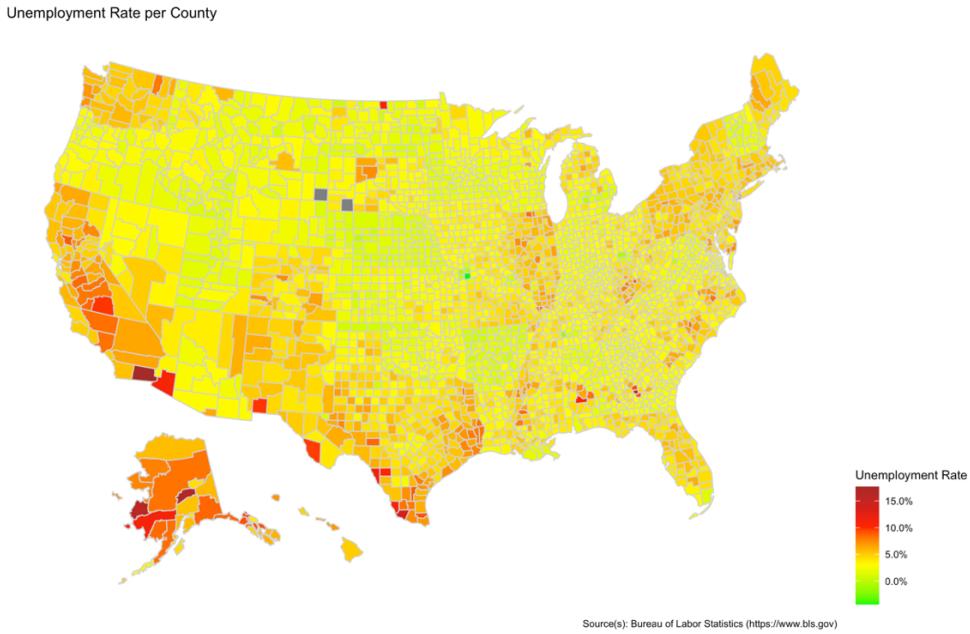
Consider that there are now an additional ~5M businesses competing for those workers; the additional competition, along with the churn of employees transforming into entrepreneurs, current employment levels (see Figure 24), and the well-publicized trends of employer incentives and inflation are a difficult combination of conditions to manage. We previously stated that we expect 25%-35% of these businesses to fail by YE2022. ***We further expect that the vast majority of these businesses will cease operations over the next three to five years (likely by YE2026), with their entrepreneur founders returning to the workforce as employees once economic conditions stabilize***.

Figure 23: US Monthly New Business Applications and High-Propensity Business Applications



Source: https://www.census.gov/econ/bfs/index.html

Figure 24: US Unemployment Rate per County



Other Commentary

- "The labor market is stronger than the low 210,000 jobs that were added in November indicates. Job gains dropped from 546,000 in October, with most of the reduced hiring taking place in the service sector, such as restaurants. This is likely the result of the pickup in Covid-19 cases that occurred in November as the weather turned colder in parts of the country, and people spent more time inside." (https://www.kiplinger.com/economic-forecasts/jobs; Dec. 3, 2021)
- "While talk of the "Great Resignation" may leave the impression that employment is surprisingly low, that is not the case. Since last December, the economy has added an average of 555,000 jobs per month, about the monthly pace expected by the Survey of Professional Forecasters in forecasts published earlier this year. This is the result of two offsetting factors: The demand for labor increased much more rapidly than most people expected, as evidenced by an estimated 11 million job openings in November, but at the same time the supply of labor has disappointed, as evidenced by the continued low level of labor force participation. Together, these developments have contributed to faster nominal wage growth, with nominal wages well above their pre-pandemic trends—although this increase has been lost to higher inflation." (See https://www.piie.com/blogs/realtime-economic-issues-watch/us-met-forecasts-job-growth-2021-amid-unexpected-high-labor; Dec. 3, 2021)
- "Total employment is projected to grow 0.7 percent annually from 2020 to 2030.4 Because of a low employment level in 2020, the projected 10-year employment growth is faster than that which would be expected in a period starting with a full-employment year. Service-providing sectors are expected to account for most of the jobs added from 2020 to 2030." (Per https://www.bls.gov/opub/mlr/2021/article/projections-overview-and-highlights-2020-30.htm; Oct. 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.

For the past 18 months or so, this rate has been "effectively zero". Recent news[36], however, indicates that the FOMC has reconsidered their staunch stance on holding rates to that historic level through 2022 in the face of strong household savings[37], inflation[38], and growing jobs[39]. The Omicron variant of the COVID-19 virus, though, is the wild card as to whether this is the correct position to take: the new virus' high rate of transmission and somewhat milder symptoms has resulted in the world watching it go from original identification in South Africa during November 2021 to being the fastest growing strain in the world in less than a month. International travel restrictions have been reimplemented globally in the interim in an effort to control the virus.

Despite these issues, current thinking is that increases in the overnight lending rate will be pushed forward at least twice during 2022, and possibly three times. The change in position of the FOMC is shown below in Figure 25 and Figure 26; therein, we see the attitude in September was that there was a possibility of one rate increase during all of 2022. More recently, the belief is, again, two or three rate increases may be warranted, with rates reaching 1.0% during 2023.

We believe that the ability to continue to control the COVID virus and its variants are the lynchpin to the exact decisions made by the FOMC, but the current level of household savings have fueled a fire (in the form of inflation and labor force non-participation) that cannot be ignored. It seems all-but-certain that ***the FOMC will end its financial support of the markets during 1Q2022, leading immediately to its first rate increase***. A second increase could come as soon as three to four months thereafter, with a third following in 4Q2022 only if COVID is truly held at bay. International factors, however, will also play into these decisions since producer and consumer supply chains are extremely weak at this time, and overall economic strength in the US is contingent on the recovery of other nations. Finally, we are concerned about whether rate hikes occurring with the expected tepid rate will actually be able to control the inflation that has been ignited, and might hope for the slim possibility of more substantial rate increases (50 bp, or possibly a full 100 bp) being taken during 2022 in order to reassert some control over current conditions.

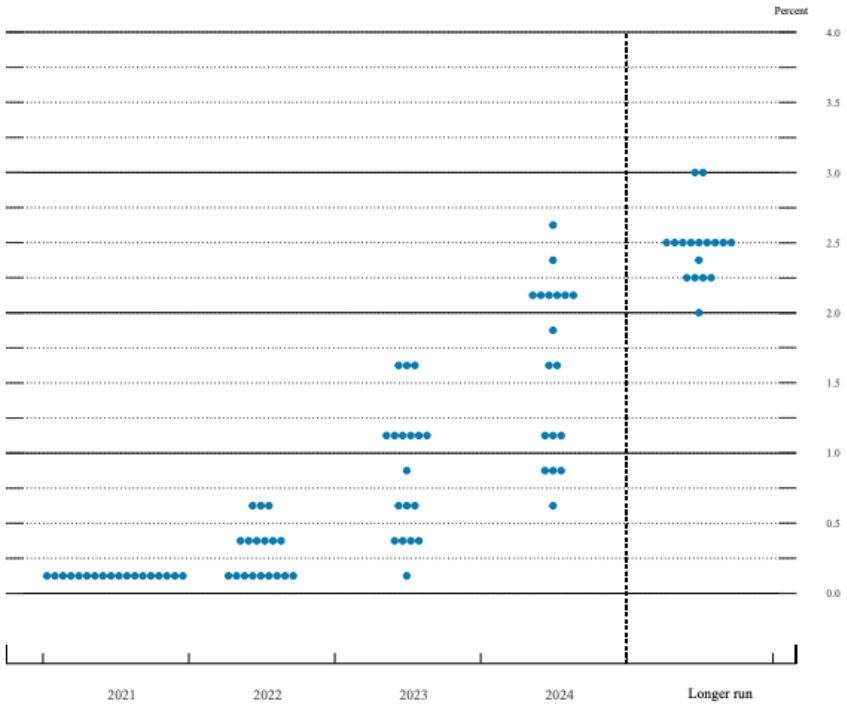
[36] See, e.g., https://www.piie.com/blogs/realtime-economic-issues-watch/us-met-forecasts-job-growth-2021-amid-unexpected-high-labor; https://www.cnbc.com/2021/12/14/the-federal-reserve-is-expected-to-take-a-very-big-step-toward-its-first-rate-hike.html; https://www.wsj.com/articles/fed-officials-project-three-rate-rises-next-year-and-accelerate-wind-down-of-stimulus-11639594785; and https://www.cnn.com/2021/12/15/economy/federal-reserve-powell-inflation-taper/index.html

[37] https://www.wsj.com/articles/vast-household-wealth-could-be-a-factor-behind-u-s-labor-shortage-11639926006

[38] https://www.bloomberg.com/news/articles/2021-12-09/inflation-near-40-year-high-shocks-americans-spooks-washington; https://www.wsj.com/articles/high-inflation-falling-unemployment-prompted-powells-fed-pivot-11638786601; and https://www.stlouisfed.org/publications/regional-economist/fourth-quarter-2021/inflation-wild-card-us-gdp-outlook-2022

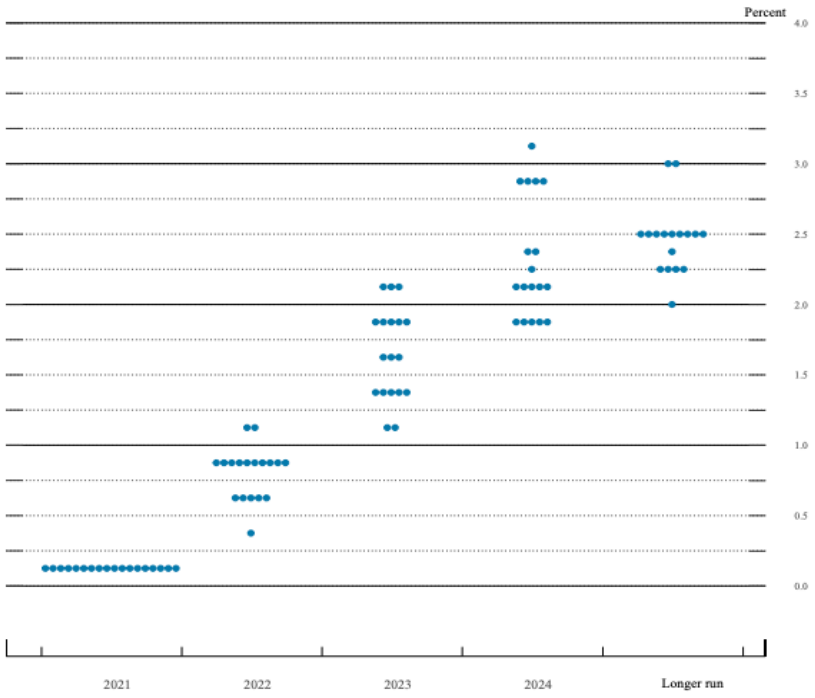
[39] See https://www.wsj.com/articles/november-jobs-report-unemployment-rate-2021-11638480609

Figure 25: FOMC "Dot Plot" from September 2021 Board of Governors' Meeting



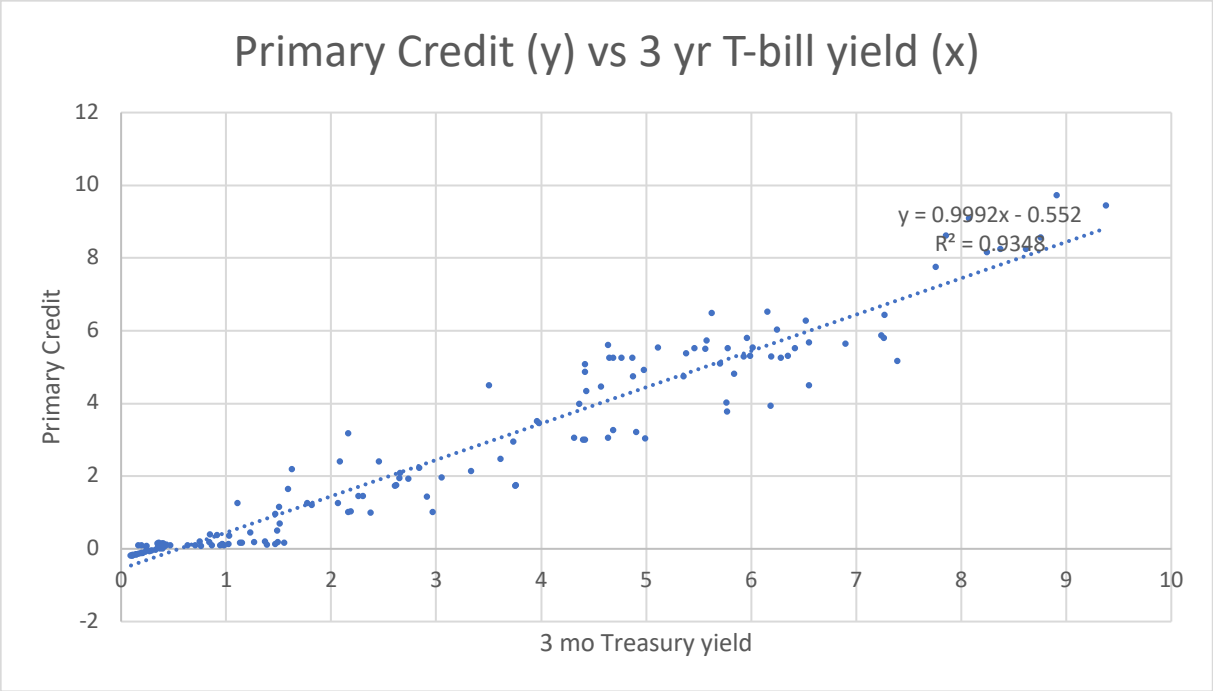
Source: https://www.federalreserve.gov/monetarypolicy/files/fomcprojtabl20210922.pdf

Figure 26: FOMC "Dot Plot" from December 2021 Board of Governors' Meeting



Source: https://www.federalreserve.gov/monetarypolicy/files/fomcprojtabl20211215.pdf

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



Source: Authors' calculation

Other Commentary

- "Fed officials now predict the central bank's benchmark interest rate to rise to 0.9% in 2022, up from the 0.3% expectation from September, signaling additional interest hikes. … To investors and market watchers, this suggests there will be three rate hikes next year. … at this point, potential economic fallout from the spread of the Omicron variant hasn't yet changed the Fed's view." (https://www.cnn.com/2021/12/15/economy/federal-reserve-powell-inflation-taper/index.html; Dec. 15, 2021)
- "Most central bank officials, in projections released Wednesday at the conclusion of their two-day meeting, penciled in at least three quarter-percentage-point rate increases next year. In September, around half of those officials thought rate increases wouldn't be warranted until 2023. … 'There's a real risk now, I believe, that inflation may be more persistent and…the risk of higher inflation becoming entrenched has increased,' said Mr. Powell …" (See https://www.wsj.com/articles/fed-officials-project-three-rate-rises-next-year-and-accelerate-wind-down-of-stimulus-11639594785; Dec. 15, 2021)
- "Markets are anticipating the Fed will speed up the wind-down of its bond buying program, changing the end date to March from June. … That would free the central bank to start raising interest rates from zero, and Fed officials are expected to release a new forecast showing two to

three interest rate hikes in 2022 and another three to four in 2023." (https://www.cnbc.com/2021/12/14/the-federal-reserve-is-expected-to-take-a-very-big-step-toward-its-first-rate-hike.html; Dec. 14, 2021)

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

Analysis

Figure 27 shows how the yield curve for T-bill's has evolved over the past two years. At the end of 2019, there was little benefit to longer term investments as the yield curve was close to flat as it recovered from inversion. By mid-2020 the FOMC had slashed overnight lending rates, turning short-term yields to zero. Longer term yields were driven based on expectations of the housing market, and trading equities. At the end of 2020, general civil unrest, concerns about evictions, and the possibility of a vaccine for COVID were dominating the thoughts of traders, with the result being a slight buoying of rates on the whole. Through 2021, rates appear to have peaked mid-year, as concerns about the Fed' pulling back on its supplements to the market, and inflation eroding returns became evident.

Inflation (for all items) was at 0.1% in May 2020, and has risen approximately linearly from 1.7% in February 2021 to 6.8% in November 2021. We mentioned in previous reports that, given the FOMC's intention to manage inflation to a "long term view", that inflation would cross the 5% mark during 2021.[40] While Chairman Powell has now opened the door to dropping financial support of markets and increasing rates[41], there is significant concern about the amount of liquidity that exists within the financial system, and its impact on housing prices, bond rates, and other factors.

We have previously described our interpretation of the steep slope of the yield curve as the expression by investors that (a) the strength of the overall US economy is improving with the distribution of the COVID-19 vaccines, and (b) they expect that the economy will experience inflation due to (1) global supply chain issues (both in raw materials & transportation), (2) domestic labor issues, and (3) President Biden's stimulus plans. However, we are now concerned (a) whether Mr. Powell and the FOMC will be able to control the record-breaking inflation that the nation is currently experiencing, and (b) which planks of Mr. Biden's "Build Back Better" plans will eventually emerge. A certain amount of government spending will be key to creating productivity along with a useful velocity of money within the system. However, without both of these last two points being satisfied, we are concerned about significant drops in real yields of short- and mid-term bonds due to overwhelming inflationary forces.

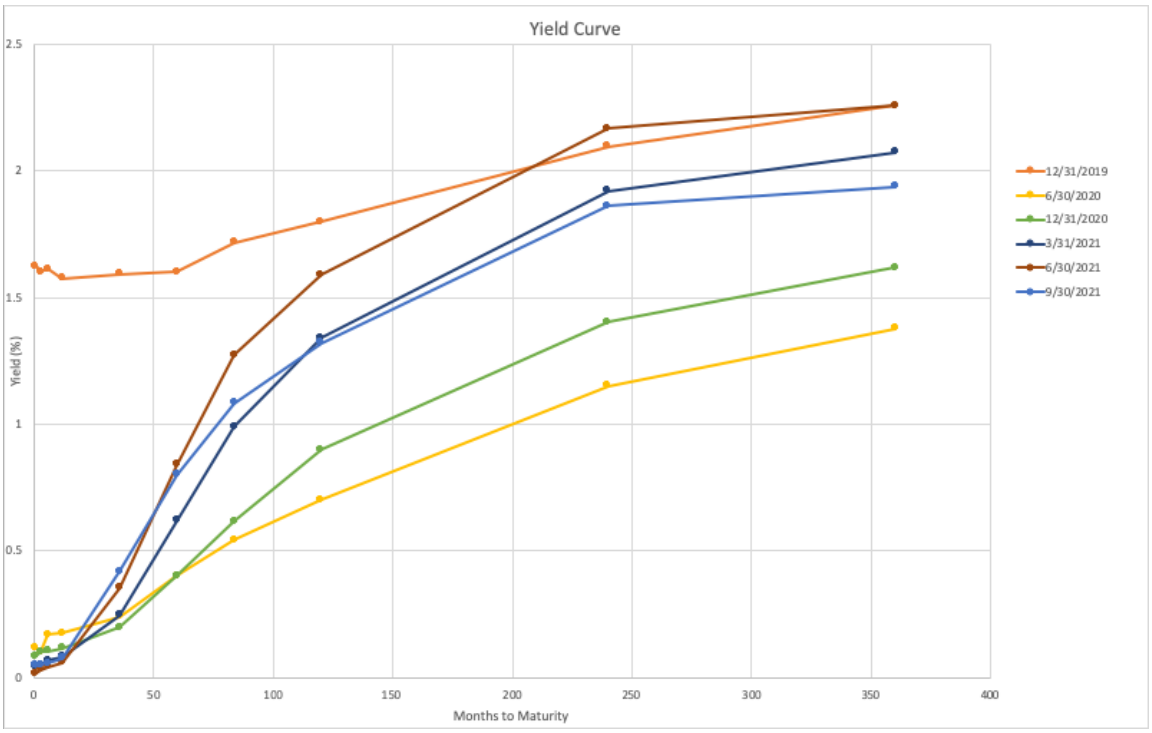
[40] See https://www.wsj.com/articles/why-investors-should-care-about-the-powell-pivot-11639474493?mod=series_inflation for a prescient article on the co-mingling of politics and monetary policy.

[41] https://www.cnbc.com/2021/12/14/the-federal-reserve-is-expected-to-take-a-very-big-step-toward-its-first-rate-hike.html

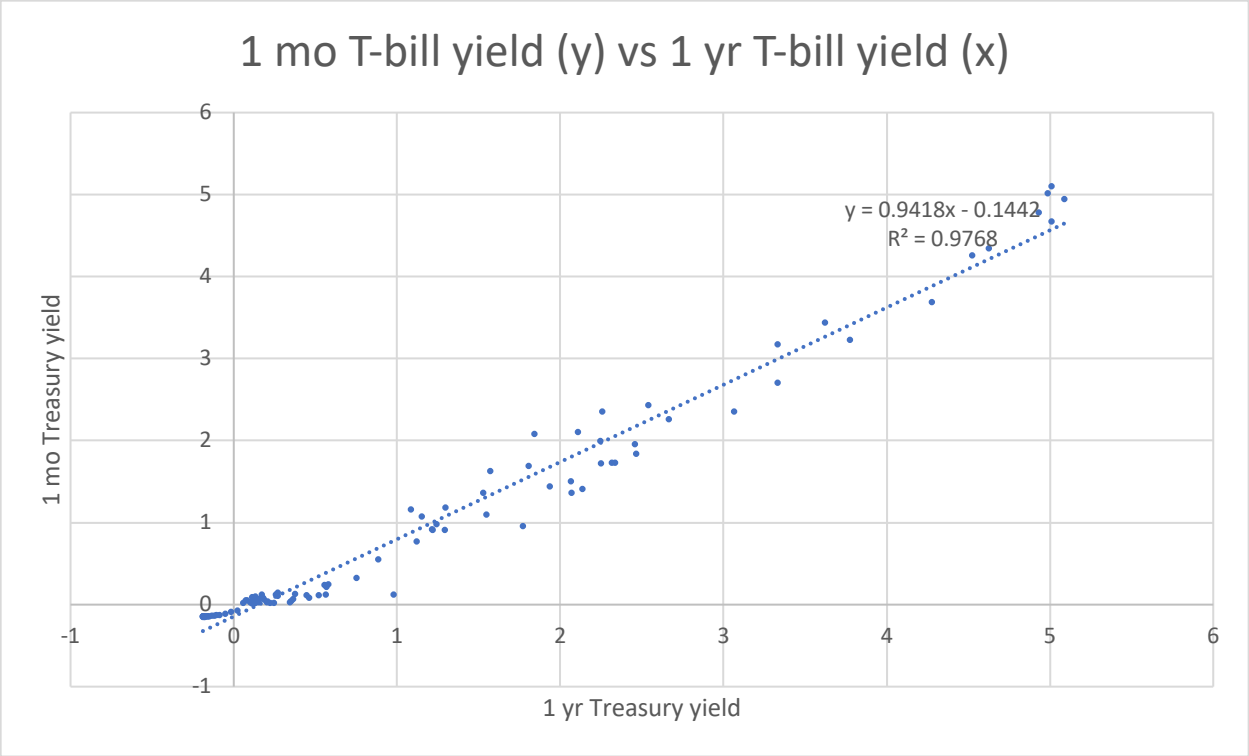
Other Commentary

- "The rise in [Treasury bond] yields came as stocks rallied on the White House's announcement that President Joe Biden would nominate Federal Reserve Chairman Jerome Powell to a second four-year term." (see https://www.marketwatch.com/story/treasury-yields-climb-to-start-thanksgiving-weeks-holiday-shortened-trade-11637585015; Nov. 22, 2021)
- "For years, many have held out hope that the 10-year U.S. Treasury yield will head back toward 2%, … And while the consensus forecast is now calling for that to occur in 2022, a smaller number of analysts are warning of the opposite: that the widely followed yield will generally continue to drift lower, as it has for each of the past three or four decades." (https://www.marketwatch.com/story/the-lower-for-longer-camp-on-u-s-bond-yields-is-standing-firmly-by-its-views-heading-into-2022-11637254906; Nov. 18, 2021)
- "Market experts see Treasury yields rising over the coming year, as the economy recovers and the Federal Reserve reduces stimulus, according to a new Bankrate survey. The Third-Quarter Market Mavens survey shows that analysts expect the benchmark 10-year Treasury rate to climb to 1.86 percent. That's up more than 50 basis points from where it stood at the end of the survey period." (https://www.bankrate.com/investing/market-mavens-survey-bonds-october-2021/; Oct. 5, 2021)

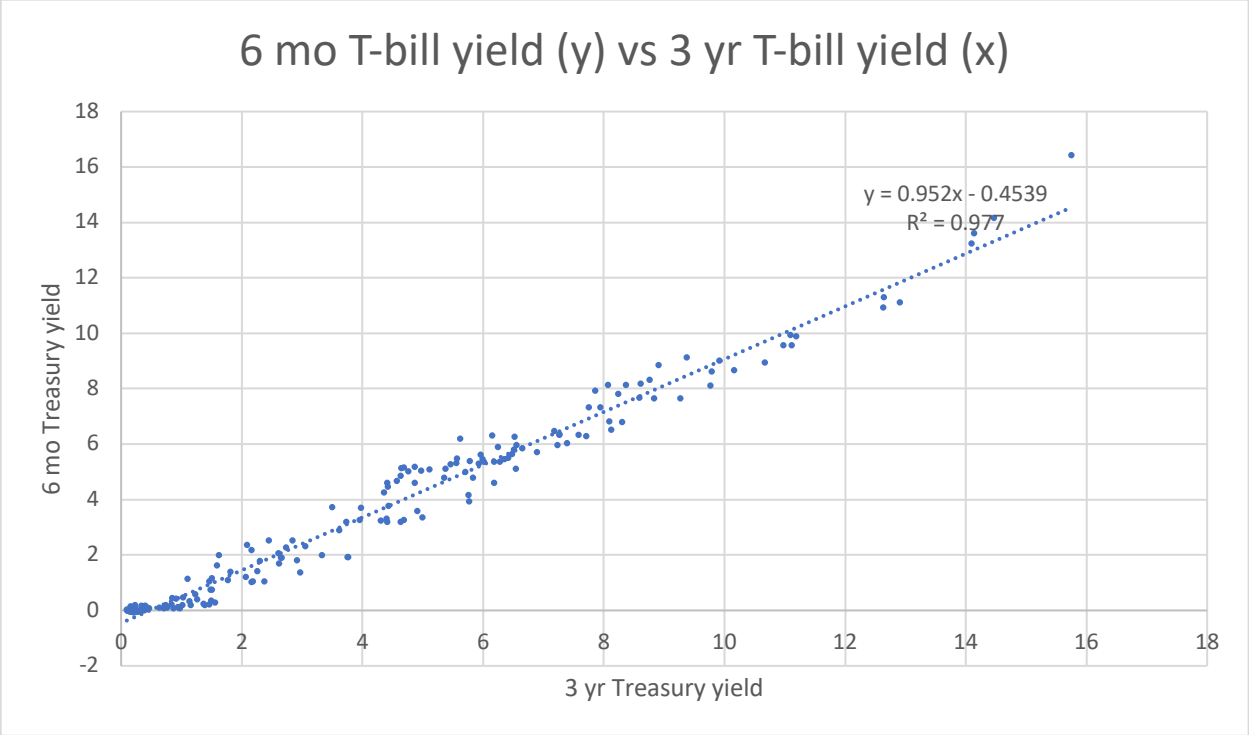
Figure 27: Treasury Yield Curves based on maturity duration



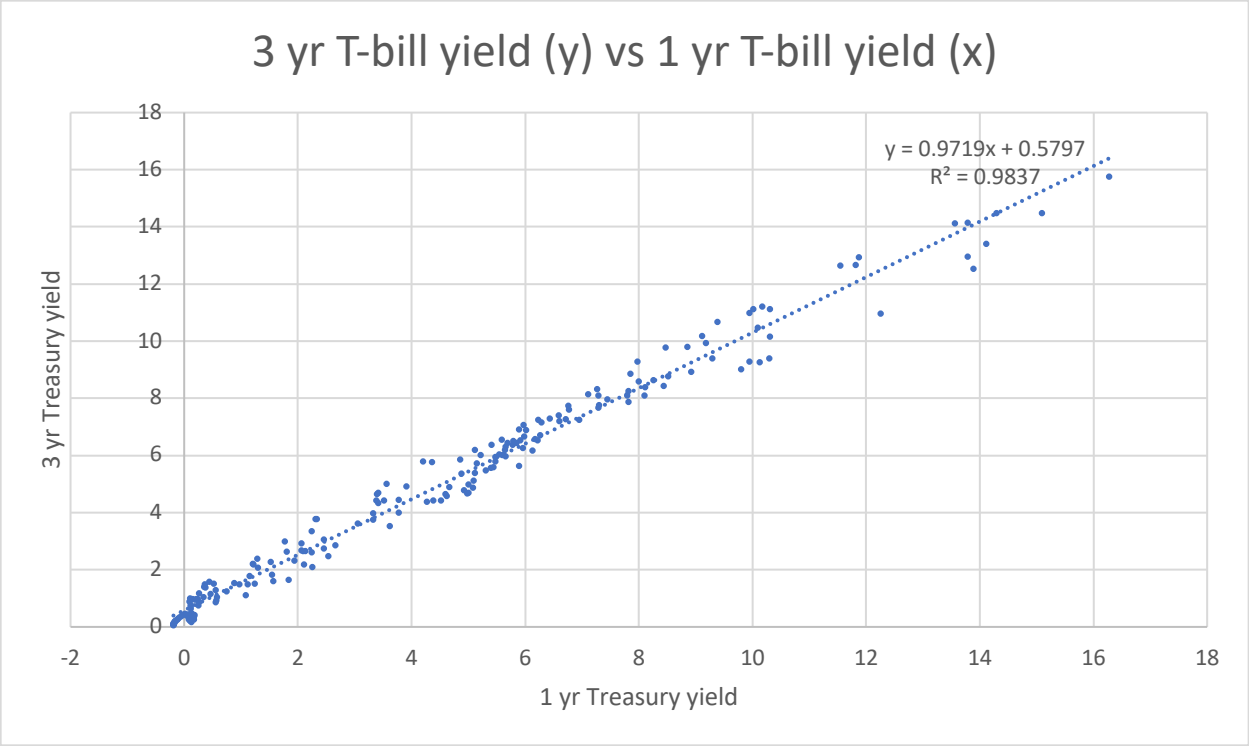
Source: US Treasury



Source: Authors' calculation



Source: Authors' calculation



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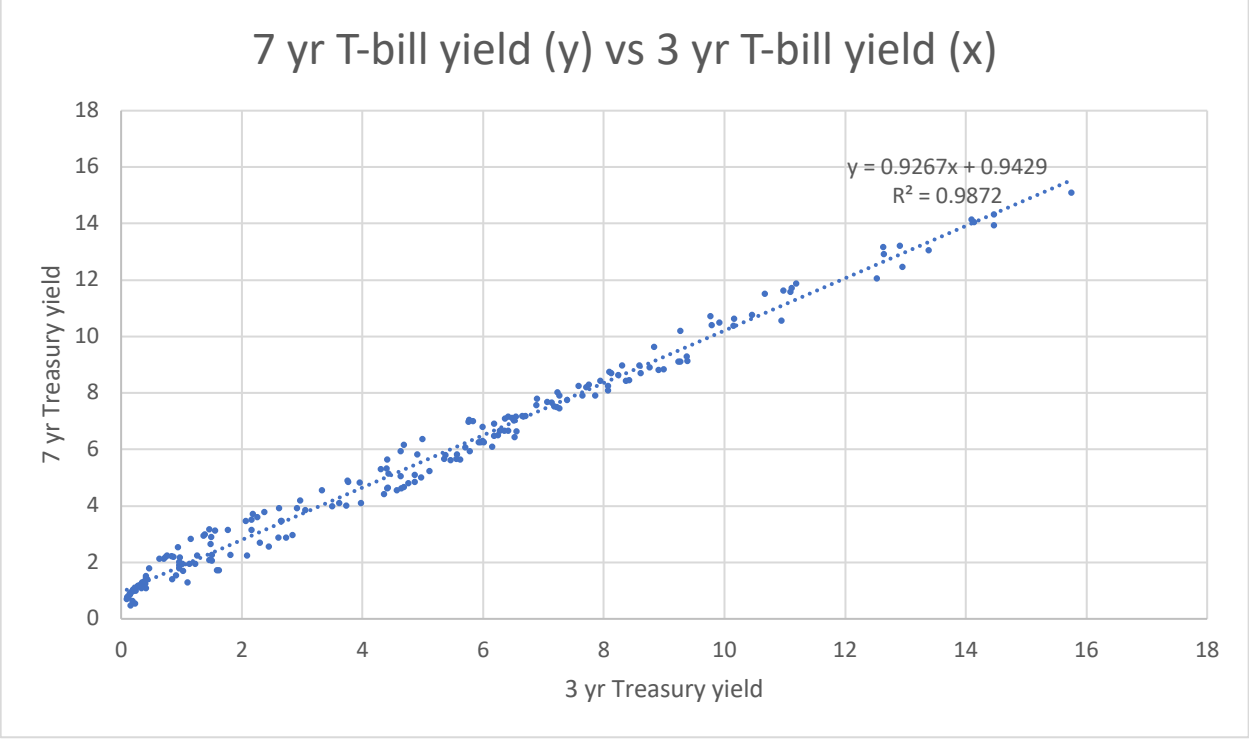

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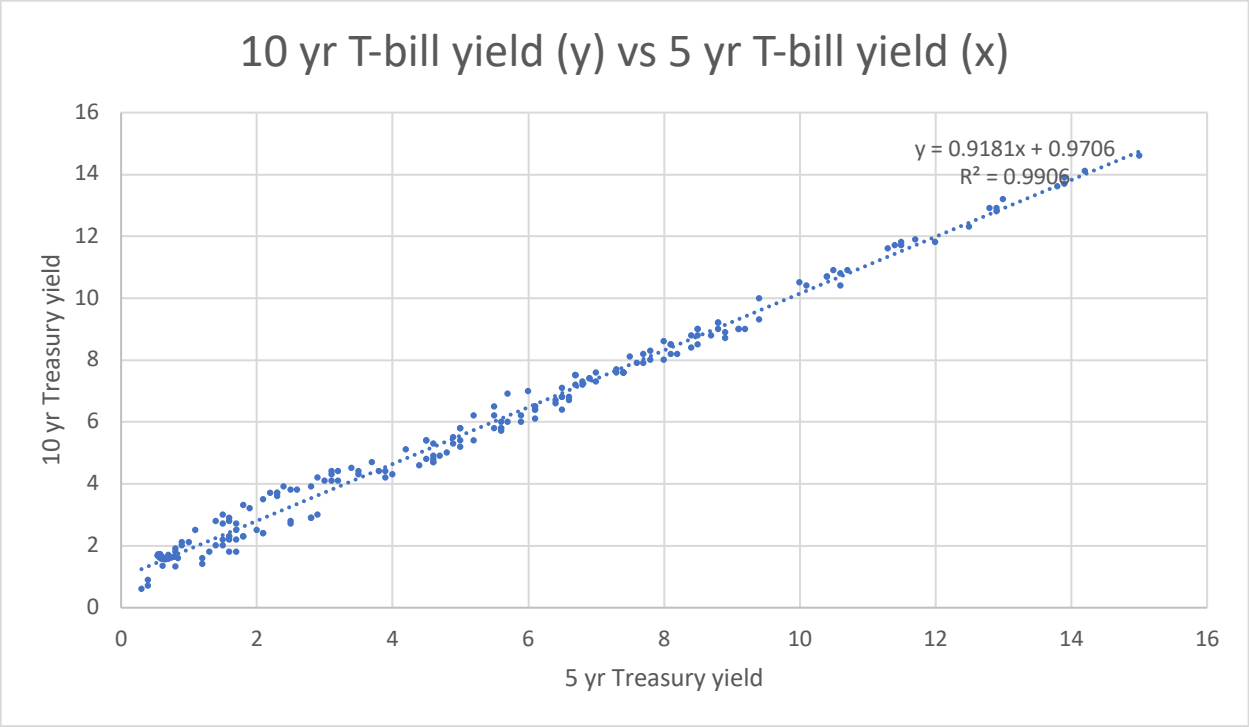

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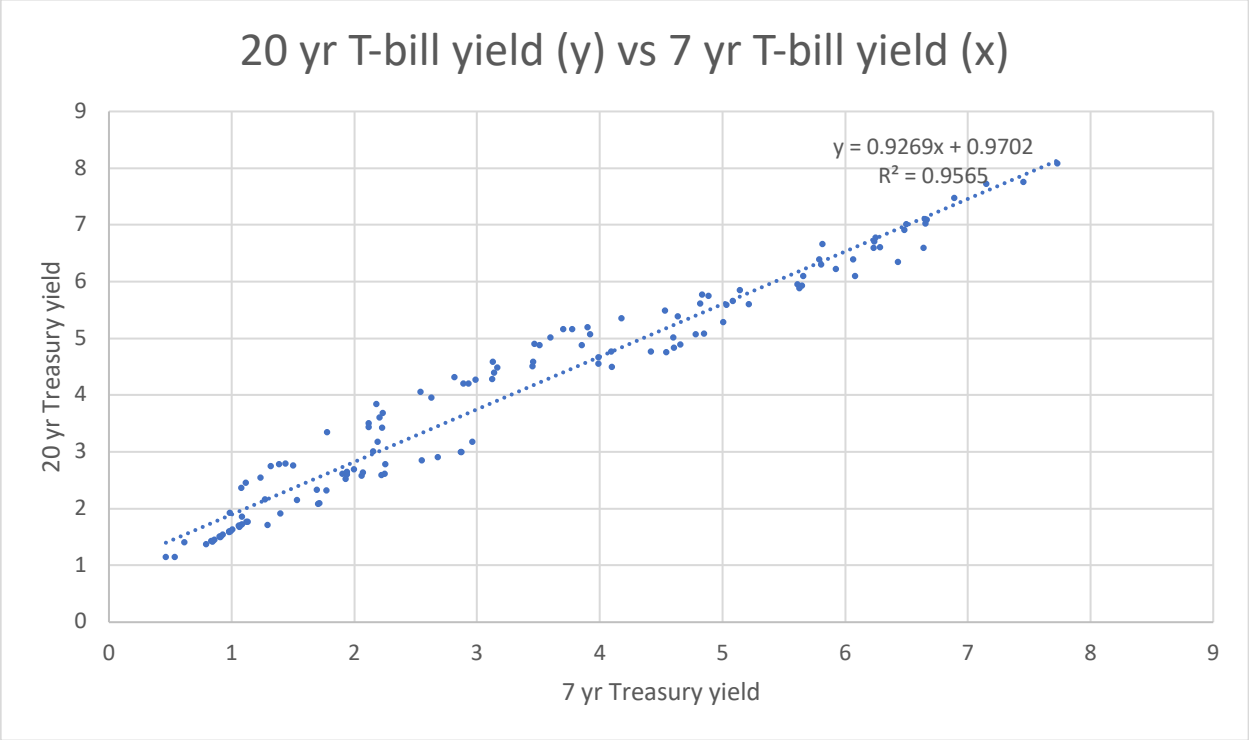
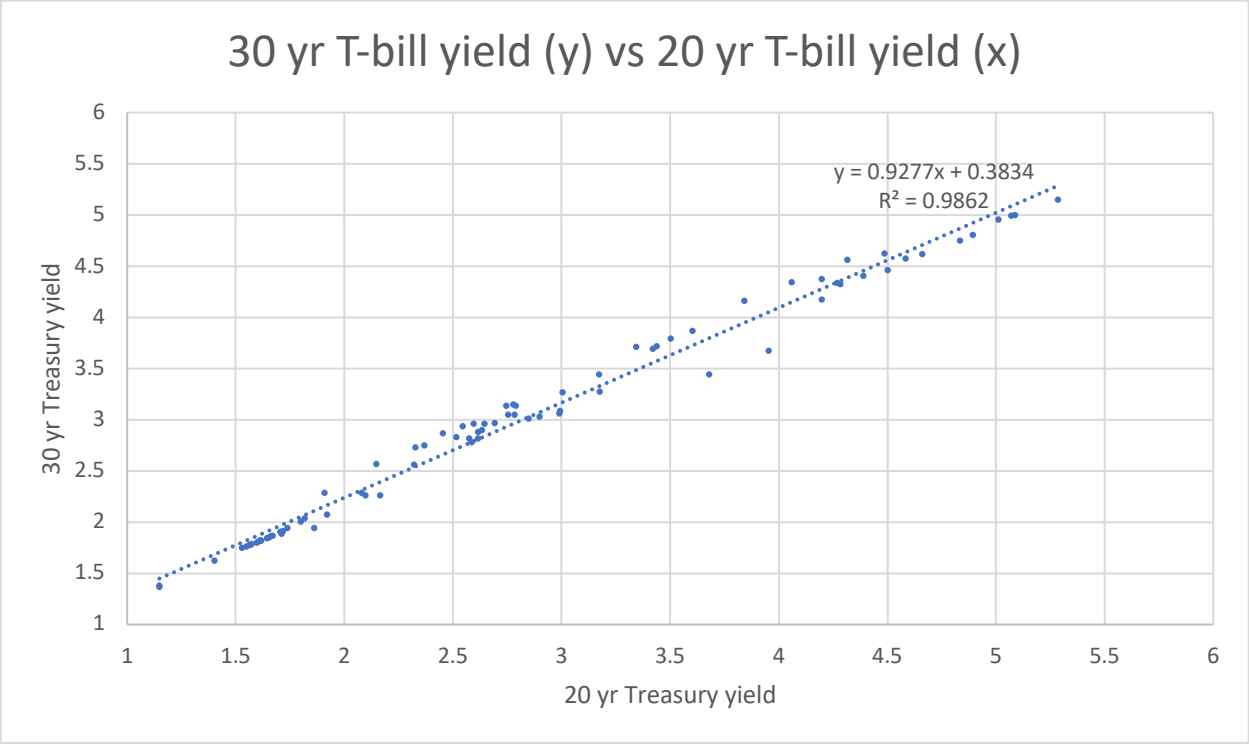


Source: Authors' calculation



Source: Authors' calculation

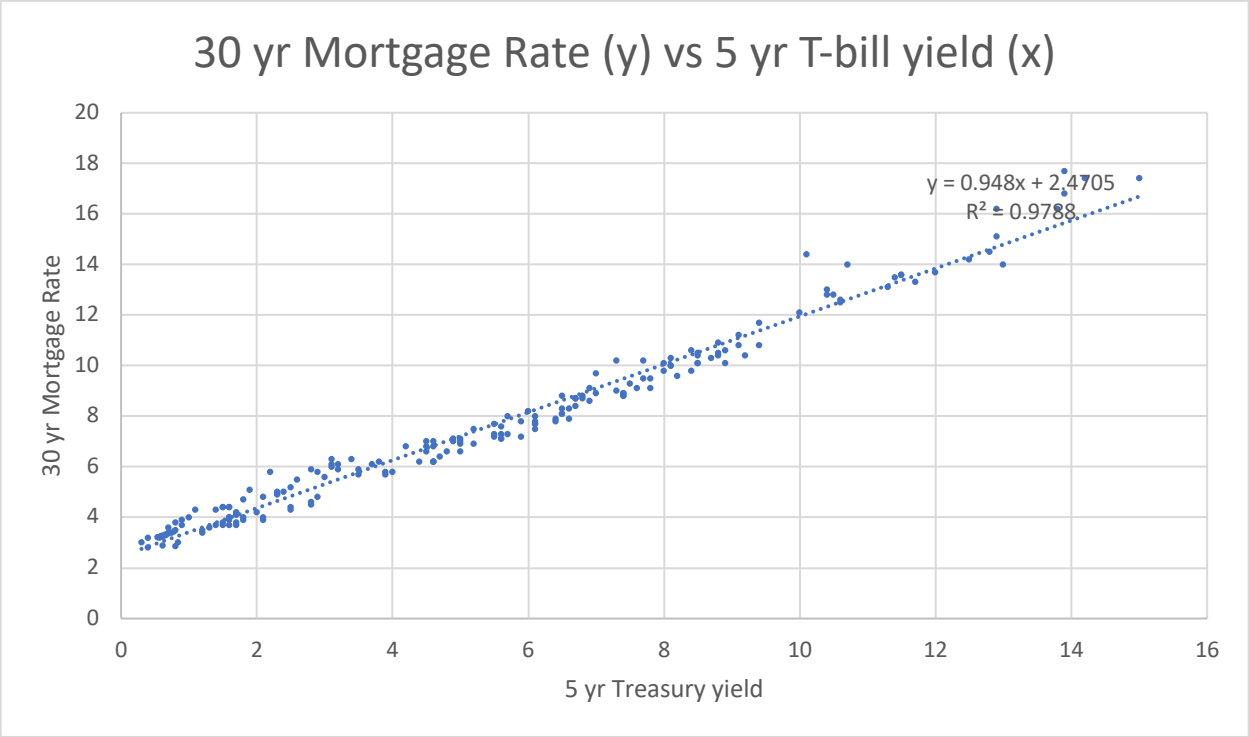
30-year Mortgage Rate

Analysis

30-year fixed rate mortgages have been driven by mid-range (i.e., 7- to 10-year) treasury note yields, which are, in turn, affected by overnight lending rates. Mortgage rates have been hovering around 3% for over a year due to the FOMC holding overnight lending rates to "near zero". However, as of December 15, Chairman Powell has opened the door[42] for rapidly tapering the Fed's asset-purchase program (which has been used to help supplement the market and enhance its perceived stability and confidence for over 18 months); the natural follow-on to this tapering is lending rate increases.

The impression that Chairman Powell left during his press conference is that multiple 25 bp rate increases are all but a certainty during 2022 and 2023. (The only currently foreseeable event that might mitigate that outcome would be if a new biological crisis, i.e., yet another new COVID variant, emerges in the interim.) We would expect that these rate increases would transparently affect mortgages, meaning that mortgage rates would almost immediately reflect quantum increases along with overnight lending rates. As a result, ***we could envision mortgage rates as high as 4.0% to 4.5% by YE2022, and 5.0% by YE2023.***

[42] See https://www.cnbc.com/2021/12/15/follow-along-to-real-time-updates-of-the-big-fed-decision-and-powells-press-conference.html and https://www.forbes.com/advisor/investing/fomc-meeting-federal-reserve/



Source: Authors' calculation

Other Commentary

- "Dr. Lawrence Yun, National Association of Realtors (NAR) chief economist, forecasts the 30-year fixed mortgage rate to increase to 3.5% by the end of 2022 as the Fed raises interest rates to control inflation. For its part, Realtor.com predicts an average mortgage rate of 3.3% throughout the year, hitting 3.6% by end of year." (https://www.marketwatch.com/picks/if-the-market-is-cooling-down-its-only-by-a-few-degrees-leading-economists-and-analysts-on-what-to-look-for-in-the-housing-market-in-2022-01639758149; Dec. 20, 2021)
- "The prospect of higher interest rates cooling the hot housing market also looms. Higher borrowing costs would reduce buyers' ability to keep up with the price hikes that builders have used to offset their own increased costs. Most Fed officials have penciled in at least three quarter-percentage point rate increases next year. … [John Burns Real Estate Consulting] expects home construction to accelerate in 2022 and strong growth in major remodeling jobs due to the record amount of home equity available to pay for new kitchens and additions." (see https://www.wsj.com/articles/sky-high-lumber-prices-are-back-11639842879; Dec. 19, 2021)
- "One offset to that may be housing costs. Bloomberg Economics' David Wilcox says they could be rising at a 6% to 7% pace by next summer, about double the rate in the years before the pandemic." (see https://www.bloomberg.com/news/articles/2021-12-09/inflation-near-40-year-high-shocks-americans-spooks-washington; Dec. 9, 2021)

- "A new wave of COVID cases and possible variants threatens economic progress, putting downward pressure on mortgage interest rates, says Nicole Bachaud, a Zillow economist." (https://time.com/nextadvisor/mortgages/monthly-mortgage-forecast-and-predictions/; Dec. 2, 2021)

Source: Authors' 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.

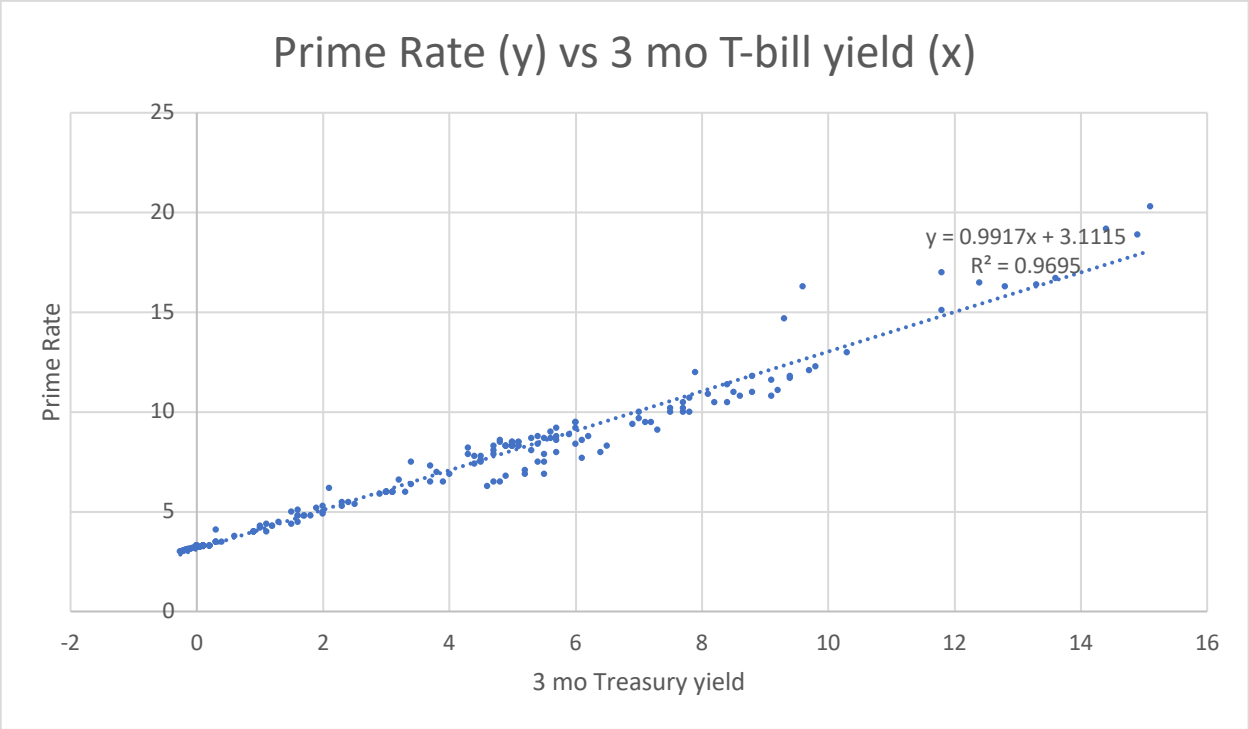
Capitalytics' quantitative models see AAA rates slightly declining over the next several years (through 2024) from 2.76% in 1Q2022 to 2.67% by the end of 2023. We do not believe that this is a likely outcome, instead believing that BAA yields will continue to track with AAA yields, with approximately 25 to 35 bp additional return to compensate for the risk associated with the BAA instruments. We anticipate that AAA yields will hover around 2.75% between YE2021 and Y#2023, with (again) BAA yields slightly 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%, with modifications based on overnight rate increases. In other words, as the FOMC increases overnight lending rates, the Prime Rate will be comparably affected. As such, ***we feel that it is likely that the Prime Rate will peak between 4.0% and 4.5% by YE2022, and it could hit 5% by YE2023.***

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



Source: Authors' calculation

US Average Retail Gasoline Price

Analysis

Retail gasoline prices hit seven-year highs this past summer due to the price of West Texas Intermediate (WTI) crude oil prices; WTI has dropped to around $70 per barrel as of this writing and Brent crude oil is at $73 per barrel[43]. While many were concerned about slowing supplies and high demand for petroleum and natural gas, the winter season has been unexpectedly mild. Further, with the current spread of the Omicron variant, many are being urged not to travel or gather for holiday events, resulting in significantly lower than expected fuel prices[44].

The national average for gasoline has topped $3.30/gallon as of this writing[45]. The EIA is still forecasting that "… retail gasoline prices will average $3.13/gal in December before falling to $3.01/gal in January and $2.88/gal on average in 2022."[46] Further, the price of natural gas is expected to fall similarly.

[43] See https://oilprice.com/oil-price-charts/
[44] https://oilprice.com/Energy/Oil-Prices/Oil-Prices-Crash-On-Renewed-Omicron-Panic.html
[45] See https://gasprices.aaa.com/
[46] https://www.eia.gov/outlooks/steo/

Given these issues, we are still concerned about the impact of COVID on the petroleum distribution network in the US. While fuel prices seem to be likely to steady due to the mild winter season, any interruption of tanker drivers will have a significant effect on local supplies.

Other Commentary

- "Oil and gasoline futures are trading lower in tandem with stock markets. If that trend holds, the decreases should filter through to the retail level in coming days. However, we look for gas prices to stay elevated, with the national average likely holding at or above $3 per gallon this winter. If that is the case, a run to near $4 could happen in the spring, when demand usually revs up and prices typically rise." (https://www.kiplinger.com/economic-forecasts/energy; Dec. 17, 2021)
- "While Bloomberg Economics predicts inflation close to 7% for another few months, there's widespread agreement that it will come down at some point next year. … Energy markets are already signaling some relief, with oil down about 15% since late October, presaging lower fuel and transportation costs in 2022." (see https://www.bloomberg.com/news/articles/2021-12-09/inflation-near-40-year-high-shocks-americans-spooks-washington; Dec. 9, 2021)
- "We expect Brent prices will average $71/b in December and $73/b in the first quarter of 2022 (1Q22). For 2022 as a whole, we expect that growth in production from OPEC+, of U.S. tight oil, and from other non-OPEC countries will outpace slowing growth in global oil consumption, especially in light of renewed concerns about COVID-19 variants. We expect Brent prices will remain near current levels in 2022, averaging $70/b." (https://www.eia.gov/outlooks/steo/; Dec. 2, 2021)

House and Commercial Real Estate Price Indexes

Analysis

The residential real estate market has skyrocketed for a multitude of reasons over the past 24 months; record low interest rates, questions about job satisfaction, and a desire to be much more self-sufficient within one's home (or transitioning from a rented property to an owned property) has fueled demand for upwardly accessible single-family-homes; in many markets, inventory has been all but exhausted.

Furthermore, new home construction is gradually slowing nationwide. While builders pass on increased material costs to buyers, the coordinated availability of skilled tradesmen (that have also been impacted

by the COVID pandemic) has slowed development. Slowed production of finished homes result in increased competition for that product, and increased prices.[47]

We expect for this trend of very slowly cooling markets to gradually continue (i.e., price increases not as dramatic as in 2020 & 2021) until 2Q2022. Secondary homes will likely also return to the market as values soften in vacation or "retreat" locales that weren't designed to support full-time day-to-day living. Also, as buyers re-adapt to an appropriate level of social lifestyle, a significant number will put their recently acquired "dream home" back on the market in order to match the lifestyle that they can afford. It also would not be surprising for the emergence of a new trend with landlords (that want to exit that industry) presenting "rent-to-own" financing options to eligible tenants where possible.

A final note: ***lumber prices have again started rising significantly over the past few weeks***; on Dec. 17, lumber futures crested over $1000.00 per thousand board-feet.[48] While this price isn't quite where prices were last spring (over $1700 per thousand board-feet), it is a noteworthy resurgence. Experts expect that, with the mild season, demand is heightened. Additionally, unexpected flooding in Canada have cut off some sawmills from their supplies of raw materials and distribution, i.e., impacting end consumers supplies.[49] And, this time of year typically sees prices increases going into the spring construction season. As a result, this trend could have a (upward) bearing on new home prices and renovation projects for the 2022 season.

At this point, ***we expect commercial real estate investors to be quickly committing to (and executing) a strategy for their assets, with most likely directions being to upgrade, repurpose, or sell assets***. Investors have been watching the climate for the past 18 months in order to determine the direction that tenants will take in the future, and use that information to guide how they will continue to survive. At this stage, most that have not exited the industry via divestiture have already determined if their best strategic course is to continue to compete for tenants, or adapt their investments to new markets and clients. In terms of "adaptation of assets", as residential home prices increase along with mortgage borrowing rates, we would not be surprised to find commercial real estate investors investigate converting traditional office buildings into novel residential and/or warehouse/distribution offerings[50].

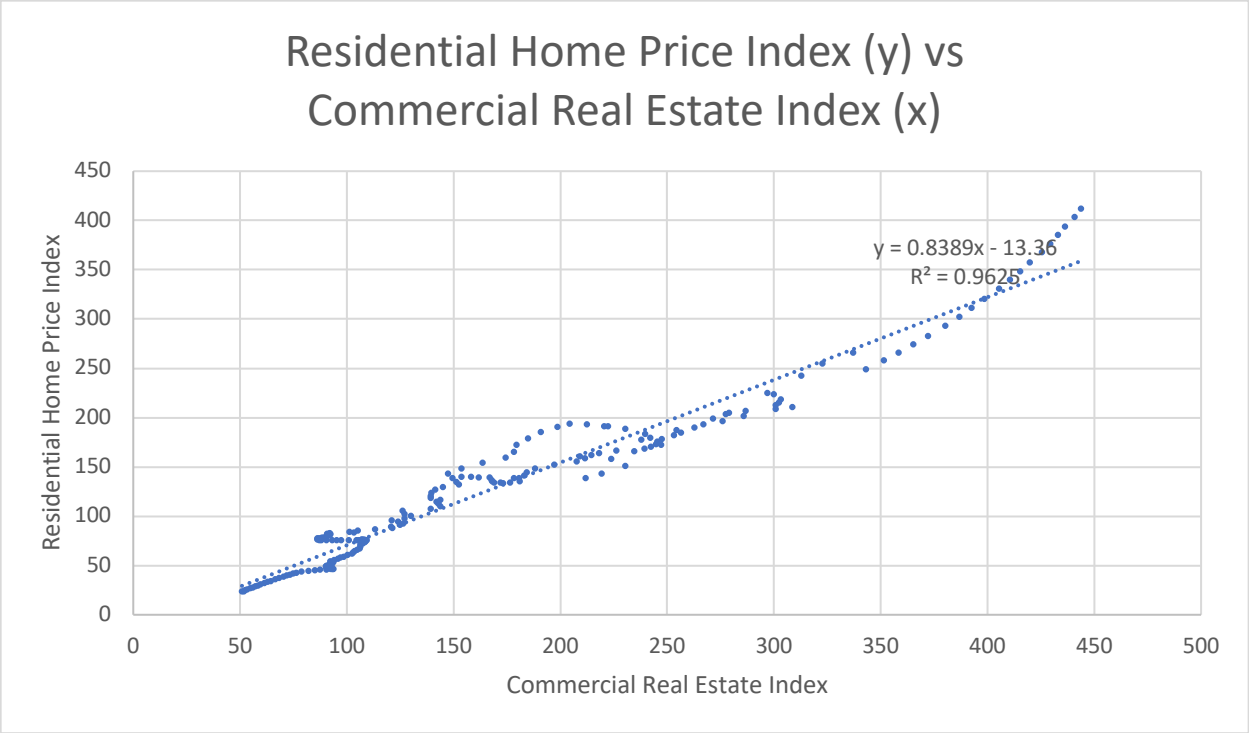
The accompanying chart shows the correlation between the residential and commercial real estate indexes.

[47] See, e.g., https://tradingeconomics.com/united-states/building-permits

[48] https://www.wsj.com/articles/sky-high-lumber-prices-are-back-11639842879

[49] https://markets.businessinsider.com/news/commodities/lumber-prices-rally-supply-shortages-commodities-markets-demand-housing-2021-12

[50] See, e.g., https://commercialobserver.com/2020/10/adaptive-reuse-is-the-future-of-commercial-real-estate/; https://mountainx.com/news/repurposing-vacant-commercial-property-could-help-combat-sprawl-create-affordable-housing/ ; https://www.independent.com/2021/11/08/adaptive-reuse-in-commercial-real-estate/ ; and https://www.nar.realtor/on-common-ground/repurposed-buildings



Source: Authors' calculation

Other Commentary

- "Though lumber is traded in esoteric markets, two-by-fours became a proxy in the debate over whether inflation would fade with distance from the lockdown. In June, Federal Reserve Chairman Jerome Powell pointed to lumber prices plunging from a shocking peak as evidence that surging costs would subside. On Wednesday, he said the central bank would hasten the wind down of its bond-buying program, setting the stage for a series of interest-rate hikes meant to tame inflation." (https://www.wsj.com/articles/sky-high-lumber-prices-are-back-11639842879; Dec. 19, 2021)

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

Analysis

The Dow Jones U.S. Total Market Index (DWCF) is a market-capitalization-weighted index that represents the top 95% of the U.S. stock market based on market capitalization.

Per Table 2, after President Biden assumed office, the index grew an average of 21.4 points per day. Recall that during this period, the US had generally been "locked down" for almost a full year at this

point (except for "essential services"), but life had been able to continue for many: the Federal Reserve made borrowing money very easy, and provided many supplements to lower income individuals; and trading was apprehensive, but generally comfortable, with the incoming Democratic administration and Congress. The markets were very concerned about the costs of President Biden's "Build Back Better" plan, as well as the "Delta" variant of the COVID virus. There was also a growing concern about how much more money could be squeezed from technology stocks that had flourished during the previous year. During 2Q2021, the index grew by an average of 52.4 points per day, reflecting the growing comfort with the new administration and its different tone; however, now attention was shifting back to the Federal Reserve, its bond yields, its quantitative easing program (that would come to an end eventually), and supply chain issues that emerged as the US distributed its vaccines while the rest of the world was struggling. Due to some harsh trading days at the end of 3Q, the gains made during the late summer and fall were completely erased, though there has been a resurgence during 4Q despite the rampant transmissiveness of the new "Omicron" COVID variant.

Table 2: Approximate Quarterly Milestones for the Dow-Jones Total Market Index

Period	Index Range[51]	Trading Days	Avg points/day
"1Q2021" (1/21/2021-3/31/2021)	40551.83 → 41602.65	49	21.4
2Q2021 (4/1/2021-6/30/2021)	41602.65 → 44904.32	63	52.4
3Q2021 (7/1/2021-9/30/2021)	44904.32 → 44705.79	65	-3.1
"4Q2021" (10/1/2021-12/21/2021)	44705.79 → 47392.45	56	48.0

We note in Table 3 that the Standard & Poor's 500 Index ("SP500") is an index of 500 very large, publicly traded companies in the U.S. This index's measures are very similar to that of the DWCF, though on a different scale.

Table 3: Approximate Quarterly Milestones for the Standard and Poor's 500 ("SP500") Index

Period	Index Range[52]	Trading Days	Avg points/day
"1Q2021" (1/21/2021-3/31/2021)	3851.85→ 3972.89	49	2.47
2Q2021 (4/1/2021-6/30/2021)	3972.89 → 4297.50	63	5.15
3Q2021 (7/1/2021-9/30/2021)	4297.50 → 4307.54	65	0.15
"4Q2021" (10/1/2021-12/21/2021)	4307.54 → 4638.61	56	5.91

We expect that major issues of the first half of 2022 (that will have a bearing on the DWCF and SP500 indexes) to revolve around the tapering of the Fed's quantitative easing program, and rising interest rates. With the recent denial of President Biden's "Build Back Better" plans, it is not clear that inflation will be managed to the degree expected by the markets, and global supply chains will likely not be strengthened given that internationally developed vaccines have not been found to be strongly effective

[51] Index values found at https://www.marketwatch.com/investing/index/dwcf

[52] Index values found at https://www.marketwatch.com/investing/index/spx

against the Omicron variant. As such, ***we think that these measures will flounder at least during 1Q2022 and the beginning of 2Q2022***.

The VIX has inched from 18.0 in 2Q2021, to 18.3 in 3Q2021, to 19.45 in 4Q2021 (to date). As compared to its levels during the previous White House administration, it is in remarkably low territory. However, we think that it (and, as a result) the markets are subject to the possibility of significant change. ***A new variant will likely not compromise the VIX if the messages are consistent, and communication is maintained***. Even supply chains being compromised do not seem to rattle current markets.

The current administration is experiencing an eroding satisfaction on various fronts, including inflation; this point will likely slightly move the VIX' needle, and hamper the other indexes. A change in US leadership could potentially cause traders to pull back slightly, given the recent light that the Vice President has occupied, and would impact the VIX. Similarly, a substantive change in policies of Middle East or Far East countries could be enough to give pause to US markets, and thereby affect the VIX.

Other Commentary

- "Stocks closed higher as investors welcomed the Fed's messages. The S&P 500 rose 1.63%, reversing earlier declines and ending the day near a record. The Dow Jones Industrial Average added 383.25 points, or 1.08%. The Nasdaq Composite Index surged 2.15%. Treasury yields rose as well." (See https://www.wsj.com/articles/fed-officials-project-three-rate-rises-next-year-and-accelerate-wind-down-of-stimulus-11639594785; Dec. 15, 2021)

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 3Q2011 and 2Q2021, inclusive.

Table 15: Regression Aggregate Errors for 3Q2011 through 2Q2021

Variable	Min Abs. Error	Average Error	Max Abs. Error
Real GDP Growth	445.08%	**	***
Nominal GDP Growth	800.26%	**	***
Real Disposable Income Growth	87.79%	2548.50%	***
Nominal Disposable Income Growth	80.05%	2377.00%	***

Inflation	0.00%	409.78%	***
Unemployment Rate	88.93%	**	***
1-month Treasury Yield	0.18%	12.59%	760.52%
3-month Treasury Yield	0.00%	27.39%	***
6-month Treasury Yield	1.79%	29.25%	845.95%
1-year Treasury Yield	442.82%	5551.80%	***
3-year Treasury Yield	***	6589.22%	***
5-year Treasury Yield	15.41%	130.98%	***
7-year Treasury Yield	0.33%	15.23%	306.62%
10-year Treasury Yield	494.95%	765.69%	***
20-year Treasury Yield	0.13%	4.26%	147.55%
30-year Treasury Yield	24.62%	151.82%	223.95%
30-year Mortgage Rate	0.13%	0.16%	12.54%
Moody's AAA Curve	1.30%	-17.05%	40.34%
Moody's BAA Curve	0.70%	-9.36%	21.75%
BBB Corporate Yield	61.41%	186.50%	246.04%
Prime Rate	0.18%	1.43%	99.27%
US Average Retail Gasoline Price	326.58%	-905.85%	***
Cost of Federal Funds	1.27%	83.18%	***
Dow Jones Total Stock Market Index	4.97%	-66.18%	152.34%
S&P 500 Stock Price Index	99.58%	499.33%	993.16%
Commercial Real Estate Price Index	71.32%	334.38%	608.95%
Residential Home Price Index	3.99%	43.54%	73.85%
Market Volatility Index	***	***	***

** 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	-41.344 (+/- 8.808)
	p = 0.00005***
Real disposable income growth	-0.671 (+/- 0.063)
	p = 0.000***
30-year Treasury Yield	-92.623 (+/- 22.316)
	p = 0.0003***
LN_30-year Treasury Yield	220.895 (+/- 54.581)
	p = 0.0003***
10-year Treasury Yield	85.275 (+/- 17.260)
	p = 0.00003***
LN_10-year Treasury Yield	-124.761 (+/- 24.788)
	p = 0.00002***
5-year Treasury Yield_2	-3.971 (+/- 1.111)
	p = 0.002***
Observations	40
R^2	0.833
Adjusted R^2	0.803
Residual Std. Error	3.356 (df = 33)
F Statistic	27.427*** (df = 6; 33)
Note:	*p<0.1; **p<0.5; ***p<0.01

REGRESSION FOR NOMINAL GDP GROWTH

	Dependent variable (+/- SE):
	Nominal GDP growth
Constant	15.226 (+/- 14.722)
	p = 0.310
Unemployment Rate	-7.825 (+/- 0.589)
	p = 0.000***
Home Price Index	-0.206 (+/- 0.039)
	p = 0.00002***
30-year Treasury Yield	-246.139 (+/- 24.303)
	p = 0.000***
LN_30-year Treasury Yield	537.341 (+/- 53.464)
	p = 0.000***
20-year Treasury Yield	79.057 (+/- 11.458)
	p = 0.00000***
10-year Treasury Yield	230.858 (+/- 25.985)
	p = 0.000***
LN_10-year Treasury Yield	-470.563 (+/- 42.035)
	p = 0.000***
7-year Treasury Yield	-118.762 (+/- 15.469)
	p = 0.000***
LN_7-year Treasury Yield	142.433 (+/- 21.100)
	p = 0.00000***
Observations	40
R^2	0.913

Adjusted R^2	0.887
Residual Std. Error	2.789 (df = 30)
F Statistic	35.079^{***} (df = 9; 30)
Note:	*p<0.1; **p<0.5; ***p<0.01

REGRESSION FOR REAL DISPOSABLE INCOME GROWTH

	Dependent variable (+/- SE):
	Real disposable income growth
Constant	86.217 (+/- 48.743)
	p = 0.087*
Unemployment Rate	9.854 (+/- 0.847)
	p = 0.000***
Commercial Real Estate Price Index	0.145 (+/- 0.030)
	p = 0.00004***
10-year Treasury Yield	-189.709 (+/- 50.577)
	p = 0.001***
LN_10-year Treasury Yield	162.079 (+/- 36.735)
	p = 0.0002***
LN_3-year Treasury Yield	23.727 (+/- 2.731)
	p = 0.000***
6-month Treasury Yield_2	-2.367 (+/- 0.618)
	p = 0.001***
10-year Treasury Yield_2	24.462 (+/- 7.544)
	p = 0.003***
Observations	40
R^2	0.826
Adjusted R^2	0.788
Residual Std. Error	4.131 (df = 32)
F Statistic	21.648*** (df = 7; 32)
Note:	*p<0.1; **p<0.5; ***p<0.01

REGRESSION FOR NOMINAL DISPOSABLE INCOME GROWTH

	Dependent variable (+/- SE):
	Nominal disposable income growth
Constant	81.625 (+/- 49.573)
	p = 0.110
Unemployment Rate	9.134 (+/- 0.861)
	p = 0.000***
Commercial Real Estate Price Index	0.125 (+/- 0.031)
	p = 0.0004***
10-year Treasury Yield	-173.066 (+/- 51.438)
	p = 0.003***
LN_10-year Treasury Yield	145.757 (+/- 37.361)
	p = 0.0005***
LN_3-year Treasury Yield	22.614 (+/- 2.778)
	p = 0.000***
6-month Treasury Yield_2	-2.156 (+/- 0.629)
	p = 0.002***
10-year Treasury Yield_2	22.577 (+/- 7.673)
	p = 0.007***
Observations	40
R^2	0.801
Adjusted R^2	0.757
Residual Std. Error	4.201 (df = 32)
F Statistic	18.383*** (df = 7; 32)
Note:	*p<0.1; **p<0.5; ***p<0.01

REGRESSION FOR CPI INFLATION RATE

	Dependent variable (+/- SE):
	CPI Inflation Rate
Constant	-5.196 (+/- 0.911)
	p = 0.00003***
US Fed Reserve O-N Loan Rate	-8.157 (+/- 1.098)
	p = 0.00000***
Real GDP growth	-0.386 (+/- 0.086)
	p = 0.0004***
Nominal GDP growth	0.369 (+/- 0.086)
	p = 0.0005***
Real disposable income growth	-1.026 (+/- 0.073)
	p = 0.000***
Nominal disposable income growth	0.980 (+/- 0.071)
	p = 0.000***
30-year Mortgate Rate	0.836 (+/- 0.163)
	p = 0.0001***
Prime Rate	1.365 (+/- 0.269)
	p = 0.0001***
Home Price Index	0.085 (+/- 0.011)
	p = 0.00000***
Commercial Real Estate Price Index	-0.064 (+/- 0.009)
	p = 0.00001***
LN_20-year Treasury Yield	-4.065 (+/- 1.231)
	p = 0.005***
10-year Treasury Yield	-6.990 (+/- 1.922)

	p = 0.003***
LN_10-year Treasury Yield	11.687 (+/- 2.461)
	p = 0.0002***
1-month Treasury Yield	15.813 (+/- 1.656)
	p = 0.00000***
7-year Treasury Yield	10.252 (+/- 2.416)
	p = 0.001***
LN_7-year Treasury Yield	-10.070 (+/- 2.006)
	p = 0.0002***
3-month Treasury Yield	-13.148 (+/- 1.468)
	p = 0.00000***
6-month Treasury Yield	7.005 (+/- 1.704)
	p = 0.001***
LN_6-month Treasury Yield	-1.591 (+/- 0.275)
	p = 0.00003***
3-year Treasury Yield	-4.473 (+/- 1.061)
	p = 0.001***
LN_1-year Treasury Yield	2.970 (+/- 0.444)
	p = 0.00001***
6-month Treasury Yield_2	-3.483 (+/- 0.550)
	p = 0.00001***
3-month Treasury Yield_2	2.882 (+/- 0.516)
	p = 0.00004***
Observations	40
R^2	0.997
Adjusted R^2	0.993

Residual Std. Error	0.132 (df = 17)
F Statistic	258.185*** (df = 22; 17)

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

Unemployment Rate

REGRESSION FOR UNEMPLOYMENT RATE

	Dependent variable (+/- SE):
	Unemployment Rate
Constant	-32.028 (+/- 0.677)
	p = 0.00003***
SP500 Stock Price Index	0.007 (+/- 0.0001)
	p = 0.00001***
US Fed Reserve O-N Loan Rate	-21.055 (+/- 0.291)
	p = 0.00001***
Moody's AAA Curve	-5.602 (+/- 0.059)
	p = 0.00001***
Moody's BAA Curve	4.927 (+/- 0.052)
	p = 0.00001***
Real GDP growth	-1.974 (+/- 0.019)
	p = 0.00001***
Nominal GDP growth	1.827 (+/- 0.019)
	p = 0.00001***
Real disposable income growth	-1.219 (+/- 0.028)
	p = 0.00003***
Nominal disposable income growth	1.148 (+/- 0.026)
	p = 0.00003***
CPI Inflation Rate	-1.711 (+/- 0.024)
	p = 0.00001***
30-year Mortgate Rate	4.175 (+/- 0.049)

	p = 0.00001***
Prime Rate	12.524 (+/- 0.104)
	p = 0.00001***
Home Price Index	0.238 (+/- 0.004)
	p = 0.00001***
Commercial Real Estate Price Index	-0.283 (+/- 0.003)
	p = 0.00001***
Market Volatility Index	0.153 (+/- 0.002)
	p = 0.00001***
LN_Market Volatility Index	-3.473 (+/- 0.045)
	p = 0.00001***
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	1.545 (+/- 0.028)
	p = 0.00002***
30-year Treasury Yield	-14.320 (+/- 1.034)
	p = 0.001***
LN_30-year Treasury Yield	60.732 (+/- 2.433)
	p = 0.0002***
20-year Treasury Yield	21.215 (+/- 1.068)
	p = 0.0003***
LN_20-year Treasury Yield	-96.039 (+/- 2.268)
	p = 0.00003***
LN_10-year Treasury Yield	-13.788 (+/- 0.404)
	p = 0.0001***
1-month Treasury Yield	37.627 (+/- 0.476)
	p = 0.00001***
LN_1-month Treasury Yield	-2.187 (+/- 0.027)

	p = 0.00001***
7-year Treasury Yield	-28.453 (+/- 0.614)
	p = 0.00003***
LN_7-year Treasury Yield	77.041 (+/- 1.022)
	p = 0.00001***
3-month Treasury Yield	-21.932 (+/- 0.264)
	p = 0.00001***
5-year Treasury Yield	28.633 (+/- 0.457)
	p = 0.00001***
LN_5-year Treasury Yield	-39.408 (+/- 0.705)
	p = 0.00002***
6-month Treasury Yield	30.005 (+/- 0.494)
	p = 0.00001***
LN_6-month Treasury Yield	-2.491 (+/- 0.080)
	p = 0.0001***
LN_3-year Treasury Yield	-4.696 (+/- 0.176)
	p = 0.0002***
1-year Treasury Yield	-32.373 (+/- 0.502)
	p = 0.00001***
LN_1-year Treasury Yield	9.901 (+/- 0.187)
	p = 0.00002***
3-year Treasury Yield_2	-2.772 (+/- 0.030)
	p = 0.00001***
3-month Treasury Yield_2	-2.243 (+/- 0.029)
	p = 0.00001***
10-year Treasury Yield_2	0.880 (+/- 0.052)

	p = 0.0005***
Observations	40
R^2	1.000
Adjusted R^2	1.000
Residual Std. Error	0.010 (df = 3)
F Statistic	43,379.740*** (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	0.484 (+/- 0.099)
	p = 0.00003***
Prime Rate	-0.148 (+/- 0.030)
	p = 0.00002***
3-month Treasury Yield	0.973 (+/- 0.037)
	p = 0.000***
3-month Treasury Yield_2	0.075 (+/- 0.014)
	p = 0.00001***
Observations	40
R^2	0.998
Adjusted R^2	0.998
Residual Std. Error	0.036 (df = 36)
F Statistic	6,368.934*** (df = 3; 36)
Note:	*p<0.1; **p<0.5; ***p<0.01

REGRESSION FOR 3-MONTH TREASURY YIELD

	Dependent variable (+/- SE):
	3-month Treasury Yield
Constant	0.283 (+/- 0.069)
	p = 0.0003***
Real disposable income growth	-0.061 (+/- 0.014)
	p = 0.0002***
Nominal disposable income growth	0.060 (+/- 0.014)
	p = 0.0002***
CPI Inflation Rate	-0.045 (+/- 0.011)
	p = 0.0003***
Dow Total Stock Market Index	0.00001 (+/- 0.00000)
	p = 0.00003***
Commercial Real Estate Price Index	-0.002 (+/- 0.0004)
	p = 0.00005***
LN_20-year Treasury Yield	-0.095 (+/- 0.025)
	p = 0.001***
1-month Treasury Yield	0.778 (+/- 0.024)
	p = 0.000***
1-year Treasury Yield	0.321 (+/- 0.032)
	p = 0.000***
1-year Treasury Yield_2	-0.031 (+/- 0.010)
	p = 0.004***
Observations	40
R^2	0.999

Adjusted R^2	0.999
Residual Std. Error	0.024 (df = 30)
F Statistic	4,630.381*** (df = 9; 30)
Note:	*p<0.1; **p<0.5; ***p<0.01

REGRESSION FOR 6-MONTH TREASURY YIELD

	Dependent variable (+/- SE):
	6-month Treasury Yield
Constant	-1.218 (+/- 0.159)
	p = 0.000***
Unemployment Rate	-0.019 (+/- 0.004)
	p = 0.0002***
Prime Rate	0.421 (+/- 0.048)
	p = 0.000***
3-month Treasury Yield	0.622 (+/- 0.046)
	p = 0.000***
Market Volatility Index_2	0.00005 (+/- 0.00001)
	p = 0.00001***
Observations	40
R^2	0.998
Adjusted R^2	0.998
Residual Std. Error	0.039 (df = 35)
F Statistic	4,287.099*** (df = 4; 35)
Note:	*p<0.1; **p<0.5; ***p<0.01

REGRESSION FOR 1-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	1-year Treasury Yield
Constant	-4.941 (+/- 1.657)
	p = 0.006***
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	-0.171 (+/- 0.040)
	p = 0.0002***
30-year Treasury Yield	6.507 (+/- 2.082)
	p = 0.004***
LN_30-year Treasury Yield	-7.227 (+/- 2.480)
	p = 0.007***
3-month Treasury Yield	0.983 (+/- 0.024)
	p = 0.000***
30-year Treasury Yield_2	-0.655 (+/- 0.209)
	p = 0.004***
Observations	40
R^2	0.986
Adjusted R^2	0.983
Residual Std. Error	0.107 (df = 34)
F Statistic	463.349*** (df = 5; 34)
Note:	*p<0.1; **p<0.5; ***p<0.01

REGRESSION FOR 3-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	3-year Treasury Yield
Constant	-25.413 (+/- 5.037)
	p = 0.00002***
Nominal disposable income growth	0.026 (+/- 0.006)
	p = 0.0003***
Unemployment Rate	-0.417 (+/- 0.034)
	p = 0.000***
30-year Treasury Yield	37.261 (+/- 6.507)
	p = 0.00001***
LN_30-year Treasury Yield	-46.932 (+/- 7.969)
	p = 0.00001***
30-year Treasury Yield_2	-3.473 (+/- 0.638)
	p = 0.00001***
Observations	40
R^2	0.851
Adjusted R^2	0.829
Residual Std. Error	0.311 (df = 34)
F Statistic	38.899*** (df = 5; 34)
Note:	*p<0.1; **p<0.5; ***p<0.01

REGRESSION FOR 5-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	5-year Treasury Yield
Constant	6.808 (+/- 2.116)
	p = 0.003***
Real disposable income growth	0.015 (+/- 0.005)
	p = 0.003***
Unemployment Rate	-0.188 (+/- 0.028)
	p = 0.00000***
Market Volatility Index	0.209 (+/- 0.064)
	p = 0.003***
LN_Market Volatility Index	-3.225 (+/- 1.072)
	p = 0.006***
30-year Treasury Yield	0.531 (+/- 0.067)
	p = 0.000***
1-month Treasury Yield	0.326 (+/- 0.061)
	p = 0.00001***
Market Volatility Index_2	-0.001 (+/- 0.0004)
	p = 0.002***
Observations	40
R^2	0.917
Adjusted R^2	0.898
Residual Std. Error	0.215 (df = 32)
F Statistic	50.198*** (df = 7; 32)
Note:	*p<0.1; **p<0.5; ***p<0.01

REGRESSION FOR 7-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	7-year Treasury Yield
Constant	4.109 (+/- 0.354)
	p = 0.000***
SP500 Stock Price Index	-0.0003 (+/- 0.0001)
	p = 0.002***
Real disposable income growth	0.024 (+/- 0.008)
	p = 0.005***
Unemployment Rate	-0.280 (+/- 0.037)
	p = 0.000***
Observations	40
R^2	0.619
Adjusted R^2	0.587
Residual Std. Error	0.400 (df = 36)
F Statistic	19.479*** (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	-9.187 (+/- 1.648)
	p = 0.00001***
Real disposable income growth	0.011 (+/- 0.002)
	p = 0.00000***
Unemployment Rate	-0.144 (+/- 0.013)
	p = 0.000***
Dow Total Stock Market Index	0.00001 (+/- 0.00000)
	p = 0.001***
30-year Treasury Yield	12.967 (+/- 2.043)
	p = 0.00000***
LN_30-year Treasury Yield	-15.357 (+/- 2.471)
	p = 0.00000***
30-year Treasury Yield_2	-1.111 (+/- 0.202)
	p = 0.00001***
Observations	40
R^2	0.978
Adjusted R^2	0.974
Residual Std. Error	0.096 (df = 33)
F Statistic	248.619*** (df = 6; 33)
Note:	*p<0.1; **p<0.5; ***p<0.01

REGRESSION FOR 20-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	20-year Treasury Yield
Constant	-2.955 (+/- 0.821)
	p = 0.002***
Real disposable income growth	-0.135 (+/- 0.040)
	p = 0.003***
Nominal disposable income growth	0.148 (+/- 0.043)
	p = 0.002***
Unemployment Rate	-0.163 (+/- 0.034)
	p = 0.00004***
Prime Rate	1.244 (+/- 0.232)
	p = 0.00001***
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	0.753 (+/- 0.085)
	p = 0.000***
3-month Treasury Yield	-1.191 (+/- 0.219)
	p = 0.00001***
Observations	40
R^2	0.798
Adjusted R^2	0.761
Residual Std. Error	0.275 (df = 33)
F Statistic	21.720*** (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	2.268 (+/- 0.681)
	p = 0.003***
SP500 Stock Price Index	-0.0003 (+/- 0.0001)
	p = 0.005***
Nominal disposable income growth	-0.007 (+/- 0.002)
	p = 0.0005***
Unemployment Rate	0.110 (+/- 0.021)
	p = 0.00004***
BBB corporate yield	0.235 (+/- 0.056)
	p = 0.0004***
30-year Mortgate Rate	-0.213 (+/- 0.062)
	p = 0.003***
Home Price Index	0.009 (+/- 0.003)
	p = 0.003***
Market Volatility Index	-0.003 (+/- 0.001)
	p = 0.009***
10-year Treasury Yield	-3.016 (+/- 0.795)
	p = 0.001***
LN_10-year Treasury Yield	4.673 (+/- 0.748)
	p = 0.00001***
5-year Treasury Yield	1.864 (+/- 0.528)
	p = 0.002***
LN_5-year Treasury Yield	-2.931 (+/- 0.567)

	p = 0.00003***
6-month Treasury Yield	0.347 (+/- 0.086)
	p = 0.0005***
3-year Treasury Yield	-1.964 (+/- 0.410)
	p = 0.0001***
LN_3-year Treasury Yield	1.518 (+/- 0.261)
	p = 0.00001***
10-year Treasury Yield_2	0.479 (+/- 0.108)
	p = 0.0002***
Observations	40
R^2	0.997
Adjusted R^2	0.995
Residual Std. Error	0.043 (df = 24)
F Statistic	477.737*** (df = 15; 24)
Note:	*p<0.1; **p<0.5; ***p<0.01

30-year Mortgage Rate

REGRESSION FOR 30-YEAR MORTGATE RATE

	Dependent variable (+/- SE):
	30-year Mortgate Rate
Constant	1.761 (+/- 0.201)
	p = 0.000***
30-year Treasury Yield	0.692 (+/- 0.071)
	p = 0.000***
1-month Treasury Yield	0.204 (+/- 0.052)
	p = 0.0004***
Observations	40
R^2	0.755
Adjusted R^2	0.741
Residual Std. Error	0.255 (df = 37)
F Statistic	56.923*** (df = 2; 37)
Note:	*p<0.1; **p<0.5; ***p<0.01

Moody's AAA & BAA Rates

REGRESSION FOR MOODY'S AAA CURVE

	Dependent variable (+/- SE):
	Moody's AAA Curve
Constant	5.947 (+/- 0.292)
	p = 0.000***
SP500 Stock Price Index	-0.001 (+/- 0.0001)
	p = 0.000***
Nominal disposable income growth	0.021 (+/- 0.007)
	p = 0.004***
Unemployment Rate	-0.141 (+/- 0.031)
	p = 0.0001***
Observations	40
R^2	0.682
Adjusted R^2	0.655
Residual Std. Error	0.337 (df = 36)
F Statistic	25.719*** (df = 3; 36)
Note:	*p<0.1; **p<0.5; ***p<0.01

REGRESSION FOR MOODY'S BAA CURVE

	Dependent variable (+/- SE):
	Moody's BAA Curve
Constant	6.933 (+/- 0.284)
	p = 0.000***
SP500 Stock Price Index	-0.001 (+/- 0.0001)
	p = 0.000***
Nominal disposable income growth	0.016 (+/- 0.006)
	p = 0.010***
Unemployment Rate	-0.099 (+/- 0.035)
	p = 0.007***
1-month Treasury Yield	-0.778 (+/- 0.266)
	p = 0.007***
1-month Treasury Yield_2	0.413 (+/- 0.111)
	p = 0.001***
Observations	40
R^2	0.818
Adjusted R^2	0.792
Residual Std. Error	0.268 (df = 34)
F Statistic	30.662*** (df = 5; 34)
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	5.418 (+/- 0.815)
	p = 0.00000***
SP500 Stock Price Index	-0.001 (+/- 0.0002)
	p = 0.00001***
Nominal GDP growth	-0.028 (+/- 0.007)
	p = 0.001***
Unemployment Rate	-0.273 (+/- 0.064)
	p = 0.0002***
30-year Treasury Yield	2.950 (+/- 0.824)
	p = 0.002***
LN_30-year Treasury Yield	-7.402 (+/- 2.305)
	p = 0.004***
1-month Treasury Yield	-4.701 (+/- 1.222)
	p = 0.001***
LN_1-month Treasury Yield	-0.391 (+/- 0.104)
	p = 0.001***
3-month Treasury Yield	5.592 (+/- 1.359)
	p = 0.0003***
Observations	40
R^2	0.871
Adjusted R^2	0.838

Residual Std. Error	0.286 (df = 31)
F Statistic	26.245*** (df = 8; 31)
Note:	*p<0.1; **p<0.5; ***p<0.01

Prime Rate

REGRESSION FOR PRIME RATE

	Dependent variable (+/- SE):
	Prime Rate
Constant	6.559 (+/- 0.577)
	p = 0.000***
Market Volatility Index	0.105 (+/- 0.017)
	p = 0.00000***
LN_Market Volatility Index	-1.725 (+/- 0.290)
	p = 0.00001***
1-month Treasury Yield	-0.644 (+/- 0.167)
	p = 0.001***
6-month Treasury Yield	1.292 (+/- 0.115)
	p = 0.000***
1-month Treasury Yield_2	0.105 (+/- 0.031)
	p = 0.003***
Market Volatility Index_2	-0.001 (+/- 0.0001)
	p = 0.00000***
Observations	40
R^2	0.995
Adjusted R^2	0.994
Residual Std. Error	0.059 (df = 33)
F Statistic	1,031.365*** (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	-7.738 (+/- 2.825)
	p = 0.034**
SP500 Stock Price Index	-0.002 (+/- 0.0003)
	p = 0.005***
US Fed Reserve O-N Loan Rate	14.260 (+/- 2.458)
	p = 0.002***
Moody's AAA Curve	0.527 (+/- 0.100)
	p = 0.002***
Real GDP growth	0.940 (+/- 0.133)
	p = 0.0004***
Nominal GDP growth	-0.891 (+/- 0.129)
	p = 0.0005***
Real disposable income growth	1.813 (+/- 0.248)
	p = 0.0004***
Nominal disposable income growth	-1.765 (+/- 0.239)
	p = 0.0004***
Unemployment Rate	0.574 (+/- 0.078)
	p = 0.0004***
CPI Inflation Rate	1.844 (+/- 0.257)
	p = 0.0004***
BBB corporate yield	0.727 (+/- 0.125)

	p = 0.002***
30-year Mortgate Rate	-1.867 (+/- 0.263)
	p = 0.0004***
Prime Rate	-4.295 (+/- 0.868)
	p = 0.003***
Home Price Index	-0.154 (+/- 0.018)
	p = 0.0002***
Commercial Real Estate Price Index	0.152 (+/- 0.019)
	p = 0.0002***
Market Volatility Index	-0.055 (+/- 0.012)
	p = 0.005***
LN_Market Volatility Index	1.733 (+/- 0.303)
	p = 0.002***
30-year Treasury Yield	-12.925 (+/- 1.691)
	p = 0.0003***
LN_30-year Treasury Yield	13.732 (+/- 3.106)
	p = 0.005***
20-year Treasury Yield	12.919 (+/- 1.522)
	p = 0.0002***
10-year Treasury Yield	20.478 (+/- 4.832)
	p = 0.006***
LN_10-year Treasury Yield	-12.381 (+/- 3.163)
	p = 0.008***
1-month Treasury Yield	-14.234 (+/- 3.223)
	p = 0.005***
LN_1-month Treasury Yield	1.224 (+/- 0.150)

	p = 0.0002***
7-year Treasury Yield	-11.310 (+/- 1.467)
	p = 0.0003***
3-month Treasury Yield	17.374 (+/- 2.787)
	p = 0.001***
5-year Treasury Yield	6.732 (+/- 1.026)
	p = 0.001***
6-month Treasury Yield	-24.384 (+/- 3.311)
	p = 0.0004***
LN_6-month Treasury Yield	3.567 (+/- 0.545)
	p = 0.001***
LN_3-year Treasury Yield	3.581 (+/- 0.375)
	p = 0.0001***
LN_1-year Treasury Yield	-5.835 (+/- 0.639)
	p = 0.0001***
6-month Treasury Yield_2	9.985 (+/- 1.354)
	p = 0.0004***
1-month Treasury Yield_2	-7.184 (+/- 0.957)
	p = 0.0003***
10-year Treasury Yield_2	-3.305 (+/- 0.784)
	p = 0.006***
Observations	40
R^2	0.998
Adjusted R^2	0.990
Residual Std. Error	0.056 (df = 6)
F Statistic	120.057*** (df = 33; 6)

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	0.175 (+/- 0.122)
	p = 0.160
Home Price Index	-0.005 (+/- 0.001)
	p = 0.002***
Commercial Real Estate Price Index	0.004 (+/- 0.001)
	p = 0.002***
20-year Treasury Yield	-0.288 (+/- 0.091)
	p = 0.004***
LN_20-year Treasury Yield	0.653 (+/- 0.199)
	p = 0.003***
3-month Treasury Yield	0.939 (+/- 0.018)
	p = 0.000***
Observations	40
R^2	0.996
Adjusted R^2	0.995
Residual Std. Error	0.055 (df = 34)
F Statistic	1,535.102*** (df = 5; 34)
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	1,639.249 (+/- 7,203.765)
	p = 0.822
US Fed Reserve O-N Loan Rate	-44,619.370 (+/- 9,851.373)
	p = 0.0001***
Real GDP growth	-262.395 (+/- 40.381)
	p = 0.00000***
Unemployment Rate	-3,345.019 (+/- 341.735)
	p = 0.000***
Prime Rate	11,123.970 (+/- 2,374.233)
	p = 0.0001***
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	-4,805.038 (+/- 908.932)
	p = 0.00002***
LN_10-year Treasury Yield	-14,086.900 (+/- 1,711.136)
	p = 0.000***
1-month Treasury Yield	40,187.620 (+/- 10,394.280)
	p = 0.001***
1-year Treasury Yield	34,272.520 (+/- 6,335.702)
	p = 0.00001***
LN_1-year Treasury Yield	-15,704.050 (+/- 1,528.702)
	p = 0.000***
1-year Treasury Yield_2	-8,665.107 (+/- 1,221.948)

	p = 0.00000***
Observations	40
R^2	0.970
Adjusted R^2	0.960
Residual Std. Error	1,623.109 (df = 29)
F Statistic	94.486*** (df = 10; 29)
Note:	*p<0.1; **p<0.5; ***p<0.01

REGRESSION FOR SP500 STOCK PRICE INDEX

	Dependent variable (+/- SE):
	SP500 Stock Price Index
Constant	2,937.000 (+/- 683.115)
	p = 0.0003***
Nominal GDP growth	-22.305 (+/- 2.832)
	p = 0.00000***
Unemployment Rate	-159.536 (+/- 25.797)
	p = 0.00001***
Market Volatility Index	17.450 (+/- 5.126)
	p = 0.003***
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	-255.608 (+/- 58.010)
	p = 0.0003***
LN_30-year Treasury Yield	-9,776.948 (+/- 968.657)
	p = 0.000***
20-year Treasury Yield	9,786.526 (+/- 1,194.857)
	p = 0.00000***
10-year Treasury Yield	-6,313.344 (+/- 1,654.288)
	p = 0.001***
LN_7-year Treasury Yield	2,491.727 (+/- 533.436)
	p = 0.0002***
6-month Treasury Yield	-2,534.807 (+/- 737.321)
	p = 0.003***
LN_6-month Treasury Yield	695.613 (+/- 156.369)
	p = 0.0003***
1-year Treasury Yield	2,962.751 (+/- 870.639)

	p = 0.003***
LN_1-year Treasury Yield	-1,130.020 (+/- 177.856)
	p = 0.00001***
3-year Treasury Yield_2	-282.282 (+/- 98.058)
	p = 0.009***
1-month Treasury Yield_2	176.043 (+/- 59.057)
	p = 0.007***
10-year Treasury Yield_2	1,009.313 (+/- 322.003)
	p = 0.005***
20-year Treasury Yield_2	-1,099.784 (+/- 192.743)
	p = 0.00001***
Market Volatility Index_2	-0.223 (+/- 0.058)
	p = 0.001***
Observations	40
R^2	0.993
Adjusted R^2	0.987
Residual Std. Error	79.823 (df = 22)
F Statistic	181.116*** (df = 17; 22)
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	305.753 (+/- 13.148)
	p = 0.000***
Real disposable income growth	0.757 (+/- 0.222)
	p = 0.002***
Unemployment Rate	-10.025 (+/- 1.574)
	p = 0.00000***
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	-20.537 (+/- 4.859)
	p = 0.0002***
LN_30-year Treasury Yield	-80.230 (+/- 10.309)
	p = 0.000***
1-year Treasury Yield	48.987 (+/- 5.754)
	p = 0.000***
LN_1-year Treasury Yield	-39.355 (+/- 4.377)
	p = 0.000***
Observations	40
R^2	0.914
Adjusted R^2	0.898
Residual Std. Error	10.387 (df = 33)
F Statistic	58.210*** (df = 6; 33)
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	291.461 (+/- 45.849)
	p = 0.00001***
Real GDP growth	-12.838 (+/- 3.457)
	p = 0.002***
Nominal GDP growth	12.491 (+/- 3.417)
	p = 0.002***
Real disposable income growth	10.716 (+/- 3.025)
	p = 0.002***
Nominal disposable income growth	-9.732 (+/- 2.896)
	p = 0.003***
Unemployment Rate	-15.350 (+/- 2.682)
	p = 0.00001***
BBB corporate yield	-17.075 (+/- 5.331)
	p = 0.005***
30-year Treasury Yield	279.891 (+/- 40.518)
	p = 0.00000***
LN_30-year Treasury Yield	-788.756 (+/- 94.904)
	p = 0.00000***
3-month Treasury Yield	-253.640 (+/- 41.718)
	p = 0.00001***
5-year Treasury Yield	-299.323 (+/- 71.045)
	p = 0.0004***
LN_5-year Treasury Yield	290.560 (+/- 73.824)

	p = 0.001***
3-year Treasury Yield	271.981 (+/- 73.323)
	p = 0.002***
LN_3-year Treasury Yield	-157.606 (+/- 44.745)
	p = 0.002***
1-year Treasury Yield	399.282 (+/- 75.662)
	p = 0.00003***
LN_1-year Treasury Yield	-61.823 (+/- 14.987)
	p = 0.0005***
1-year Treasury Yield_2	-93.642 (+/- 15.673)
	p = 0.00001***
3-month Treasury Yield_2	60.749 (+/- 10.669)
	p = 0.00001***
Observations	40
R^2	0.984
Adjusted R^2	0.972
Residual Std. Error	7.550 (df = 22)
F Statistic	81.689*** (df = 17; 22)
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	324.475 (+/- 57.950)
	p = 0.00002***
Real disposable income growth	22.919 (+/- 3.412)
	p = 0.00000***
Nominal disposable income growth	-22.356 (+/- 3.334)
	p = 0.00000***
CPI Inflation Rate	17.063 (+/- 2.663)
	p = 0.00001***
Prime Rate	-39.925 (+/- 6.113)
	p = 0.00001***
Dow Total Stock Market Index	-0.004 (+/- 0.001)
	p = 0.00000***
Commercial Real Estate Price Index	0.417 (+/- 0.101)
	p = 0.0005***
30-year Treasury Yield	1,039.090 (+/- 171.315)
	p = 0.00001***
LN_30-year Treasury Yield	-2,678.310 (+/- 412.450)
	p = 0.00001***
20-year Treasury Yield	-1,018.531 (+/- 155.336)
	p = 0.00001***
LN_20-year Treasury Yield	1,961.880 (+/- 299.759)

	p = 0.00001***
10-year Treasury Yield	356.078 (+/- 73.893)
	p = 0.0001***
1-month Treasury Yield	-119.330 (+/- 20.405)
	p = 0.00001***
3-month Treasury Yield	209.864 (+/- 28.412)
	p = 0.00000***
3-year Treasury Yield	-246.367 (+/- 35.627)
	p = 0.00000***
3-year Treasury Yield_2	25.695 (+/- 3.912)
	p = 0.00001***
7-year Treasury Yield_2	58.776 (+/- 12.992)
	p = 0.0002***
10-year Treasury Yield_2	-70.046 (+/- 19.517)
	p = 0.002***
Observations	40
R^2	0.952
Adjusted R^2	0.914
Residual Std. Error	3.838 (df = 22)
F Statistic	25.440*** (df = 17; 22)
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[53]
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),

[53] 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[54]
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)[55].
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)[56].
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).

[54] 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.

55 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

[56] 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[57].

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.

[57] 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://data.nasdaq.com/data/FED/FL075035243_Q-interest-rates-and-price-indexes-owneroccupied-real-estate-corelogic-national-sa-quarterly-levels-nsa

Commercial Real Estate Price Index	https://data.nasdaq.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[58] "forecast" package[59]; specifically, the "ets" function (see p.39 of https://cran.r-project.org/web/packages/forecast/forecast.pdf)[60] 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)[61], and the determined parameters. While fitting forecasts to previous values,

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

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

[60] 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.

[61] 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)[62].

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.

[62] 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[63];
    - 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[64].

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

[63] 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.
[64] See the SP500 metric's analysis.

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

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

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

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

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

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

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

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

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

There are other forms of exponential smoothing methods that may account for any combination of forecasting *levels* (as in the Theta method), *trends* (for which a metric may, for instance, be growing or

lessening according to a linear or higher order function), and *seasonality* (for which a metric may have engrained "cycles" on, e.g., a monthly, quarterly, or annual basis).

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

Table 18: Mathematical Methods Associated with Trend & Seasonal Components

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

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

Section III: Regression Construction

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

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

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

Appendix C: Variable Correlations

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

Table 4: Correlation Factors found as of 3Q2021

Variable 1	Variable 2	Correlation
Primary Credit	BBB Corporate Yield	-0.833435
Primary Credit	30-year Fixed Mortgage Rate	-0.827887
Primary Credit	Prime Rate	-0.800366
Primary Credit	Dow Jones Total Stock Market Index	0.675812
Primary Credit	National Home Price Index	0.717656
Primary Credit	Commercial Real Estate Price Index	0.670724
Primary Credit	20-year Treasury Yield	0.795484
Primary Credit	10-year Treasury Yield	-0.806318
Primary Credit	**1-month Treasury Yield**	**0.993136**
Primary Credit	7-year Treasury Yield	0.895261
Primary Credit	3-month Treasury Yield	-0.784886
Primary Credit	5-year Treasury Yield	-0.814906
Primary Credit	**6-month Treasury Yield**	**0.994334**
Primary Credit	**3-year Treasury Yield**	**0.956257**
Primary Credit	**1-year Treasury Yield**	**0.987909**
Real GDP Growth Rate	**Nominal GDP Growth Rate**	**0.983965**
Real Disposable Income Growth Rate	**Nominal Disposable Income Growth Rate**	**0.962030**
BBB Corporate Yield	30-year Fixed Mortgage Rate	0.940480
BBB Corporate Yield	Prime Rate	0.745860
BBB Corporate Yield	Dow Jones Total Stock Market Index	-0.818265
BBB Corporate Yield	National Home Price Index	-0.809510
BBB Corporate Yield	Commercial Real Estate Price Index	-0.776305
BBB Corporate Yield	30-year Treasury Yield	-0.643218
BBB Corporate Yield	20-year Treasury Yield	-0.815728
BBB Corporate Yield	10-year Treasury Yield	0.923826
BBB Corporate Yield	7-year Treasury Yield	-0.898453
BBB Corporate Yield	3-month Treasury Yield	0.764544
BBB Corporate Yield	5-year Treasury Yield	0.885211
BBB Corporate Yield	6-month Treasury Yield	-0.841488
BBB Corporate Yield	3-year Treasury Yield	-0.883009
BBB Corporate Yield	1-year Treasury Yield	-0.852055
30-year Fixed Mortgage Rate	Prime Rate	0.857221
30-year Fixed Mortgage Rate	Dow Jones Total Stock Market Index	-0.792954
30-year Fixed Mortgage Rate	National Home Price Index	-0.819603
30-year Fixed Mortgage Rate	Commercial Real Estate Price Index	-0.819829
30-year Fixed Mortgage Rate	30-year Treasury Yield	-0.748824
30-year Fixed Mortgage Rate	20-year Treasury Yield	-0.894434

30-year Fixed Mortgage Rate	**10-year Treasury Yield**	**0.993458**
30-year Fixed Mortgage Rate	7-year Treasury Yield	-0.925462
30-year Fixed Mortgage Rate	3-month Treasury Yield	0.881119
30-year Fixed Mortgage Rate	**5-year Treasury Yield**	**0.981110**
30-year Fixed Mortgage Rate	6-month Treasury Yield	-0.834475
30-year Fixed Mortgage Rate	3-year Treasury Yield	-0.893858
30-year Fixed Mortgage Rate	1-year Treasury Yield	-0.848615
Prime Rate	20-year Treasury Yield	-0.696624
Prime Rate	10-year Treasury Yield	0.840515
Prime Rate	7-year Treasury Yield	-0.803773
Prime Rate	**3-month Treasury Yield**	**0.992355**
Prime Rate	5-year Treasury Yield	0.909452
Prime Rate	6-month Treasury Yield	-0.792217
Prime Rate	3-year Treasury Yield	-0.812777
Prime Rate	1-year Treasury Yield	-0.800079
Dow Jones Total Stock Market Index	National Home Price Index	0.876257
Dow Jones Total Stock Market Index	Commercial Real Estate Price Index	0.908607
Dow Jones Total Stock Market Index	30-year Treasury Yield	0.813538
Dow Jones Total Stock Market Index	20-year Treasury Yield	0.847999
Dow Jones Total Stock Market Index	10-year Treasury Yield	-0.798633
Dow Jones Total Stock Market Index	7-year Treasury Yield	0.839340
Dow Jones Total Stock Market Index	5-year Treasury Yield	-0.712209
Dow Jones Total Stock Market Index	6-month Treasury Yield	0.692260
Dow Jones Total Stock Market Index	3-year Treasury Yield	0.772619
Dow Jones Total Stock Market Index	1-year Treasury Yield	0.706513
National Home Price Index	**Commercial Real Estate Price Index**	**0.964263**
National Home Price Index	30-year Treasury Yield	0.626033
National Home Price Index	20-year Treasury Yield	0.860544
National Home Price Index	10-year Treasury Yield	-0.829835
National Home Price Index	7-year Treasury Yield	0.865136
National Home Price Index	3-month Treasury Yield	-0.602570
National Home Price Index	5-year Treasury Yield	-0.764556
National Home Price Index	6-month Treasury Yield	0.738019
National Home Price Index	3-year Treasury Yield	0.812012
National Home Price Index	1-year Treasury Yield	0.753004
Commercial Real Estate Price Index	30-year Treasury Yield	0.664988
Commercial Real Estate Price Index	20-year Treasury Yield	0.915495
Commercial Real Estate Price Index	10-year Treasury Yield	-0.840056
Commercial Real Estate Price Index	7-year Treasury Yield	0.859214
Commercial Real Estate Price Index	5-year Treasury Yield	-0.768156
Commercial Real Estate Price Index	6-month Treasury Yield	0.693675
Commercial Real Estate Price Index	3-year Treasury Yield	0.787575
Commercial Real Estate Price Index	1-year Treasury Yield	0.712501
30-year Treasury Yield	**20-year Treasury Yield**	**0.990344**
30-year Treasury Yield	10-year Treasury Yield	-0.746641
30-year Treasury Yield	7-year Treasury Yield	0.877761
30-year Treasury Yield	5-year Treasury Yield	-0.600793
30-year Treasury Yield	3-year Treasury Yield	0.649068
20-year Treasury Yield	10-year Treasury Yield	-0.895960
20-year Treasury Yield	**7-year Treasury Yield**	**0.972951**

20-year Treasury Yield	3-month Treasury Yield	-0.709136
20-year Treasury Yield	5-year Treasury Yield	-0.838664
20-year Treasury Yield	6-month Treasury Yield	0.814253
20-year Treasury Yield	3-year Treasury Yield	0.905514
20-year Treasury Yield	1-year Treasury Yield	0.837659
10-year Treasury Yield	7-year Treasury Yield	-0.918171
10-year Treasury Yield	3-month Treasury Yield	0.868188
10-year Treasury Yield	**5-year Treasury Yield**	**0.982527**
10-year Treasury Yield	6-month Treasury Yield	-0.813142
10-year Treasury Yield	3-year Treasury Yield	-0.877492
10-year Treasury Yield	1-year Treasury Yield	-0.827907
1-month Treasury Yield	7-year Treasury Yield	0.760174
1-month Treasury Yield	**6-month Treasury Yield**	**0.995265**
1-month Treasury Yield	3-year Treasury Yield	0.926179
1-month Treasury Yield	**1-year Treasury Yield**	**0.988043**
7-year Treasury Yield	3-month Treasury Yield	-0.808420
7-year Treasury Yield	5-year Treasury Yield	-0.893964
7-year Treasury Yield	6-month Treasury Yield	0.914300
7-year Treasury Yield	**3-year Treasury Yield**	**0.978150**
7-year Treasury Yield	1-year Treasury Yield	0.930128
3-month Treasury Yield	5-year Treasury Yield	0.934650
3-month Treasury Yield	6-month Treasury Yield	-0.776552
3-month Treasury Yield	3-year Treasury Yield	-0.805847
3-month Treasury Yield	1-year Treasury Yield	-0.785956
5-year Treasury Yield	6-month Treasury Yield	-0.814431
5-year Treasury Yield	3-year Treasury Yield	-0.865922
5-year Treasury Yield	1-year Treasury Yield	-0.826913
6-month Treasury Yield	**3-year Treasury Yield**	**0.973751**
6-month Treasury Yield	**1-year Treasury Yield**	**0.998095**
3-year Treasury Yield	**1-year Treasury Yield**	**0.983853**

Appendix D: Mortgage Delinquencies

The following tables, Table 5 through Table 9, present the delinquency rates of mortgages held by Freddie Mac for September 2021 in several southeastern states, broken down by MSA. As we have provided this information for many previous reports, but the information does not appear pertinent to the main portion of the paper, we have included it here for continuity and general interest.

Table 5: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30+ dpd) as of November 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	1195	1168	10	3	0	14	0.84%	1.42%	2.26%
	2 units	3	3	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	7	7	0	0	0	0	0.00%	0.00%	0.00%
Auburn-Opelika, AL	1 unit	4753	4701	17	8	4	23	0.36%	0.74%	1.09%
	2 units	27	27	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	31241	30806	159	40	20	216	0.51%	0.88%	1.39%
	2 units	24	24	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	367	352	4	1	1	9	1.09%	3.00%	4.09%
	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	7720	7619	39	8	6	48	0.51%	0.80%	1.31%
	2 units	15	15	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	4	4	0	0	0	0	0.00%	0.00%	0.00%
Decatur, AL	1 unit	2228	2198	11	2	3	14	0.49%	0.85%	1.35%
	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	2133	2103	16	1	1	12	0.75%	0.66%	1.41%
	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	2747	2690	25	3	0	29	0.91%	1.17%	2.08%
	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	1265	1229	7	3	2	24	0.55%	2.29%	2.85%
	2 units	2	2	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	1	1	0	0	0	0	0.00%	0.00%	0.00%
Huntsville, AL	1 unit	14182	14027	60	8	5	82	0.42%	0.67%	1.09%
	2 units	19	19	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	45	45	0	0	0	0	0.00%	0.00%	0.00%
Mobile, AL	1 unit	5529	5441	18	7	3	60	0.33%	1.27%	1.59%
	2 units	12	12	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	5	5	0	0	0	0	0.00%	0.00%	0.00%

Montgomery, AL	1 unit	6146	6064	30	4	1	47	0.49%	0.85%	1.33%
	2 units	17	17	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	5144	5068	39	2	4	31	0.76%	0.72%	1.48%
	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	10842	10623	83	25	12	99	0.77%	1.25%	2.02%
	2 units	42	42	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	10	10	0	0	0	0	0.00%	0.00%	0.00%

Data: STACR Freddie Mac, as of 23 November 2021

Table 6: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30+ dpd) as of November 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	26599	26227	114	39	27	192	0.43%	0.97%	1.40%
	2 units	342	335	1	0	0	6	0.29%	1.75%	2.05%
	3+ units	39	38	1	0	0	0	2.56%	0.00%	2.56%
Crestview-Fort Walton Beach-Destin, FL	1 unit	7292	7214	32	12	3	31	0.44%	0.63%	1.07%
	2 units	15	15	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	18672	18416	89	23	18	126	0.48%	0.89%	1.37%
	2 units	147	142	0	0	0	5	0.00%	3.40%	3.40%
	3+ units	45	42	0	0	0	3	0.00%	6.67%	6.67%
Gainesville, FL	1 unit	6053	5988	19	7	4	35	0.31%	0.76%	1.07%
	2 units	23	23	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	15	15	0	0	0	0	0.00%	0.00%	0.00%
Homosassa Springs, FL	1 unit	3054	3020	10	8	0	16	0.33%	0.79%	1.11%
	2 units	21	21	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	4	2	2	0	0	0	50.00%	0.00%	50.00%
Jacksonville, FL	1 unit	40687	40171	169	54	25	268	0.42%	0.85%	1.27%
	2 units	176	174	0	0	0	2	0.00%	1.14%	1.14%
	3+ units	110	110	0	0	0	0	0.00%	0.00%	0.00%
Lakeland-Winter Haven, FL	1 unit	15108	14885	67	26	16	114	0.44%	1.03%	1.48%
	2 units	93	91	0	0	0	2	0.00%	2.15%	2.15%
	3+ units	35	33	0	0	0	2	0.00%	5.71%	5.71%
Miami-Fort Lauderdale-Pompano Beach, FL	1 unit	138728	135185	833	265	169	2276	0.60%	1.95%	2.55%
	2 units	1202	1162	4	2	3	31	0.33%	3.00%	3.33%
	3+ units	525	512	3	0	0	10	0.57%	1.91%	2.48%
Naples-Marco Island, FL	1 unit	12584	12441	42	11	7	83	0.33%	0.80%	1.14%
	2 units	46	45	1	0	0	0	2.17%	0.00%	2.17%
	3+ units	17	17	0	0	0	0	0.00%	0.00%	0.00%
North Port-Sarasota-Bradenton, FL	1 unit	31524	31152	138	26	13	195	0.44%	0.74%	1.18%
	2 units	175	173	1	1	0	0	0.57%	0.57%	1.14%
	3+ units	27	27	0	0	0	0	0.00%	0.00%	0.00%
Ocala, FL	1 unit	7552	7435	47	9	4	57	0.62%	0.93%	1.55%
	2 units	24	24	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	19	19	0	0	0	0	0.00%	0.00%	0.00%

Orlando-Kissimmee-Sanford, FL	1 unit	73958	72587	379	132	64	796	0.51%	1.34%	1.85%
	2 units	304	299	1	0	0	4	0.33%	1.32%	1.65%
	3+ units	86	84	0	0	0	2	0.00%	2.33%	2.33%
Palm Bay-Melbourne-Titusville, FL	1 unit	19047	18788	89	19	12	139	0.47%	0.89%	1.36%
	2 units	55	55	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	26	24	0	0	0	2	0.00%	7.69%	7.69%
Panama City, FL	1 unit	4405	4331	34	6	4	30	0.77%	0.91%	1.68%
	2 units	39	39	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	15	15	0	0	0	0	0.00%	0.00%	0.00%
Pensacola-Ferry Pass-Brent, FL	1 unit	9530	9379	60	9	7	75	0.63%	0.96%	1.58%
	2 units	64	64	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	37	37	0	0	0	0	0.00%	0.00%	0.00%
Port St. Lucie, FL	1 unit	15701	15440	82	29	14	136	0.52%	1.14%	1.66%
	2 units	60	56	2	0	0	2	3.33%	3.33%	6.67%
	3+ units	15	15	0	0	0	0	0.00%	0.00%	0.00%
Punta Gorda, FL	1 unit	7298	7202	33	12	4	47	0.45%	0.86%	1.32%
	2 units	29	28	1	0	0	0	3.45%	0.00%	3.45%
	3+ units	7	7	0	0	0	0	0.00%	0.00%	0.00%
Sebastian-Vero Beach, FL	1 unit	5620	5539	26	3	3	49	0.46%	0.98%	1.44%
	2 units	15	14	0	0	0	1	0.00%	6.67%	6.67%
	3+ units	7	7	0	0	0	0	0.00%	0.00%	0.00%
Sebring-Avon Park, FL	1 unit	1862	1826	14	4	2	16	0.75%	1.18%	1.93%
	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	8877	8765	45	15	4	48	0.51%	0.76%	1.26%
	2 units	52	52	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	32	32	0	0	0	0	0.00%	0.00%	0.00%
Tampa-St. Petersburg-Clearwater, FL	1 unit	91929	90506	402	128	69	824	0.44%	1.11%	1.55%
	2 units	478	472	2	1	0	3	0.42%	0.84%	1.26%
	3+ units	256	251	0	0	1	4	0.00%	1.95%	1.95%
The Villages, FL	1 unit	2555	2537	4	3	0	11	0.16%	0.55%	0.71%
	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%
Outside all MSAs	1 unit	9331	9165	51	19	11	85	0.55%	1.23%	1.78%
	2 units	338	328	4	0	0	6	1.18%	1.78%	2.96%
	3+ units	54	52	1	0	0	1	1.85%	1.85%	3.70%

Data: STACR Freddie Mac, as of 23 November 2021

Table 7: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30+ dpd) as of November 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	1609	1579	13	3	0	14	0.81%	1.06%	1.87%
	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%
Baton Rouge, LA	1 unit	20834	20361	164	72	35	202	0.79%	1.48%	2.27%
	2 units	51	49	1	0	0	1	1.96%	1.96%	3.92%
	3+ units	63	63	0	0	0	0	0.00%	0.00%	0.00%
Hammond, LA	1 unit	2041	1972	25	20	1	23	1.23%	2.16%	3.38%
	2 units	13	13	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-Thibodaux, LA	1 unit	3399	3179	76	84	10	50	2.24%	4.24%	6.47%
	2 units	5	2	2	1	0	0	40.00%	20.00%	60.00%
	3+ units	4	4	0	0	0	0	0.00%	0.00%	0.00%
Lafayette, LA	1 unit	8648	8430	53	19	14	132	0.61%	1.91%	2.52%
	2 units	9	9	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	26	25	1	0	0	0	3.85%	0.00%	3.85%
Lake Charles, LA	1 unit	3465	3381	22	6	4	52	0.64%	1.79%	2.42%
	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	2501	2431	22	7	3	38	0.88%	1.92%	2.80%
	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, LA	1 unit	27389	26340	326	269	31	423	1.19%	2.64%	3.83%
	2 units	1436	1389	7	11	1	28	0.49%	2.79%	3.27%
	3+ units	363	350	2	2	0	9	0.55%	3.03%	3.58%
Shreveport-Bossier City, LA	1 unit	6705	6533	58	13	11	90	0.87%	1.70%	2.57%
	2 units	4	4	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	8	8	0	0	0	0	0.00%	0.00%	0.00%
Outside all MSAs	1 unit	5550	5383	44	13	12	98	0.79%	2.22%	3.01%
	2 units	462	442	5	3	0	12	1.08%	3.25%	4.33%
	3+ units	96	96	0	0	0	0	0.00%	0.00%	0.00%

Data: STACR Freddie Mac, as of 23 November 2021

Table 8: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30+ dpd) as of November 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	4016	3938	22	9	6	41	0.55%	1.39%	1.94%
	2 units	27	27	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	11	11	0	0	0	0	0.00%	0.00%	0.00%
Hattiesburg, MS	1 unit	2076	2033	20	3	0	20	0.96%	1.11%	2.07%
	2 units	4	4	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	2	2	0	0	0	0	0.00%	0.00%	0.00%
Jackson, MS	1 unit	8138	7978	46	15	5	94	0.57%	1.40%	1.97%
	2 units	9	8	1	0	0	0	11.11%	0.00%	11.11%
	3+ units	3	3	0	0	0	0	0.00%	0.00%	0.00%
Memphis, TN-MS-AR	1 unit	5051	4978	26	9	2	36	0.52%	0.93%	1.45%
	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%
Outside all MSAs	1 unit	9738	9480	84	27	9	138	0.86%	1.79%	2.65%
	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 November 2021

Table 9: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30 + dpd) as of November 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	3522	3458	29	8	2	25	0.82%	0.99%	1.82%
	2 units	18	18	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	4002	3922	18	6	8	48	0.45%	1.55%	2.00%
	2 units	13	13	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	4	4	0	0	0	0	0.00%	0.00%	0.00%
Austin-Round Rock-Georgetown, TX	1 unit	89272	88175	383	101	45	568	0.43%	0.80%	1.23%
	2 units	1036	1025	4	0	0	7	0.39%	0.68%	1.06%
	3+ units	213	210	0	0	2	1	0.00%	1.41%	1.41%
Beaumont-Port Arthur, TX	1 unit	5017	4889	45	15	6	62	0.90%	1.65%	2.55%
	2 units	3	3	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	7	7	0	0	0	0	0.00%	0.00%	0.00%
Brownsville-Harlingen, TX	1 unit	2423	2357	24	5	2	35	0.99%	1.73%	2.72%
	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	6187	6124	16	7	5	35	0.26%	0.76%	1.02%
	2 units	93	93	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	58	57	0	0	0	1	0.00%	1.72%	1.72%
Corpus Christi, TX	1 unit	6447	6321	39	12	10	65	0.61%	1.35%	1.95%
	2 units	16	15	1	0	0	0	6.25%	0.00%	6.25%
	3+ units	15	15	0	0	0	0	0.00%	0.00%	0.00%
Dallas-Fort Worth-Arlington, TX	1 unit	241557	237838	1228	270	192	2029	0.51%	1.03%	1.54%
	2 units	778	767	3	0	0	8	0.39%	1.03%	1.41%
	3+ units	206	202	2	0	0	2	0.97%	0.97%	1.94%
El Paso, TX	1 unit	5581	5434	42	10	12	83	0.75%	1.88%	2.63%
	2 units	60	59	1	0	0	0	1.67%	0.00%	1.67%
	3+ units	29	29	0	0	0	0	0.00%	0.00%	0.00%
Houston-The Woodlands-Sugar Land, TX	1 unit	172558	168851	1095	275	202	2135	0.64%	1.51%	2.15%
	2 units	283	277	1	0	0	5	0.35%	1.77%	2.12%
	3+ units	252	244	4	0	0	4	1.59%	1.59%	3.18%
Killeen-Temple, TX	1 unit	5658	5556	29	7	2	64	0.51%	1.29%	1.80%
	2 units	189	186	1	0	0	2	0.53%	1.06%	1.59%

	3+ units	173	172	1	0	0	0	0.58%	0.00%	0.58%
Laredo, TX	1 unit	1687	1648	11	2	3	23	0.65%	1.66%	2.31%
	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	2426	2378	14	8	1	25	0.58%	1.40%	1.98%
	2 units	9	9	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	2	2	0	0	0	0	0.00%	0.00%	0.00%
Lubbock, TX	1 unit	7433	7310	52	13	4	54	0.70%	0.96%	1.66%
	2 units	96	96	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	15	15	0	0	0	0	0.00%	0.00%	0.00%
McAllen-Edinburg-Mission, TX	1 unit	3823	3683	36	14	6	84	0.94%	2.72%	3.66%
	2 units	17	16	0	0	0	1	0.00%	5.88%	5.88%
	3+ units	173	169	1	0	0	3	0.58%	1.73%	2.31%
Midland, TX	1 unit	5579	5431	27	14	11	96	0.48%	2.17%	2.65%
	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	2091	2012	28	7	2	42	1.34%	2.44%	3.78%
	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	2262	2202	20	10	6	24	0.88%	1.77%	2.65%
	2 units	6	6	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	3	3	0	0	0	0	0.00%	0.00%	0.00%
San Antonio-New Braunfels, TX	1 unit	49169	48296	294	76	37	466	0.60%	1.18%	1.78%
	2 units	348	344	1	0	0	3	0.29%	0.86%	1.15%
	3+ units	199	196	2	0	0	1	1.01%	0.50%	1.51%
Sherman-Denison, TX	1 unit	3948	3887	27	7	1	26	0.68%	0.86%	1.55%
	2 units	29	29	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-AR	1 unit	1123	1097	8	2	4	12	0.71%	1.60%	2.32%
	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	4133	4055	31	4	3	40	0.75%	1.14%	1.89%
	2 units	8	8	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	1031	1000	9	0	3	19	0.87%	2.13%	3.01%
	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	4500	4424	38	11	4	23	0.84%	0.84%	1.69%
	2 units	43	43	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	1300	1268	9	2	2	19	0.69%	1.77%	2.46%
	2 units	6	6	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	3	3	0	0	0	0	0.00%	0.00%	0.00%
Outside all MSAs	1 unit	32200	31504	258	55	27	356	0.80%	1.36%	2.16%
	2 units	465	463	0	1	0	1	0.00%	0.43%	0.43%
	3+ units	62	62	0	0	0	0	0.00%	0.00%	0.00%

Data: STACR Freddie Mac, as of 23 November 2021

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