

Macroeconomic Forecasts, 2Q2022
Domestic Metrics



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Summary

Is the United States in an economic recession? If not, will the US be entering a recession shortly -- and is that recession inevitable? Despite a low and stable unemployment rate, we are more pessimistic than optimistic about the state of the economy moving forward. We would argue that the economy is currently experiencing a growth recession (similar to the argument forwarded by Krugman following the 2008 housing crisis¹), and we've likely been in a growth recession since the start of the pandemic.

At the end of the day, however, it really doesn't matter if the US is in a recession; we are seeing the markets trying to regain a more solid footing. The inflationary trends are the result of supply chain issues and easy money policy by the Federal Reserve bank over the past two years. The Fed' is trying to solidify the market and push down on the inflationary trends by increasing the Federal Funds target rate. In doing so, the housing market is cooling (not imploding), and the equities market that had over-valued a large number of companies is pressing a proverbial "reset button". By pushing up the Fed Funds target rate, the Federal Reserve is trying to encourage more workers to enter back into the labor market. The fear of a recession (or the perception that the Fed' is moving out of fear) should be enough to create a little urgency in the portion of the labor market that has not re-entered the market after the pandemic.

We anticipate that a sizeable number of former workers will re-enter the market and push the unemployment rate up, which could signal the US entering into a recession. Although this seems to be circular logic, the US has the same technical indicators regardless of whether we are in a recession or heading for a recession:

- Inflation between 6% and 7% for the remainder of 2022 and falling towards 5% for 2023;
- Small increases in the unemployment rate moving from Q2 into Q3 and Q4;
- A cooling of the housing market (but not a re-setting to pre-pandemic prices);
- A cooling of the equities market (but not the dramatic drops we saw at the onset of the pandemic); and
- A re-evaluation of non-traditional assets (cryptocurrencies), and a re-invigoration of the bonds markets.

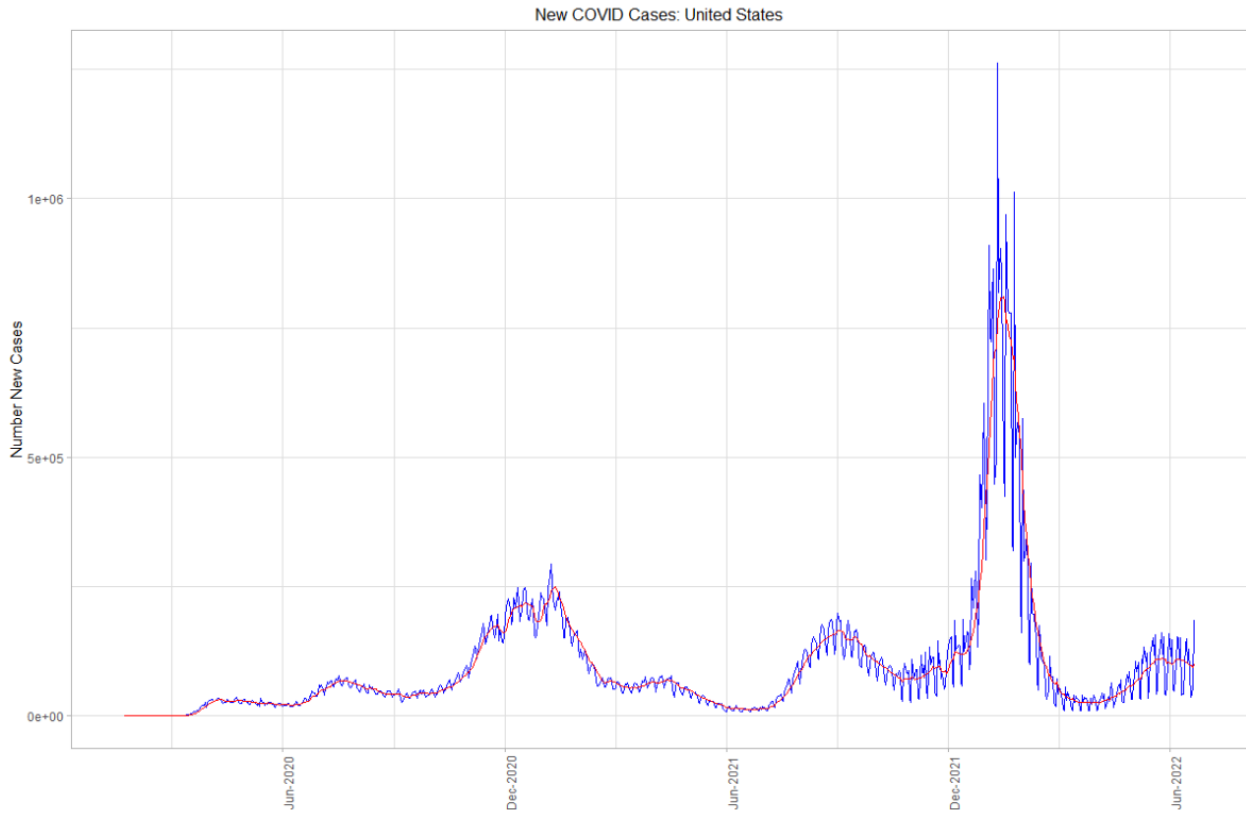
¹ See https://money.cnn.com/2008/03/14/news/economy/krugman_subprime.fortune/index.htm and <https://www.lobserveur.com/2020/05/16/kruman-what-did-we-learn-from-the-2008-financial-crisis-that-can-help-us-now/>

State of Affairs

For the last two years, we’ve started each report with an examination of the number of new COVID-19 cases and the trend of the 7-day moving average. (See Figure 1.) Although COVID is no longer front and center, it is important to keep an eye on this trend. However, we believe that the country is now operating in a “steady-state” situation where the number of new cases will be relatively stable for the foreseeable future (in the absence of a new variant or outbreak of a COVID related). Although COVID isn’t the front-page story of the current economic trends, it is one of the underlying causes (along with the conflict between Russia and Ukraine) of the issues that the country is experiencing.

Covid Trends

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

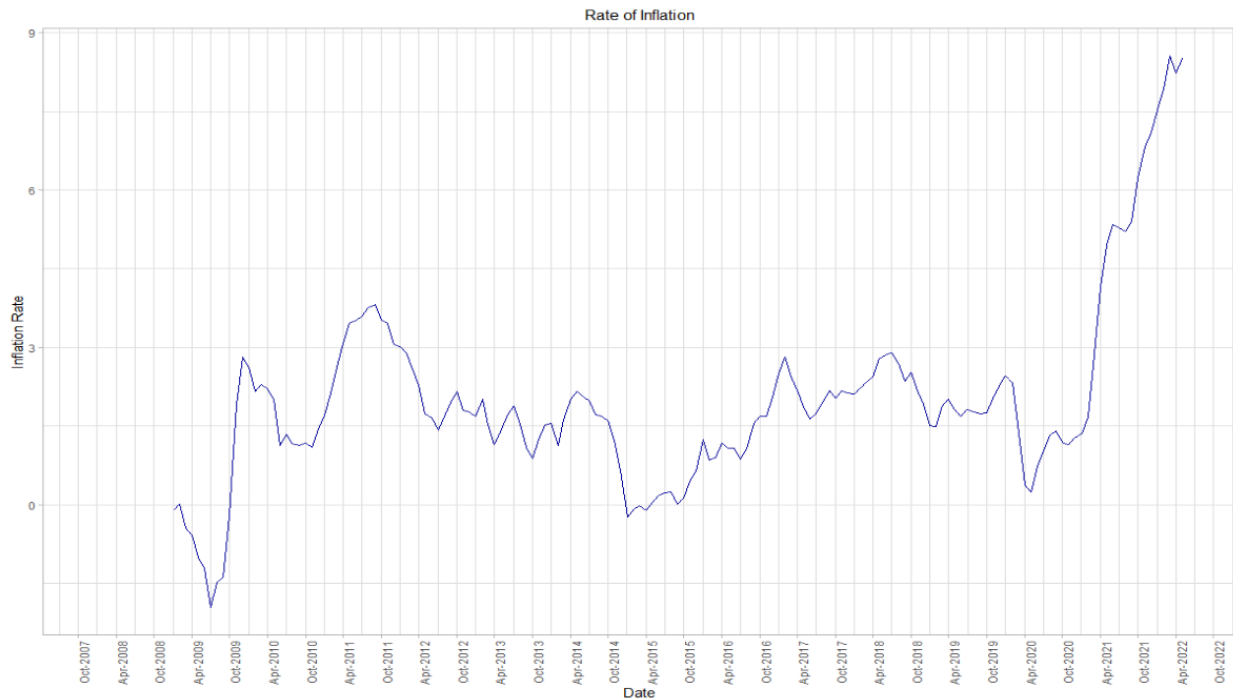


Source: Centers for Disease Control & Prevention (<https://www.cdc.org>): <https://covid.cdc.gov/covid-data-tracker>

Inflation

The primary concerns of the economy are related to inflation and the policy responses to inflation. We believe that consumers are acutely aware of the prices changes in three areas: energy², food³, and housing.

Figure 2: US Average Inflation



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

To paint the picture, the rate of inflation (as measured by annual changes in the CPI) is slightly over 8.0% annually. (See Figure 2.) Historically, this rate of inflation is the highest since near double-digit annual inflation in the early 1980’s that resulted from the OPEC oil embargoes and easy-money policy by the Federal Reserve Bank. The US experienced stable prices through the last three economic recessions (2001, 2008, and 2020). However, the supply-chain issues arising from the pandemic and the easy-money policy of the Federal Reserve Bank have created a petri dish for a period of extended high (above 3%) annual inflation.

Inflation: Fuel

Because fuel and food are two of the biggest components in consumer’s budgets, it is critical to understand the inflationary aspects of these areas. Table 1 highlights the issues that are troubling consumers – double-digit year-over-year inflation and near double-digit monthly inflation on gas prices.

² <https://www.bloomberg.com/news/articles/2022-06-09/gasoline-food-and-power-inflation-slam-us-households-and-it-could-get-worse>

³ *ibid*

Table 1: Average Gas Prices (per Gallon) in Selected States

	GA		FL		AL		AK	
	Regular	Diesel	Regular	Diesel	Regular	Diesel	Regular	Diesel
Average 6.22.2022	\$4.44	\$5.53	\$4.74	\$5.70	\$4.54	\$5.62	\$4.49	\$5.40
Average 6.15.2022	\$4.50	\$5.55	\$4.87	\$5.72	\$4.62	\$5.64	\$4.54	\$5.33
Average 5.22.2022	\$4.14	\$5.26	\$4.48	\$5.57	\$4.30	\$5.36	\$4.12	\$5.23
Average 6.22.2021	\$2.90	\$3.09	\$2.94	\$3.10	\$2.79	\$3.02	\$2.77	\$3.04
M/M % Change	7.1%	5.1%	5.9%	2.2%	5.6%	4.9%	9.1%	3.4%
Y/Y % Change	53.1%	78.8%	61.3%	83.8%	62.7%	86.2%	62.2%	77.4%

	LA		MO		MS		TX	
	Regular	Diesel	Regular	Diesel	Regular	Diesel	Regular	Diesel
Average 6.22.2022	\$4.49	\$5.37	\$4.64	\$5.37	\$4.46	\$5.37	\$4.61	\$5.31
Average 6.15.2022	\$4.55	\$5.34	\$4.68	\$5.28	\$4.52	\$5.36	\$4.69	\$5.27
Average 5.22.2022	\$4.24	\$5.17	\$4.16	\$5.16	\$4.18	\$5.18	\$4.29	\$5.16
Average 6.22.2021	\$2.72	\$2.91	\$2.75	\$2.96	\$2.72	\$2.91	\$2.74	\$2.91
M/M % Change	5.9%	3.9%	11.6%	4.1%	6.6%	3.6%	7.5%	2.9%
Y/Y % Change	65.1%	84.4%	68.8%	81.3%	64.1%	84.7%	68.0%	82.2%

Source: <https://gasprices.aaa.com/>

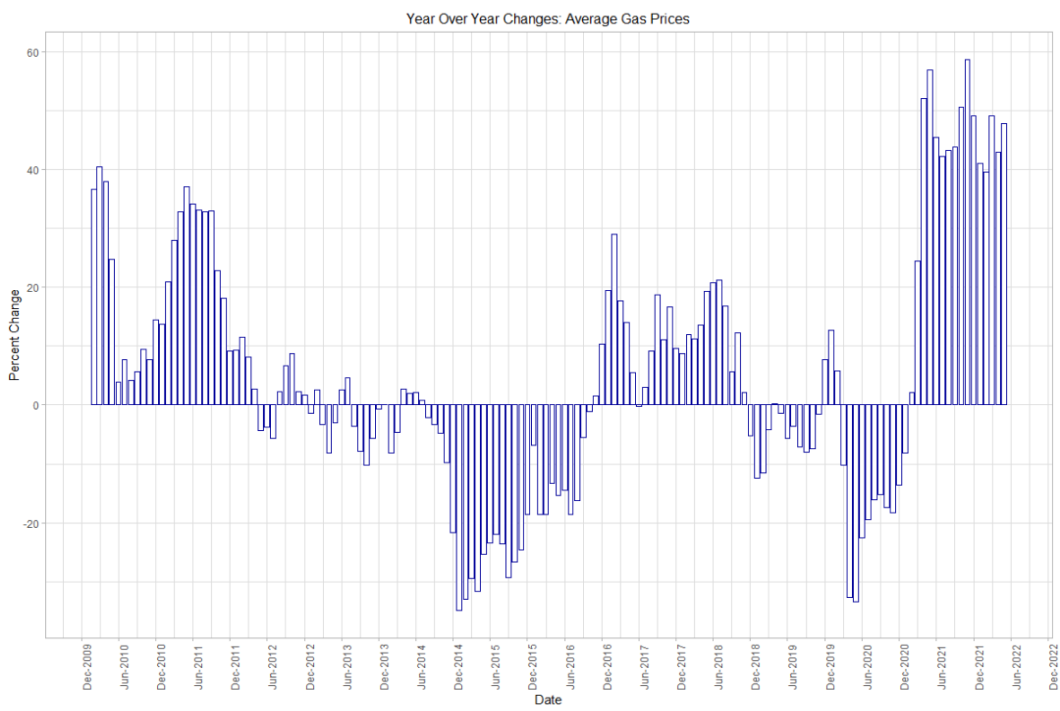
In past recessions (the 2008 recession, in particular), the drop in gas prices might have been considered a tax-break of sorts. But, because miles driven by consumers decreased so dramatically at the start of the pandemic (down more than 40% between February 2020 and April 2020⁴), the decrease in gas prices at the start of the pandemic likely didn’t resonate as a true savings. In contrast, the current increase in gas prices is occurring while vehicle travel miles⁵ and airline passenger miles⁶ are increasing. The current year-over-year increase in average gas prices per gallon (Figure 3) is eclipsing the inflation for gas prices following the 2008 recession by nearly 50%. This increase in gas prices is fueling (pun intended) the overall inflation rate.

⁴ See <https://fred.stlouisfed.org/series/TRFVOLUSM227SFWA>

⁵ Ibid

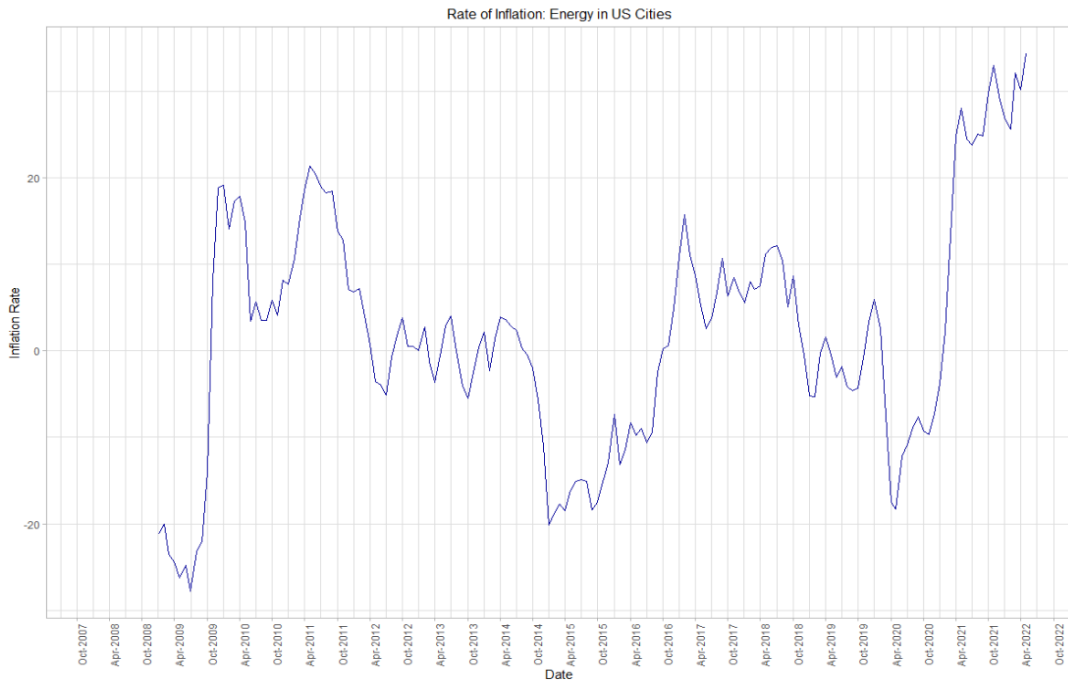
⁶ See <https://fred.stlouisfed.org/series/RPMD11>

Figure 3: Y/Y Percent Change in Retail Gasoline Prices (Reg. Unleaded)



Source: https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=emm_epm0_pte_nus_dpg&f=m

Figure 4: US Average Inflation, Energy in US Cities



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

The rate of year-over-year inflation for energy (shown in Figure 4) has been bouncing between 25% and 35% for the last 16 months. Because the energy and fuel portion of consumer's budget is considerably price inelastic in nature (recent estimates suggest the price elasticity of demand for gasoline is between -0.27 and -0.35⁷), the increase in energy and gasoline prices contribute significantly to the overall inflation rate.

The US Government's recent responses to fuel inflation have included

- Releasing fuel from the strategic oil reserves⁸;
- Suggestion of creating a Federal Tax Holiday on gas taxes⁹;
- Suggestion (or creating) State Tax Holidays on gas taxes¹⁰; and,
- Putting "pressure" on petroleum companies to lower profit expectations¹¹.

All of these policies are more for "show" than for substance; there is little evidence that any of these policies will impact the prices or price-trajectories for gasoline.

Inflation: Food

Although food inflation is not as high as gas-price inflation, the US is experiencing the highest year-over-year food price inflation seen since 1980 (~10% annual inflation). (See Figure 5.) These prices are being driven by increased prices in meat and poultry¹² and less so from changes in prices of corn and other crops¹³. The supply-chain issues that the US experienced early in the pandemic, from meat-processing closures¹⁴ to trucking and logistics¹⁵ issues have continued to cause disruptions in the food supply chain, increasing production and transportation costs and contributing to overall inflationary trends. Unlike the issues concerning the gas industry, the US Government has fewer ways to address these inflationary issues.

⁷ <https://www.dallasfed.org/research/economics/2020/0616>

⁸ <https://www.cnbc.com/2022/03/31/us-to-release-1-million-barrels-of-oil-per-day-from-reserves-to-help-cut-gas-prices.html>

⁹ <https://www.kiplinger.com/taxes/604395/gas-tax-holiday>

¹⁰ <https://budgetmodel.wharton.upenn.edu/issues/2022/6/15/effects-of-a-state-gasoline-tax-holiday>

¹¹ <https://www.nytimes.com/2022/06/15/business/biden-oil-companies-gas-prices.html>

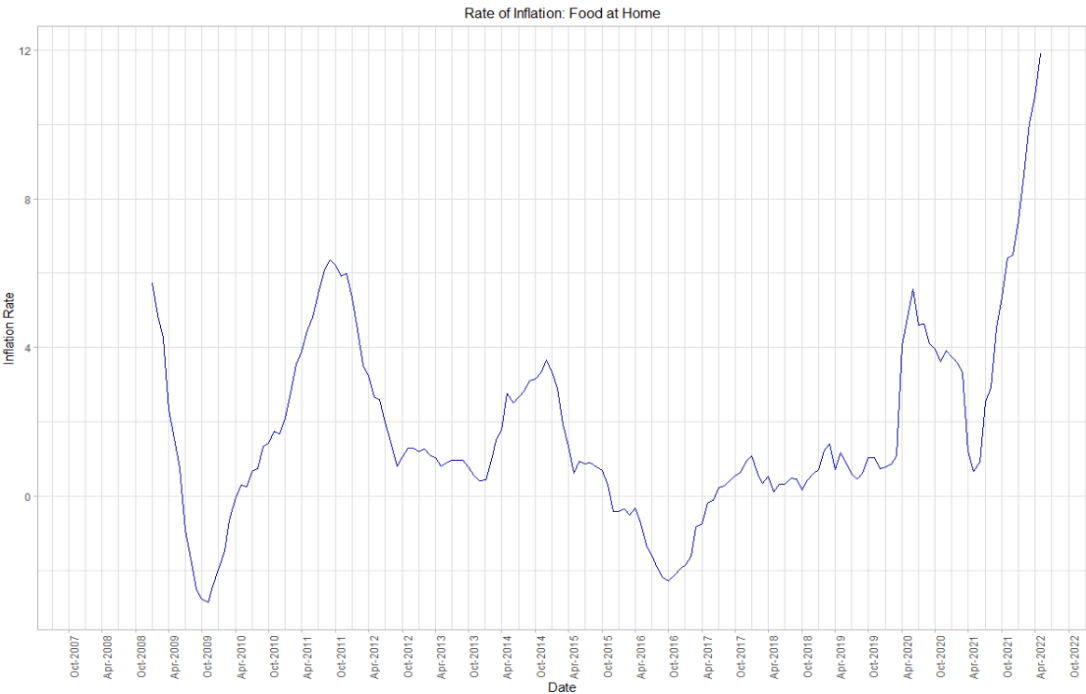
¹² <https://gro-intelligence.com/insights/a-look-at-rising-food-inflation>

¹³ *ibid*

¹⁴ <https://www.cnn.com/2020/04/26/business/meat-processing-plants-coronavirus/index.html>

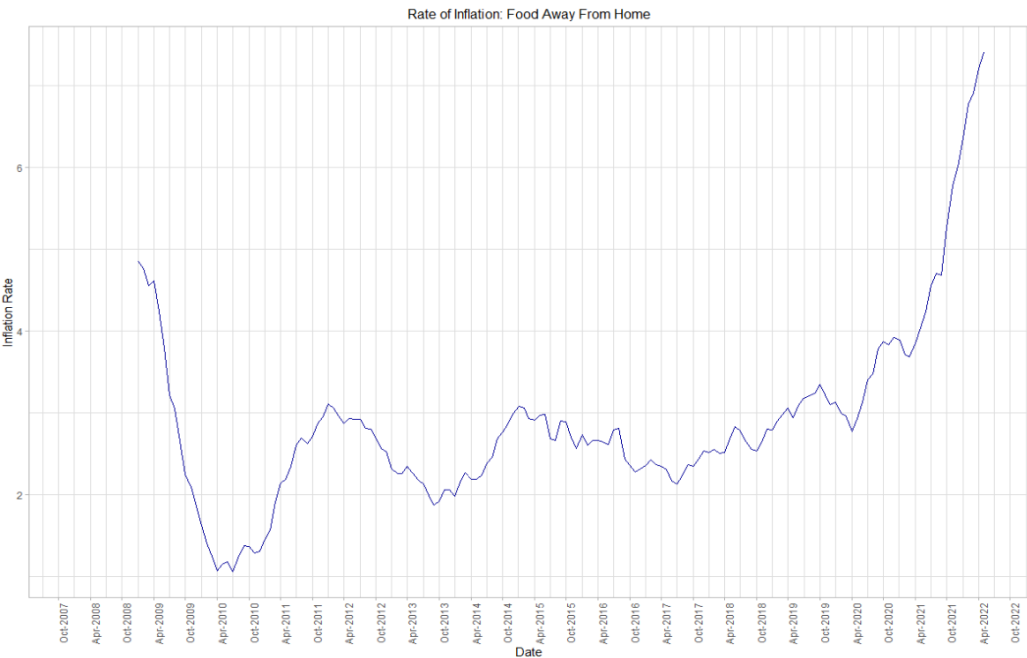
¹⁵ <https://www.redwoodlogistics.com/five-challenges-in-food-and-beverage-supply-chains/>

Figure 5: US Average Inflation, Food (at home)



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

Figure 6: US Average Inflation, Food (away from home)



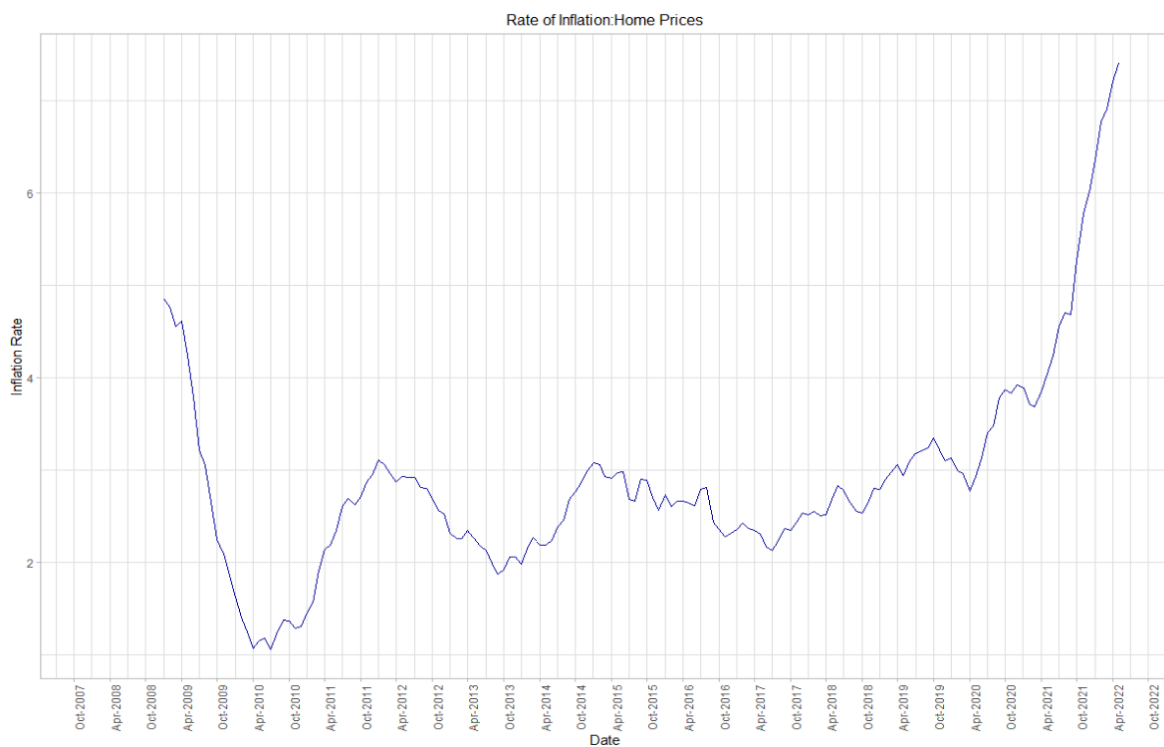
Source: Federal Reserve Economic Database (<https://fred.stlouisfed.org/>)

The price inflation of food away from home (restaurant meals) is smaller than that for food consumed in home. (Figure 6) In 1980, the US experienced year-over-year inflation for food away from the home at rates above 10%. Today’s availability of less-expensive “fast food” options in the US creates a system with slightly less upward pressure (when compared to 1980’s environment), and lower inflationary rates relative to food in the home. Regardless, this type of inflation has a significant negative impact on consumer’s budgets.

Inflation: Housing

Since early in the pandemic the US has seen an upward spike in the price of single-family housing units. (Figure 7) The year-over-year inflation for housing is now hovering between 7 and 8%. The figure above uses the Case-Shiller home price index to estimate annual inflation for single-family housing units. The recent increase in the Federal Funds rate target is likely to push down the quantity demand for residential housing and will, within the next quarter, start pushing down the inflationary trend for housing.

Figure 7: US Average Inflation, Residential Housing Prices



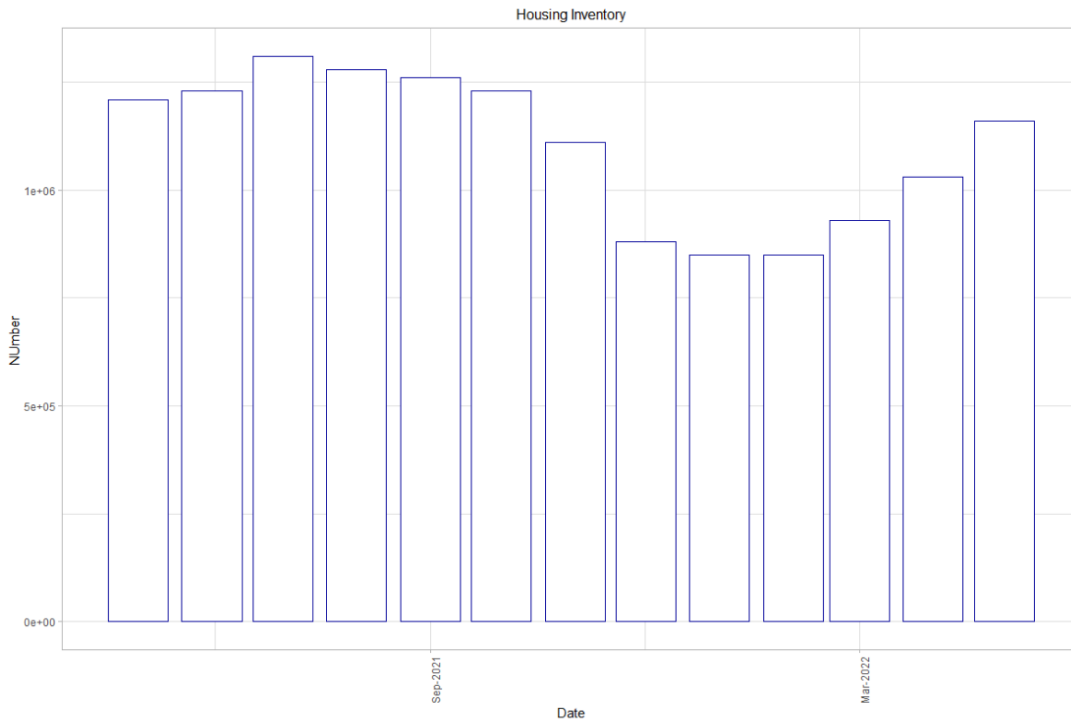
Source: Federal Reserve Economic Database (<https://fred.stlouisfed.org/>)

We have already seen an uptick in the housing inventory (after the Federal Reserve started its hawkish interest rate changes in March 2022); this trend is likely to continue as the Federal Reserve Bank has indicated¹⁶ that its interest rate target changes will be in 50 bp to 75 basis point range for the next few

¹⁶ <https://www.businessinsider.com/federal-reserve-interest-rate-hikes-double-sized-future-meetings-powell-2022-5>

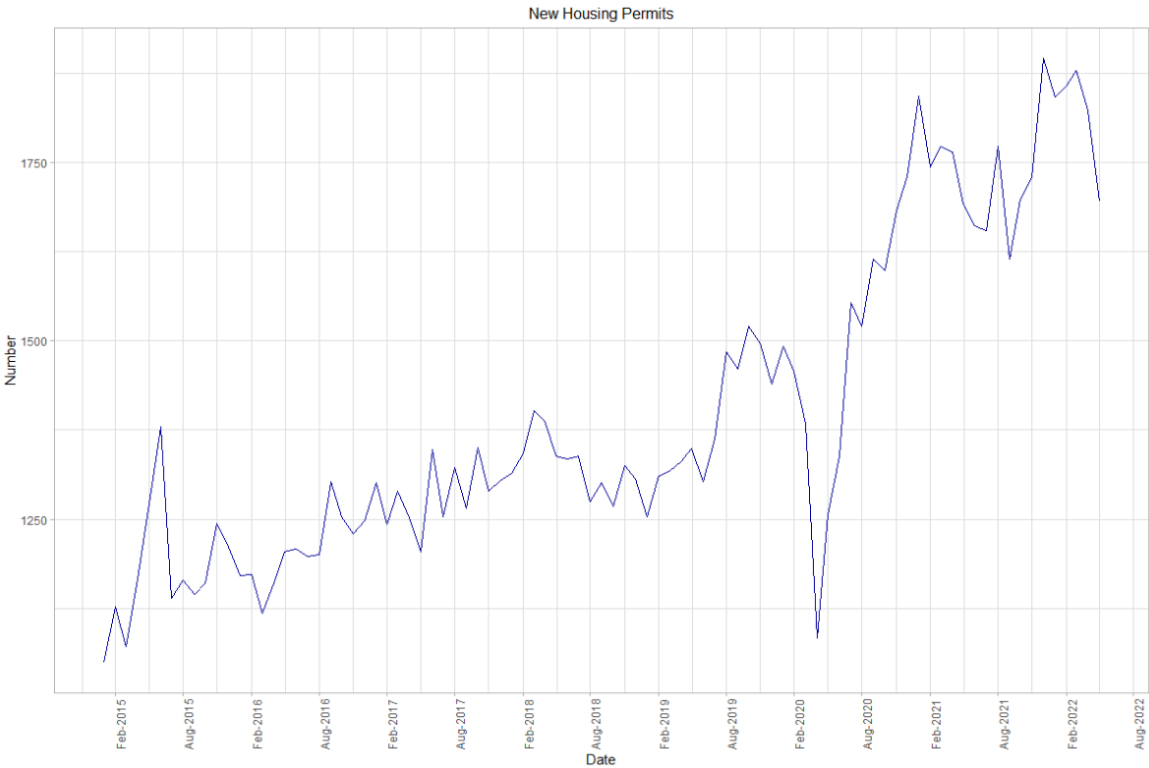
Fed meetings. The uptick in inventory (existing homes, see Figure 8) is coinciding with a decrease in new-home permits (Figure 9). The increase in the interest rates will hit consumers interested in acquiring a home mortgage and developers who need to secure financing for new home projects. The down tick in new building permits could fuel another round of high prices, but the increase in inventory and the higher mortgage rates will slow demand and ultimate aid in stabilizing prices. We are unlikely to suffer from a repeat of the housing bubble we saw in 2008. Instead, we believe that a housing “soft landing” is most likely to occur.

Figure 8: US Housing Inventory



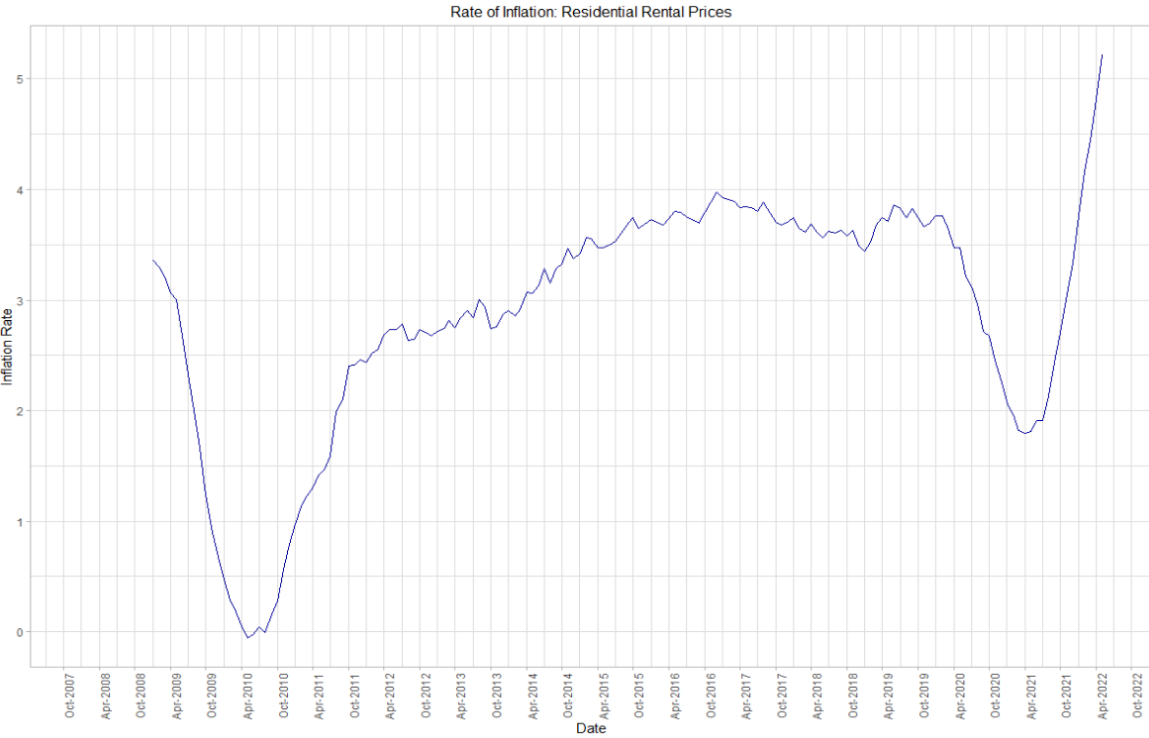
Source: Federal Reserve Economic Database (<https://fred.stlouisfed.org/>)

Figure 9: US New Housing Construction Permits



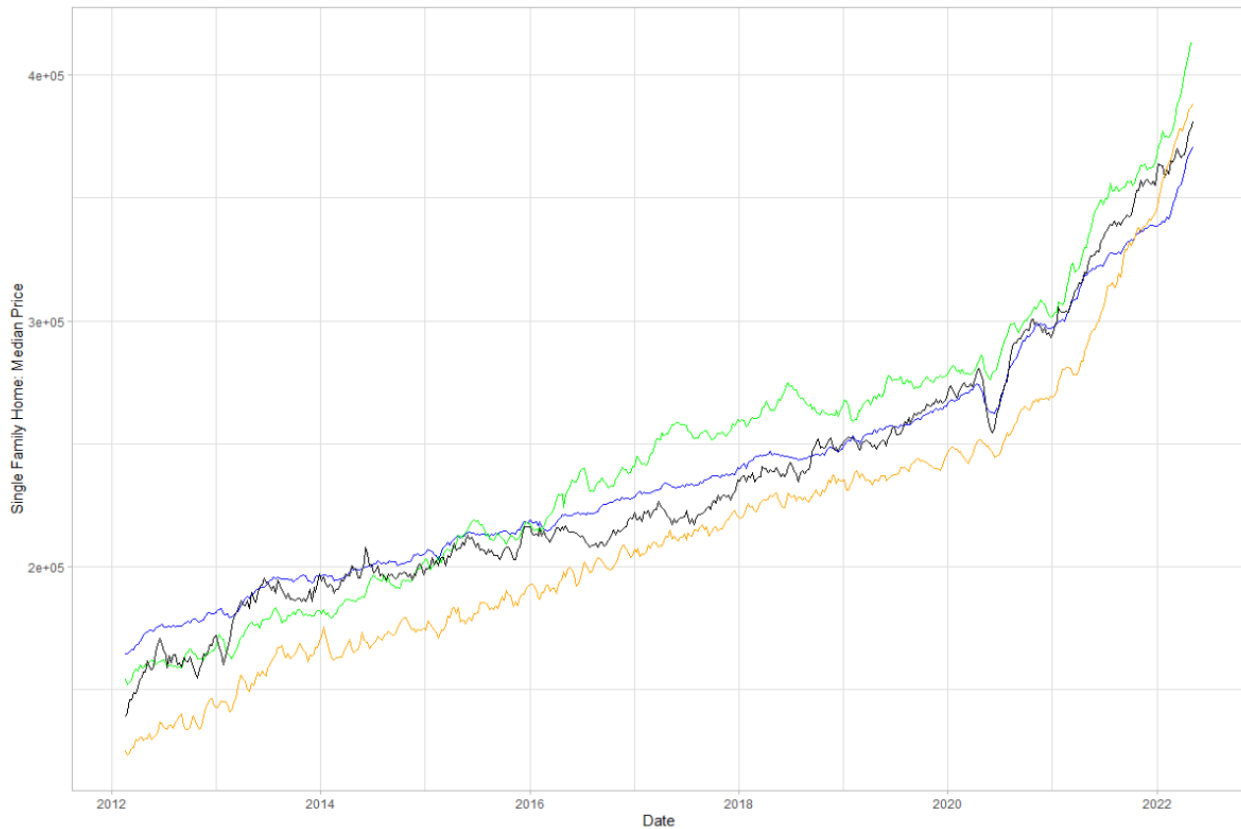
Source: Federal Reserve Economic Database (<https://fred.stlouisfed.org/>)

Figure 10: US Average Inflation, Residential Housing Rent



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

Figure 11: Median Single Family Residence Price, US National Average and Selected Cities



Source: Zillow.com

Figure 11 shows the median price for single family residences (SFR) for the United States (blue), Dallas Fort Worth, TX (green), Atlanta (black) and Tampa Bay, FL (orange). These data are only available through April 30, 2022, so they do not reflect the changes in the market after the Federal Reserve Bank’s policy moves in May and June, 2022. The rapid increase in the median price of SFRs is one of the contributors to the inflationary trend of the US. We will monitor this metric closely in the next quarter and identify the inflection point of the housing market.

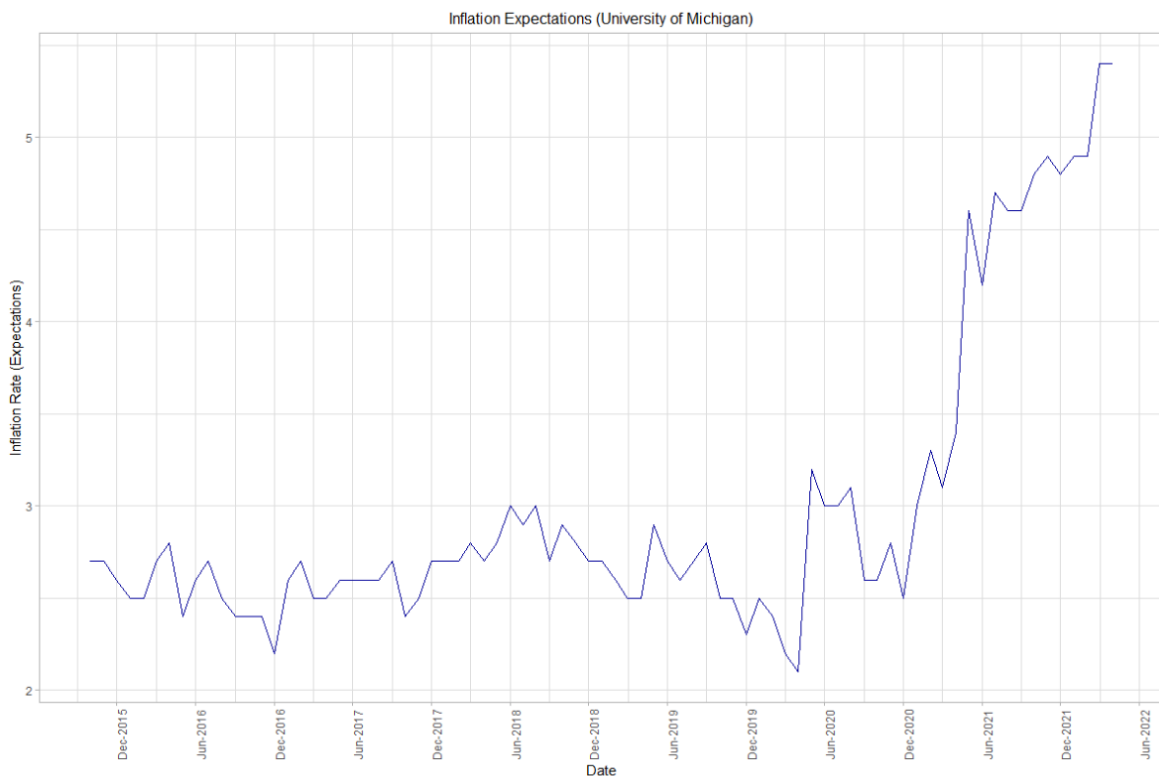
Recent discussions with real estate agents and brokers suggest that the housing market is making small moves towards the pre-pandemic state. It is important to note that the housing market does not appear to be heading towards a 2008-type housing crisis or re-set. We are seeing the following adjustments:

- Inventories are up (although just slightly);
- New home permits are falling;
- Pricing increases are slowing down (current prices are not falling; they are increasing at a slower rate); and,
- Mortgage defaults are not significantly increasing.

Inflation: Summary

Consumers are well aware of the inflationary trends of the US. The inflationary expectations (Figure 12 and Figure 13) suggest that consumers have anticipated that inflation will start to level off. This is probably less reflective of an awareness of how Federal Reserve Bank policies work and more a reflection that consumers have heard that an increase in interest rates “should” tap down inflationary trends. The Fed’s policy has been broadly covered, by media sources on the left and right sides of the isle (see CNN¹⁷, Fox¹⁸, and Newsmax¹⁹); consumers have been alerted to these policies and range of outcomes stemming from these policies (a recession²⁰). Perhaps because of these revelations (or because consumers are having difficulties with their budgets), consumer confidence in the economy has continued to decline. (See Figure 14.) There is a small rebound at the end of the consumer-confidence series – a re-examination of this trend in a quarter will be needed to know if this is a new trend or a micro-movement in a continued downward trend.

Figure 12: US Consumer Inflation Expectations



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

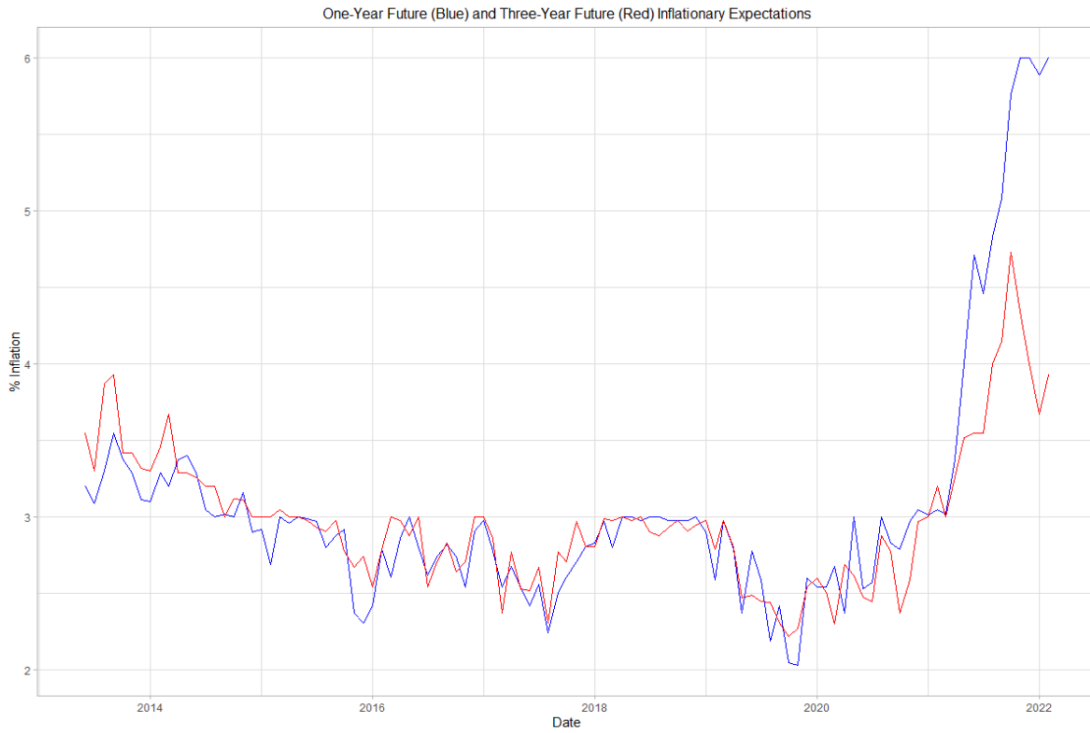
¹⁷ <https://www.cnn.com/2022/06/15/economy/fed-rate-hike-decision-june/index.html>

¹⁸ <https://www.foxbusiness.com/economy/fed-could-break-economy-aggressive-rate-hike-campaign-analyst-says>

¹⁹ <https://www.newsmax.com/finance/streettalk/federal-reserve-75-basis-point-rate-hike-inflation-jerome-powell-recession/2022/06/15/id/1074589/>

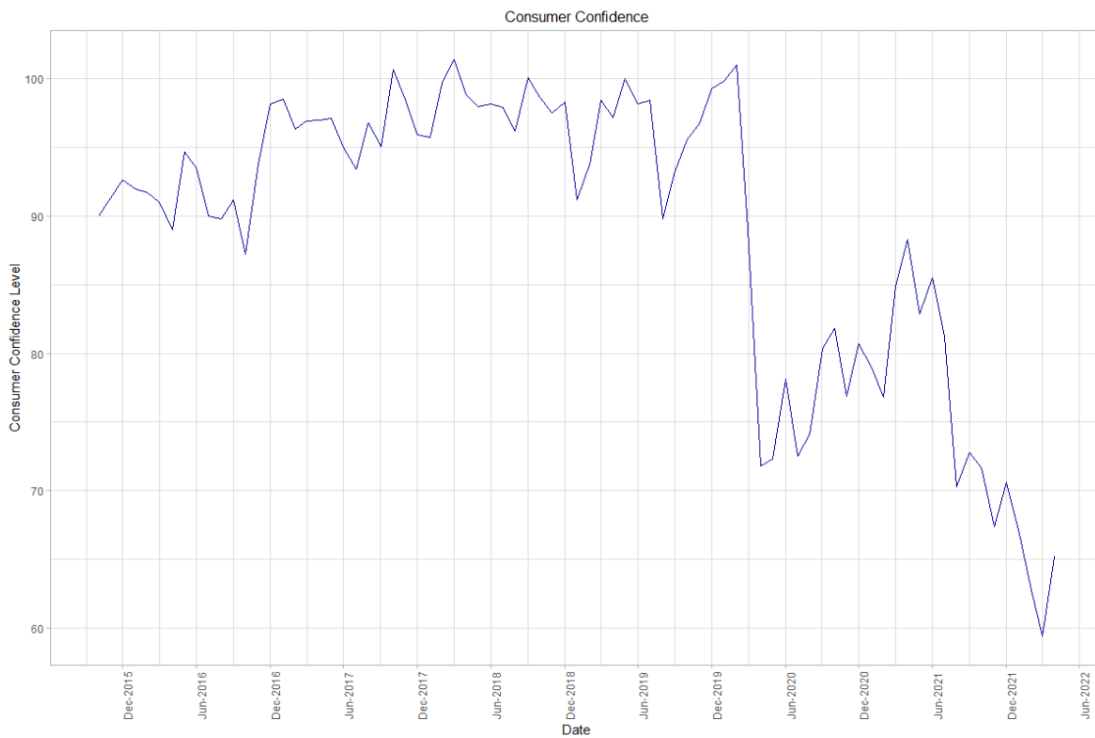
²⁰ Supra 16, 17, and 18

Figure 13: US Consumer Inflation Expectations, One Year and Three Year



Source: <https://www.newyorkfed.org/microeconomics/sce#/inflexp-1>

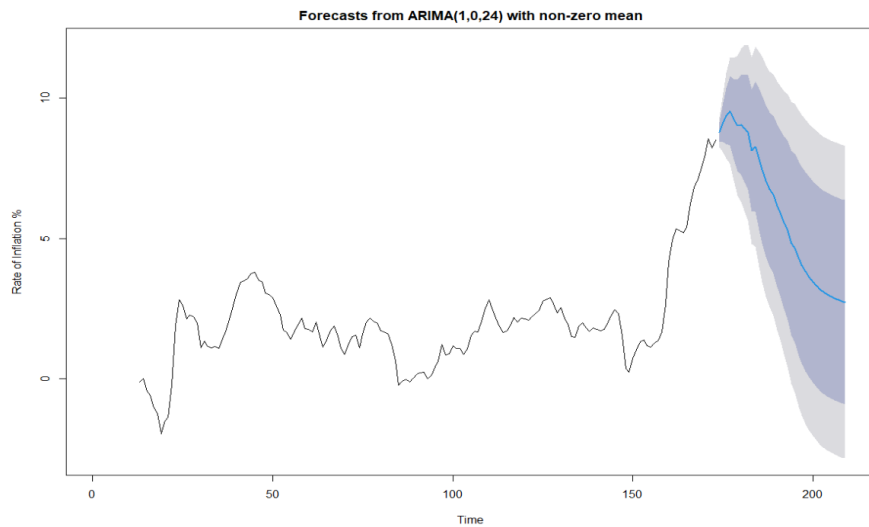
Figure 14: US Consumer Confidence



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

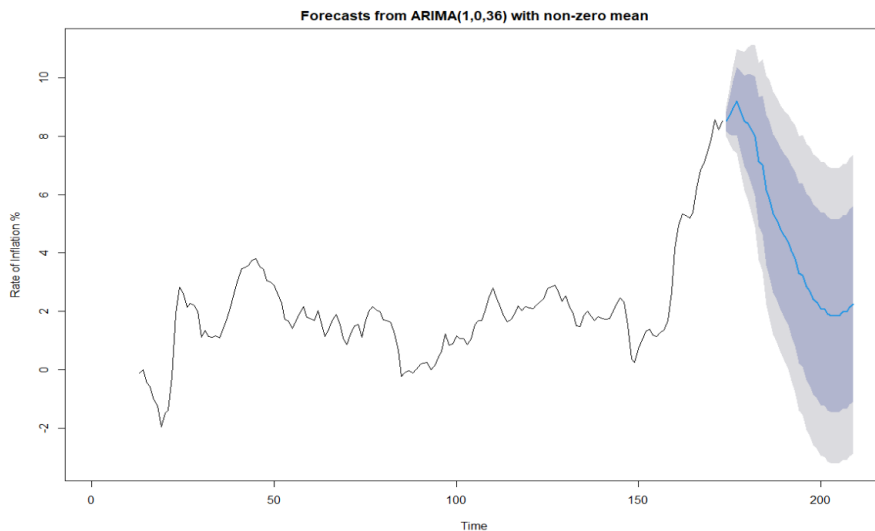
Our models for forecasting inflation are suggesting additional upticks in inflation (depending on the time horizon) followed by a longer period of downward pressure on prices. (See Figure 15 and Figure 16.) We agree that the Fed’s interest-rate policies in the first two quarters of 2022 (with emphasis on the last 10 weeks) have been very hawkish. The aggressive policy of the Fed’ is, perhaps, a little over-due (considering we were anticipating Fed policy moves in January and February of 2022). The 50 bp move followed by the 75 bp move are aimed at altering the course of inflation. We anticipate that this move will have the desired effect, pushing prices down. We are unsure, however, as to the magnitude of the Fed’s next policy move (a 50 bp move versus a 75 bp move). The Fed is telegraphing its move by suggesting it will increase target rates by another 50 or 75 bp. The Fed has acknowledged that this approach may cause an economic recession (with a best outcome of a “soft landing”).

Figure 15: 24-month ARIMA Model for US Inflation



Source: Authors’ calculations based on CPI

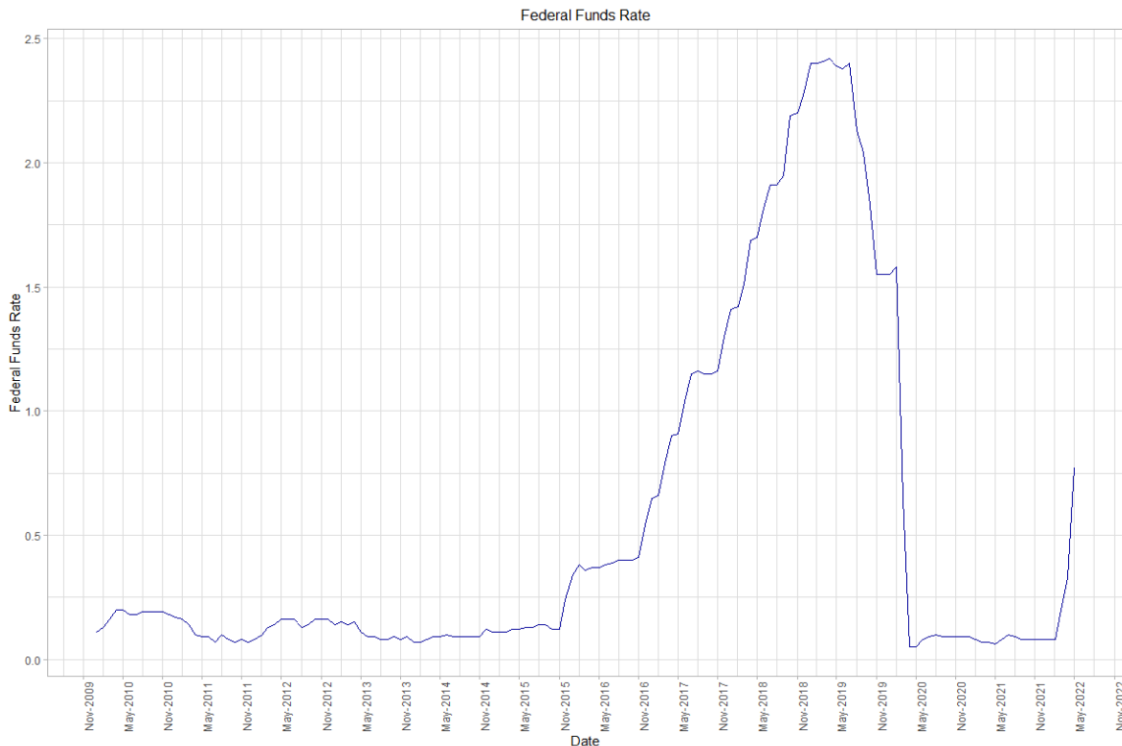
Figure 16: 36-month ARIMA Model for US Inflation



Source: Authors’ calculations based on CPI

It is important to note that **an** increase in the Federal Funds rate target was entirely anticipated. But, the timing of the Fed’s moves (zero moves in January or February followed by a small increase in March) have created a bit more of a “buzz” about the Fed’s policies and the likelihood that the Fed could push the economy into a recession. The rate of the Fed’s target increases are larger than the Fed’s increases starting in 2015. (Figure 17)

Figure 17: US Federal Funds Rate

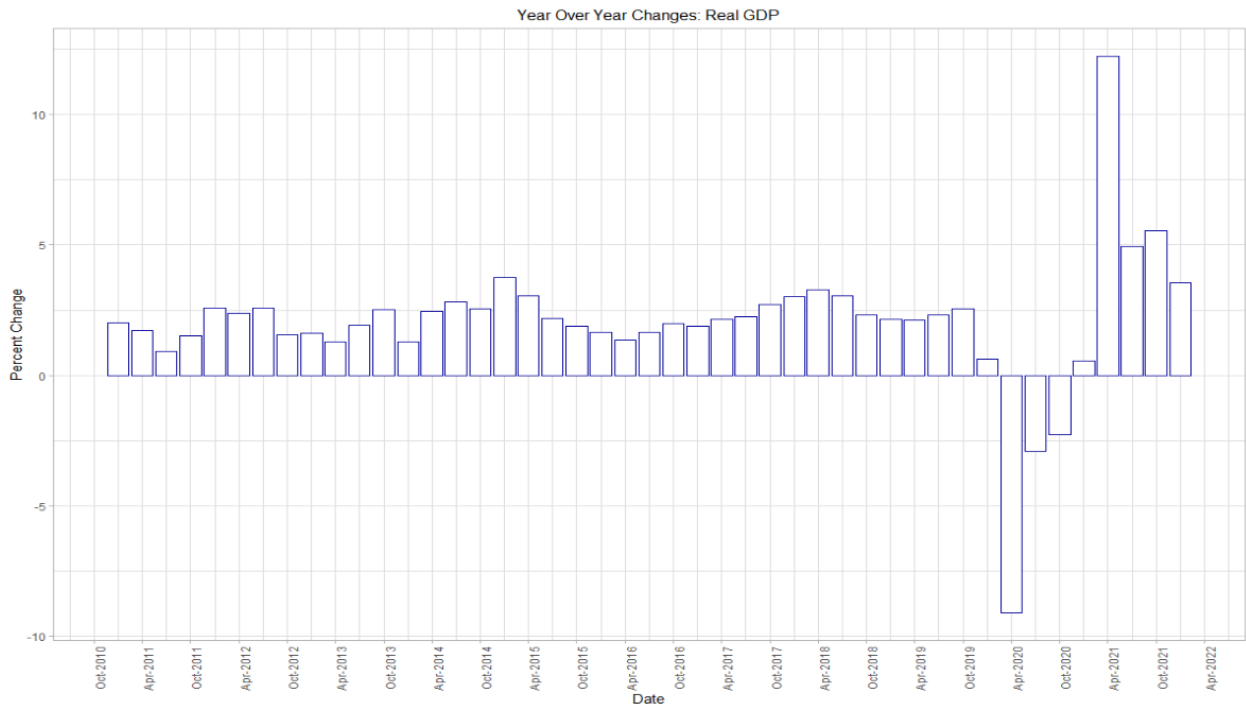


Source: Federal Reserve Economic Database (<https://fred.stlouisfed.org>)

Macroeconomic Indicators: Other

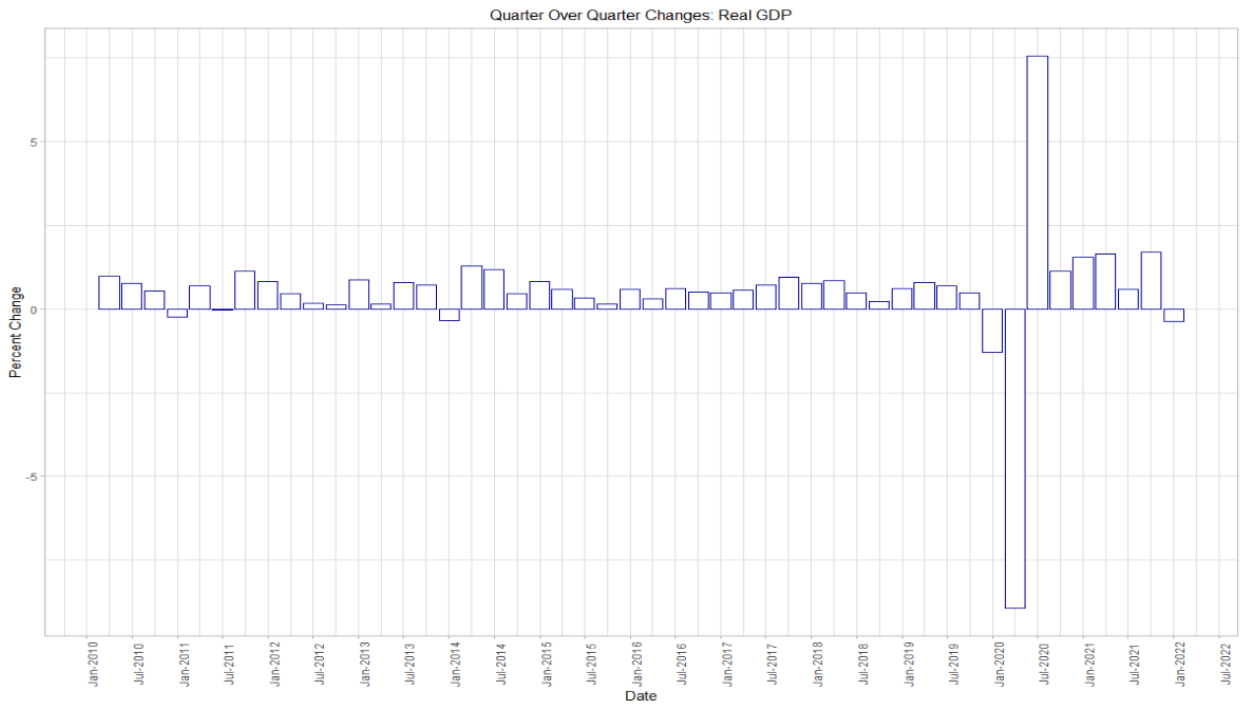
The Real GDP of the US is still growing, although we did experience a negative quarter-over-quarter growth for the real GDP between 4Q2021 and 1Q2022. (See Figure 18 and Figure 19.) The size of this negative growth is comparable to what we saw in this same period in 2011 and 2014 and shouldn’t be a concern by itself. When we look at this trend in conjunction with the high inflationary element of the economy, however, this **could** be a signal that the economy is starting to trend into recessionary territory.

Figure 18: Y/Y Percent Change in US Real GDP



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

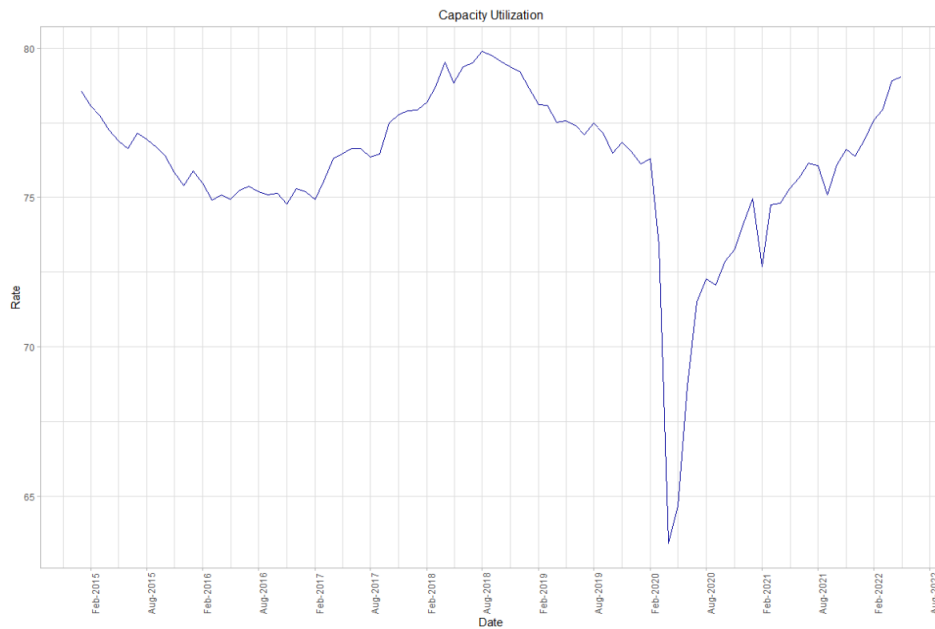
Figure 19: Q/Q Percent Change in US Real GDP



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

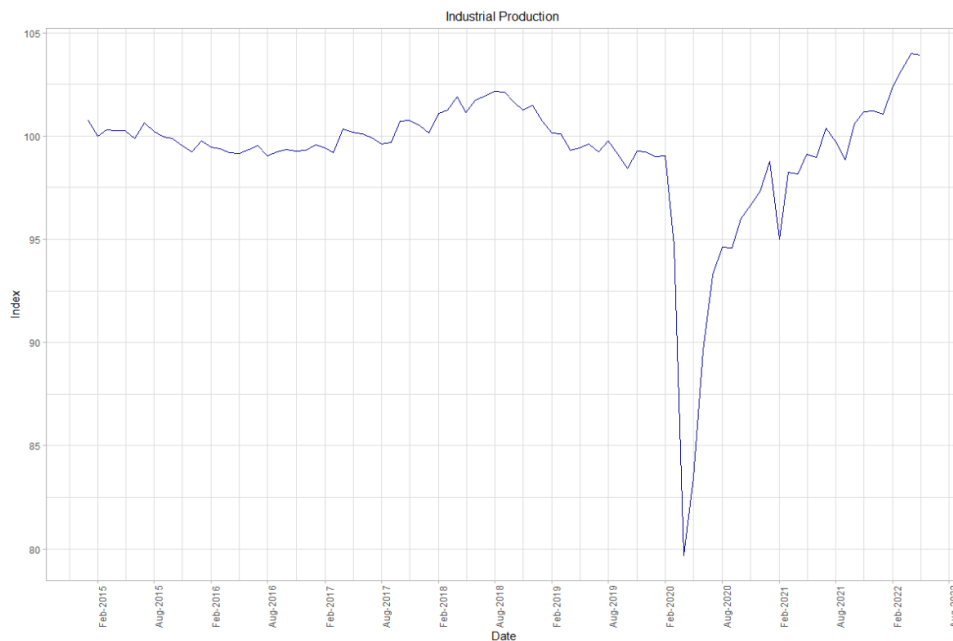
Figure 20 and Figure 21 identify capacity utilization and industrial production. Both of these trends show a slight “leveling” of the previous upward trend. Again, it is not clear at this point if these are showing a real plateau or just micro-corrections in the overall trend.

Figure 20: Capacity Utilization



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

Figure 21: Industrial Production Index

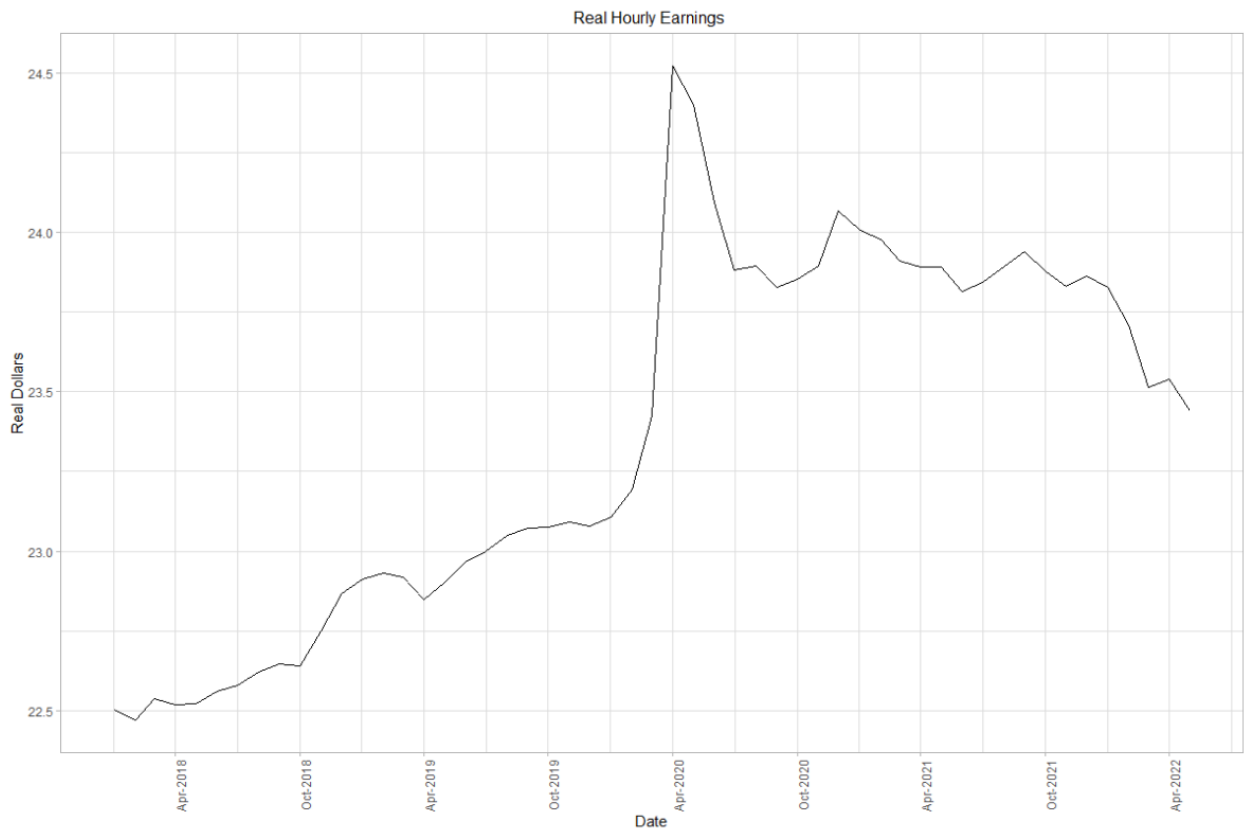


Source: Federal Reserve Economic Database (<https://fred.stlouisfed.org>)

Inflations & Real Wages

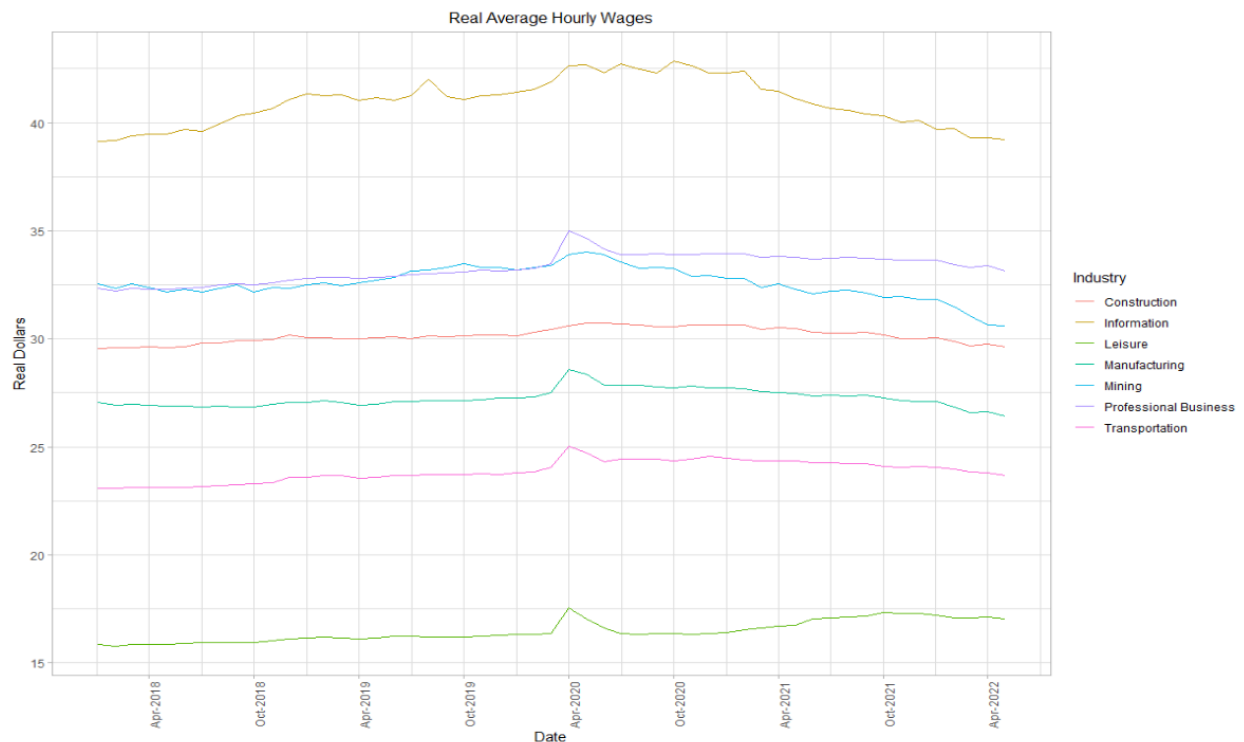
Figure 22 and Figure 23 show the real wages and the real wages by industry. The real wages for the US as a whole have shown a continued downward trend. Although nominal wages are increasing slightly, the buying power of those wages have decreased extensively as a result of the near double-digit inflation. Except for the leisure sector and professional businesses, which have only decreased slightly between 4Q2021 and 1Q2022, the other sectors have experienced a downward trend in real compensation.

Figure 22: Real Hourly Wages (Nationwide)



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

Figure 23: Real Hourly Wages for Select Industries (Nationwide)



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

Unemployment and Labor Force Participation

Although the current unemployment rate (3.6%) is nearly as low as the month before the start of the pandemic (3.5%, see Figure 24), the employment situation is still unstable and is a continued cause for concern. The labor force participation rate (Figure 25) has continued to fall behind where the US economy was prior to the start of the pandemic. The differences in the labor force participation rate across genders and races (Figure 26) shows that only black men and Hispanic men have surpassed their participation rates prior to the pandemic.

We do believe that with the fear of the US slipping into a recession and the declines in the equities and crypto currency markets we are going to see an increase in the labor force participation rate. Recent stories of rescinded job offers by Tesla²¹, Coinbase²², Twitter and Redfin²³, and layoffs by Peloton²⁴ and other companies, are likely to push “potential” employees (those on the fence) back into the labor market. The labor market participants have continued to be stubborn; we anticipated that “former” labor market participants would have made their re-entrance into the market after the omicron variant. The concern for this market, however, is that labor market hold-outs will enter back into the market as the economy is falling into a recession. In this case, the labor demand will be falling just as labor supply starts to uptick. This wouldn’t be a surprise given how asynchronous and “out-of-step” the labor market seems to be.

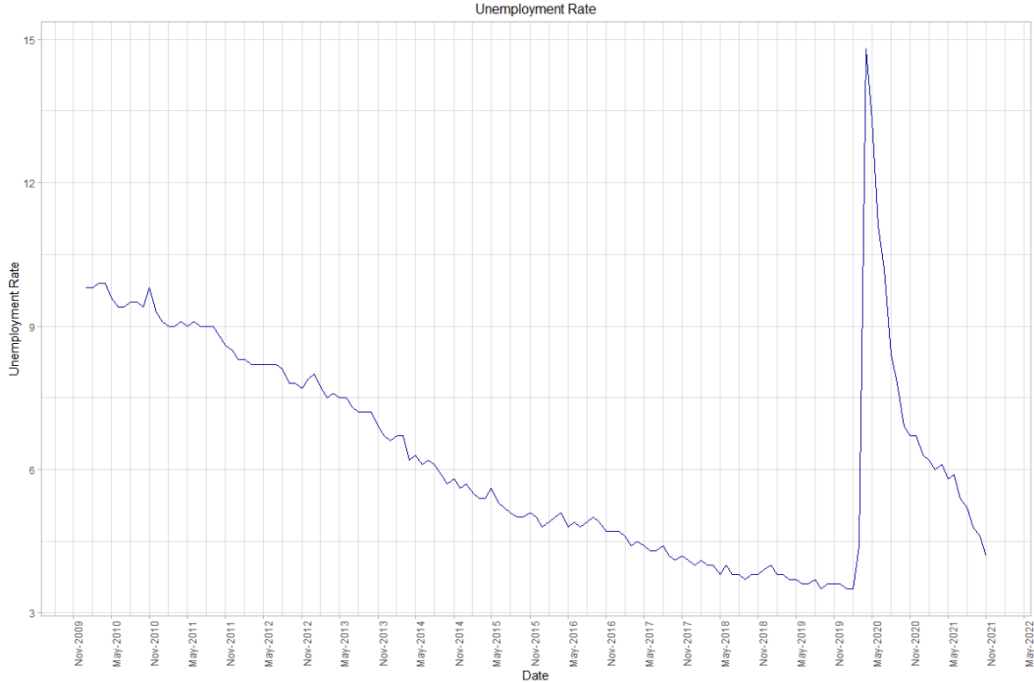
²¹ <https://www.marketwatch.com/amp/story/tesla-reportedly-lays-off-200-from-autopilot-unit-rescinds-some-job-offers-11656458622>

²² <https://www.businessinsider.com/coinbase-rescinded-job-offers-leaving-new-grads-in-tech-scrambling-2022-6>

²³ <https://www.wsj.com/articles/more-companies-start-to-rescind-job-offers-11655865283>

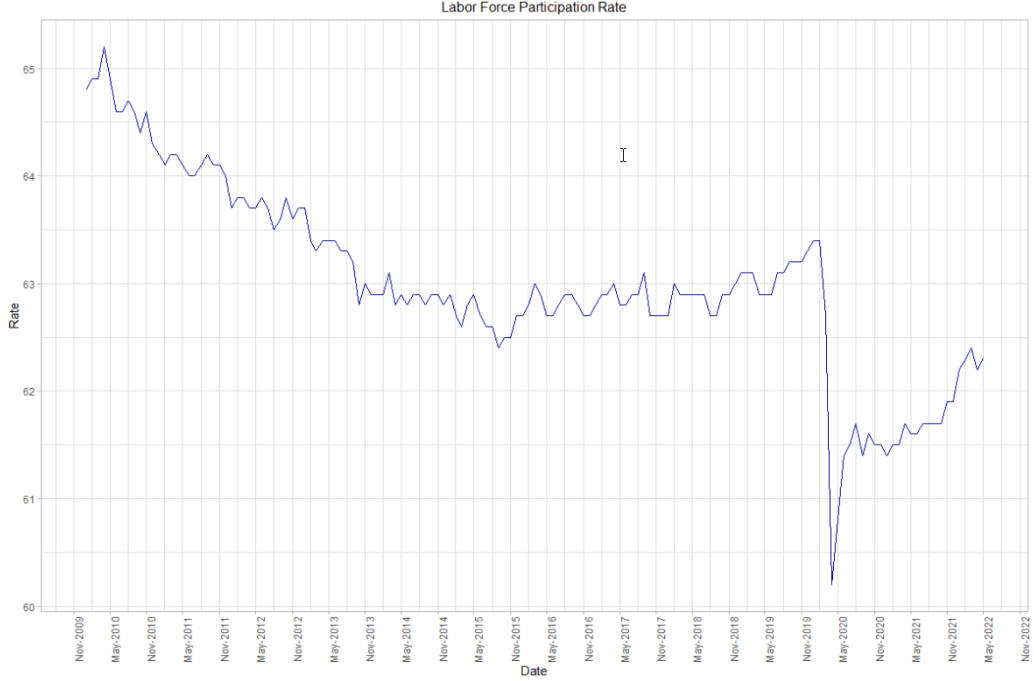
²⁴ <https://www.protocol.com/workplace/peloton-warehouse-workers-layoffs-concerns>

Figure 24: US Average Unemployment Rate



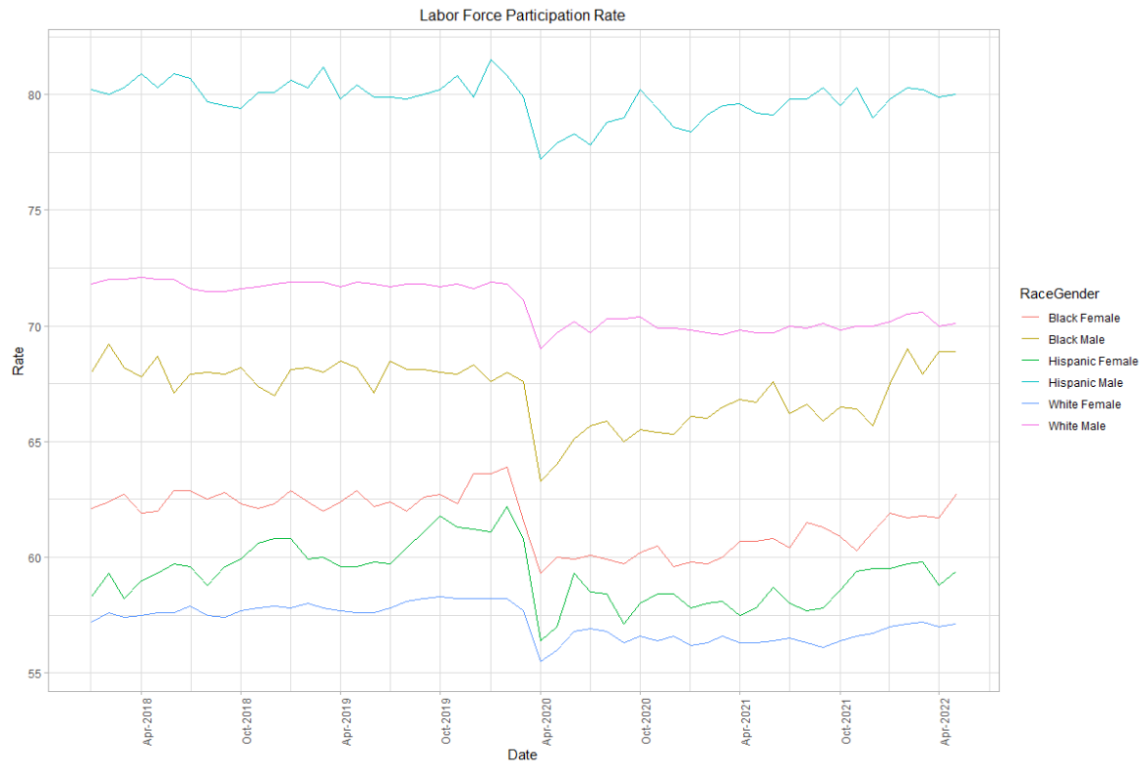
Source: Federal Reserve Economic Database (<https://fred.stlouisfed.org>)

Figure 25: US Average Labor Force Participation Rate



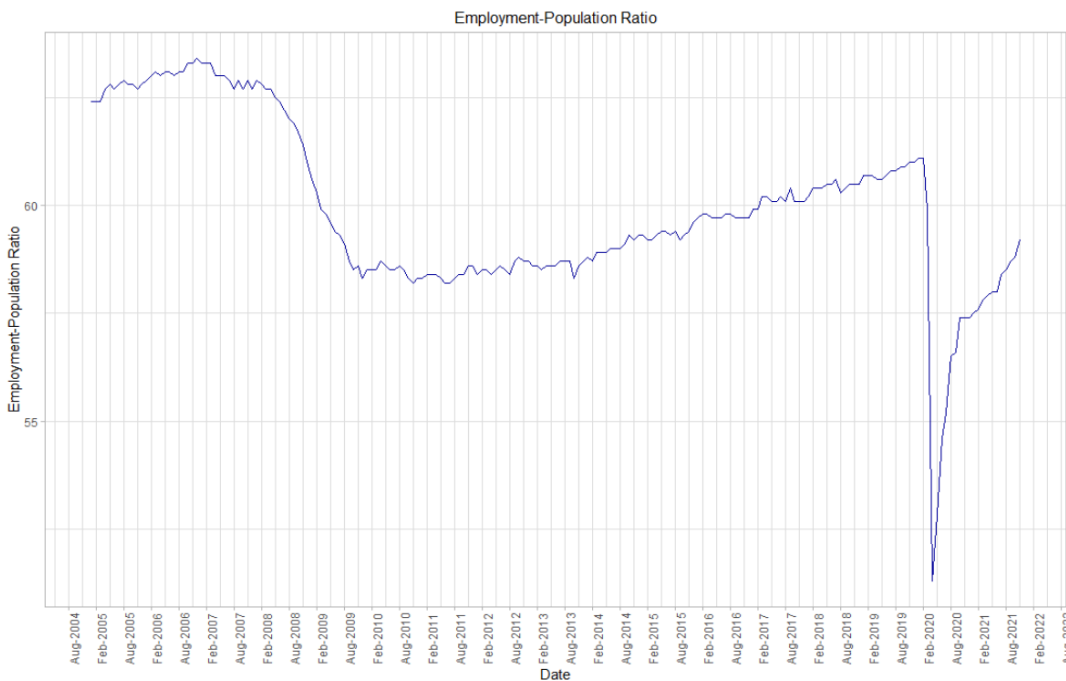
Source: Federal Reserve Economic Database (<https://fred.stlouisfed.org>)

Figure 26: US Average Labor Force Participation Rate by Gender and Race



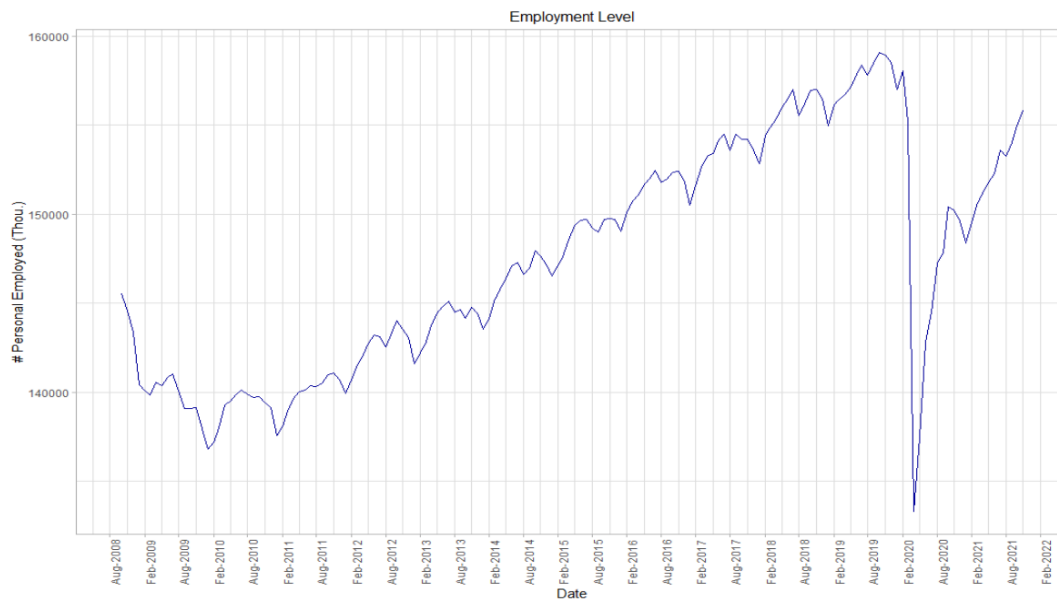
Source: Federal Reserve Economic Database (<https://fred.stlouisfed.org>)

Figure 27: US Average Employment to Population Ratio



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

Figure 28: US Average Employment Level



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

Conclusions

We have argued (at various times) that the economy is either (A) currently experiencing a growth-recession -- and, perhaps, has been for several quarters; or (B) the economy will be shortly (within the next two quarters) falling into a recession reminiscent of 2001. The difference between these scenarios is very slight. In scenario (A), we should see firms starting to adjust their expectations regarding future sales and profitability and will start making inventory adjustments now, which will include slowing down new hires or firing employees. In scenario (B), we should see firms making the same type of adjustments. The difference would be the timing of these adjustments. But, as mentioned in the previous section, some firms are already making production adjustments as sales and profits fall.

If the Federal Reserve Bank is able to adjust target interest rates to secure a “soft landing” rather than a full-blown recession, the labor market adjustments made by firms will be of a smaller magnitude, and we might see more temporary lay-offs rather than full blown fires. On the other hand, if the Federal Reserve Bank overshoots their mark and makes adjustments that are too aggressive, then the economy will slip into a deeper recession. When this happens, those on the margin of the labor market may start to panic and try to secure **any** job that they can. At that point, we would expect to see a sharp spike in the unemployment rate, which would cause additional panic, and cause the economy to likely head towards a downward spiral.

As a final comment, a significant amount of press has been expended on the satisfaction rating of President Biden²⁵, and a purported sense that Republicans will perform well in mid-term elections (leading to an expectation of the accomplishments that may be possible for the next two years). We would, however, like to point out that the recent ruling by the Supreme Court²⁶, as well as its very

²⁵ See, e.g., <https://news.gallup.com/poll/329384/presidential-approval-ratings-joe-biden.aspx>

²⁶ <https://www.cnn.com/2022/06/24/roe-v-wade-overturned-by-supreme-court-ending-federal-abortion-rights.html>

constitution (and the fact that President Biden has refused to change the number of serving justices²⁷), appears to have “galvanized” Democrats and provided them with some “lightning rod” issues that may serve to help them in the 2022 elections²⁸.

²⁷ See <https://www.wsj.com/articles/bidens-supreme-court-packers-pack-up-advisory-commission-report-11638918665> and <https://www.newsweek.com/joe-biden-clashes-progressives-over-supreme-court-expansion-1719358>

²⁸ See <https://www.marshallindependent.com/news/local-news/2022/06/ruling-may-galvanize-voters/>, <https://www.nytimes.com/2022/06/24/us/biden-roe-abortion.html>, and <https://www.forbes.com/sites/alisondurkee/2022/07/05/roe-v-wade-in-the-midterms-democratic-governors-launch-reproductive-rights-fund-as-party-hopes-abortion-sparks-turnout/?sh=7b2b0d4c3aaa>

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.

At least one market research organization is attributing a 10-15% chance of a new, significant strain of a biological agent (similar to COVID) affecting the global economy within the next 24 months. They describe it as “... a more infectious and highly vaccine resistant COVID-19 mutation requires intense lockdowns/social distancing measures in 2022-2023.”²⁹

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 networks³⁰. 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.

Several examples of state-sponsored disinformation campaigns are listed at https://en.wikipedia.org/wiki/State-sponsored_Internet_propaganda.

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.”³¹ 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

²⁹ See “Global Economic Forecasts, Q2 2022” by Euromonitor International

³⁰ See <https://www.nytimes.com/2020/09/01/technology/facebook-russia-disinformation-election.html>

³¹ See <https://us.norton.com/internetsecurity-malware-ransomware-5-dos-and-donts.html>

2019)³². And, just to add an interesting twist, ransomware is now even offered as a *service* in which a criminal may sell a *license* to a (software) ransomware variant to another criminal, who will then infect a system and demand a fee for the decryption key. As our society becomes more dependent on automated systems, disruptions to those systems will have an increasing impact on us.

State-sponsored ransomware, originating in Cuba, Iran, and is increasingly becoming a significant threat to US businesses and *municipalities*³³. The Treasury department has issued a notice that they may seek penalties against US entities that violate sanctions to pay ransom-holders, even if their data is *not* recovered.

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.³⁴

Recent hearings regarding the events of January 6, 2021 have led to an increase in acts of civil unrest in the US. The lack of trust in the US election process have spawned an increasingly fragile time for democracy in the country, according to some³⁵.

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 diversity³⁶ and wage protection³⁷, 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.

While rumors abound, and accidents can always occur at any time, President Biden's personal physician says that he is generally healthy³⁸.

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 goods³⁹. Notice that the Suez, the Panama Canal, the Strait of Hormuz, and the

³² See <https://security.berkeley.edu/faq/ransomware/> and <https://securityintelligence.com/articles/6-ransomware-trends-2020/>

³³ See, e.g., https://home.treasury.gov/system/files/126/ofac_ransomware_advisory.pdf

³⁴ 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/>

³⁵ See <https://www.ft.com/content/9c237473-603d-4196-8a32-0f135c900612>

³⁶ See, e.g., https://www.huffpost.com/entry/kamala-harris-vice-president-nominee-dnc_n_5f36f56bc5b69fa9e2fb7862

³⁷ See, e.g., <https://www.shrm.org/resourcesandtools/hr-topics/benefits/pages/where-kamala-harris-stands-on-workers-pay-and-benefits.aspx>

³⁸ <https://www.whitehouse.gov/wp-content/uploads/2021/11/President-Biden-Current-Health-Summary-November-2021.pdf>

³⁹ See <https://www.businessinsider.com/toilet-paper-coffee-products-delayed-suez-canal-blockage-impact-2021-3>

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 globally).⁴⁰

While international shipping issues are still being resolved, domestic logistics (i.e., trucking and air transport) costs are viewed as being on the rise due to labor reliability and recruiting⁴¹, as well as the lack of availability of transportation resources (e.g., portions of airplane fleets that were parked during the pandemic⁴²).

7. Cryptocurrencies: 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 cryptocurrencies, including the Bahamas, Grenada, and St. Kitt's & Nevis⁴³. Ecuador, Senegal, and China have canceled or withdrawn their currencies⁴⁴.

Cryptocurrencies have become a new “hot button” topic given the recent hit that the value of various coins have taken⁴⁵. Bitcoin is down in value significantly and several “currencies” have outright failed, having had their value extracted by investors’ withdrawing their monies as part of rising costs.

8. Global unrest: As we have now seen, Russia’s invasion of the Ukraine has led to a dramatic impact on the energy and grain sectors globally. Domestically, gasoline has risen to its highest recorded levels, and is expected to continue in that direction. The impact of rising energy prices can only drain the level of wealth held by lower quantiles of the population, which happen to be those least likely to be able to leverage the technology that made much of the “remote work” phenomena of the COVID-era possible, at a time that household savings are already being tested.

⁴⁰ See <https://www.dw.com/en/suez-canal-blockage-4-of-the-biggest-trade-chokepoints/a-57020755>

⁴¹ <https://www.wsj.com/articles/companies-face-rising-supply-chain-costs-amid-inventory-challenges-11655829235>

⁴² <https://simpleflying.com/global-airline-fleet-storage/>, <https://news.delta.com/how-delta-people-are-awakening-over-550-hibernating-planes>, <https://time.com/5823395/grounded-planes-coronavirus-storage/>, and <https://www.cnet.com/tech/tech-industry/airlines-rush-to-put-parked-airplanes-back-in-the-sky/>

⁴³ <https://www.atlanticcouncil.org/cbdctracker/>

⁴⁴ Ibid.

⁴⁵ <https://www.reuters.com/markets/europe/cryptos-latest-meltdown-leaves-punters-bruised-bewildered-2022-06-21/>

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 following⁴⁶:

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

⁴⁶ This study is motivated by the Federal Reserve Board’s Dodd-Frank Act, which includes requirements to consider various international factors; however, those factors will not be discussed extensively in this particular report based on the target use and audience of this report.

Our procedure is as follows:

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

Correlations

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

In Appendix C of this document, we document the 170 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 ⁴⁷
Real GDP Growth	... depends on ...	Nominal GDP Growth
Prime rate		3-year Treasury yield*
1-month, 3-year, and 5-year Treasury yield		1-year Treasury yield
3-month, 6-month, 7-year, and 10-year Treasury yield		3-year Treasury yield*
30-year Treasury yield		7-year Treasury yield*
30-year Mortgage rate		3-year Treasury yield*
Moody’s BAA yield		30-year Mortgage rate*
US Residential Home Price Index		Commercial Real Estate Price index

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.

⁴⁷ 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 “*”.

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

Analysis

GDP is driven by several factors:

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

Real GDP dropped by 1.5% during 1Q2022⁴⁸. As mentioned, labor force participation and supply chain durability continue to be key issues facing the economy. The recent-term impact of both of these factors have been generally and colloquially attributed to the COVID pandemic, but ***we believe that the effects of inflation, particularly energy prices, are going to become stronger influences on productivity through at least 1Q2023***. Employee retention and churn cannot help but impact sales, as personnel changes affect relationships between businesses and customers, and the ability to execute sales.

Personal income in current year dollars rose by 4.8% (annualized, current year dollars) during 1Q2022 over 4Q2021, though disposable current income actually decreased by 0.2% (annualized) and personal consumer expenses (PCE) increased by 10.3% (annualized)⁴⁹. Q/Q personal spending increased by 2.5% in 1Q2022 by roughly \$400B to \$16.7T (Q/Q; i.e., +11.4% Y/Y)⁵⁰. Given the attention that is currently being paid by the public to energy prices, interest rates, and the availability of essential items, we expect that there will be some “stockpiling” to continue over the coming weeks, and purchasers will become increasingly conservative in their expenditures, which will further fuel the expected trends. ***As a result, we expect for nominal personal spending to rapidly start to drop as the “post-COVID, pent-up demand” is either exhausted or squelched; PCE will be increasingly affected by notable inflation, but will likely half its current rate by YE2021.***

The US Government had a \$3T shortfall for FY2021, with \$700B due to the American Rescue Plan that was eventually approved by Congress. The FY2022 budget is currently projected to be \$6T, with almost \$4.2T of revenue projected (mostly from various domestic taxes) and interest on the national debt rising to \$300B. (The national debt itself is about \$30T as of 1Q2022.) Just over \$4T of the budget is considered mandatory spending (e.g., Social Security, Medicare, etc.), with the remainder being discretionary spending. Looking at nominal dollars, we expect ***government spending to continue*** through 2022, however, we expect debate to be fierce given the enormity of these numbers⁵¹, the current uncertainty about the economy (including the anticipated sales of Treasury-held assets that were purchased over the past two years)⁵², and the expected demand for international aid for Ukraine⁵³.

⁴⁸ <https://www.bea.gov/data/gdp/gross-domestic-product>

⁴⁹ <https://www.bea.gov/sites/default/files/2022-05/pi0422.pdf>

⁵⁰ <https://fred.stlouisfed.org/series/PCE>

⁵¹ <https://www.wsj.com/articles/u-s-national-debt-exceeds-30-trillion-for-first-time-11643766231>

⁵² <https://www.wsj.com/articles/rising-inflation-and-interest-rates-heap-pressure-on-emerging-markets-11655544600>,

<https://fred.stlouisfed.org/series/VIXCLS>, and <https://fred.stlouisfed.org/series/USEPUINDXD>

⁵³ <https://www.cnn.com/2022/06/15/biden-to-send-another-1-billion-in-military-aid-to-ukraine.html>

Considering the pressures involved, and the potential outcomes of upcoming Congressional elections, is possible that a government shutdown (akin to that during 1995-96) could occur in late 2022.⁵⁴

The US' net trade deficit increased to an average of almost \$95B during 1Q2022, an increase of approximately 26% Q/Q, and an increase of almost 44% since 1Q2021⁵⁵. **We believe that this increasing trend will continue during 2022**, with international aid to countries affected by the Russian invasion of Ukraine^{56,57}. The biggest questions are how long the conflict will last, given its effects on energy, grain, meat, and grocery prices in Europe and the US. Long-term, questions remain about Putin's longevity on the world stage, his level of determination to control Ukraine, and his plans for expanding Russia's influence beyond Ukraine.

It has been widely reported that, since October 2021, inflation has been higher than it has been in two decades (see Figure 29 through Figure 32). Initiated by the Russian invasion of Ukraine, the price of a barrel of West Texas Intermediate (WTI) crude oil has risen from \$75 at YE2021 to \$110⁵⁸. The average national retail gasoline price is up 10% in one month, and 65% in a year.⁵⁹ Natural gas prices are up by almost 25% Y/Y for US residential service.⁶⁰ Food prices are up over 10% (Y/Y) across the U.S. currently.⁶¹

However, the biggest issue appears to be continued “churn” in the labor markets. As businesses continue to be unable to fill positions, employers are continuing to increase wages in order to try to lure workers to come and stay. This year-long game of “one-ups-manship” has driven up salaries of blue-collar *and* white-collar workers with consumers feeling the brunt of the game. We have previously discussed the impact of, e.g., retirements & retraining of workers from the petroleum distribution industry, and how that space is expected to experience significant issues as workers become increasingly hard to find. In order to fill the gap, and keep gasoline available in areas that are far from pipelines, salaries are being increased significantly, resulting in increased prices at the pumps⁶².

The projected pain to the US consumer due to the “Russian lock-out” from the world economy seems even worse. Further, as economic sanctions take hold over the Russian economy, their ability to pay premiums on the bond debts will become increasingly limited, eventually resulting in defaults that will likely end up being written off losses for bond holders. We expect that these will be the most significant implications unless the West becomes directly involved in the conflict, an outcome that – frankly – will almost surely have a catastrophic outcome.

⁵⁴ <https://www.crfb.org/blogs/upcoming-congressional-fiscal-policy-deadlines>

⁵⁵ <https://fred.stlouisfed.org/series/BOPGSTB> and https://www.census.gov/foreign-trade/Press-Release/current_press_release/ft900.pdf

⁵⁶ <https://www.washingtonpost.com/opinions/2022/02/21/ukraine-invasion-putin-goals-what-expect/>

⁵⁷ We note that Ukrainian exports to the US have dropped by 50% to 60% Y/Y, with their imports from the US down by 40% Y/Y per <https://www.ustradenumbers.com/country/ukraine/>. Also, US aid to Ukraine, though, has amounted to \$6.3B since January 2021 per <https://www.state.gov/u-s-security-cooperation-with-ukraine/>.

⁵⁸ See <https://oilprice.com/oil-price-charts/>

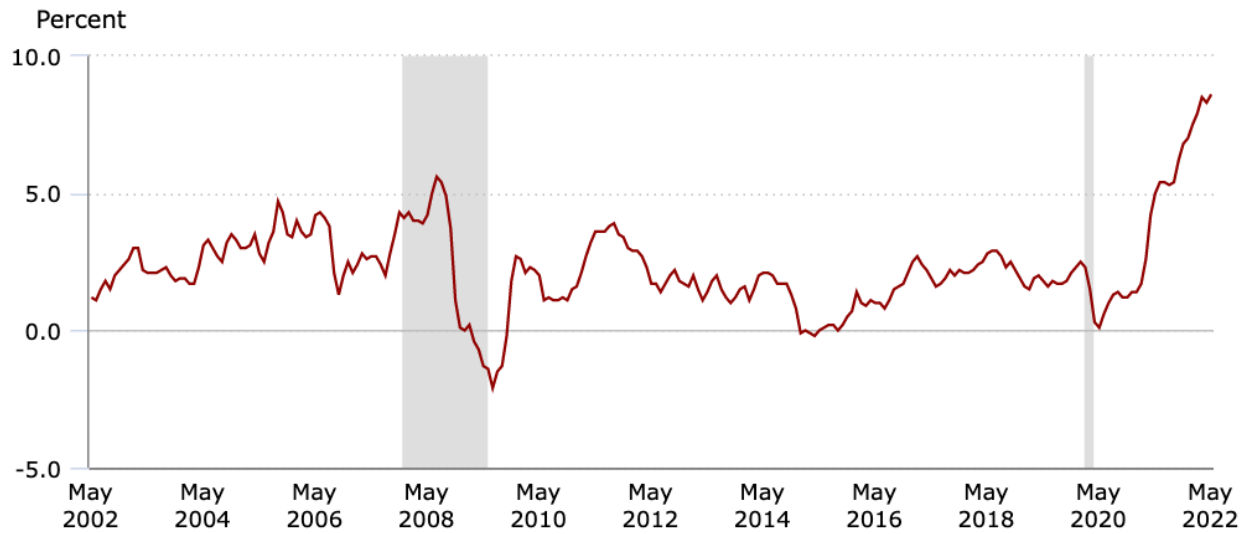
⁵⁹ See <https://gasprices.aaa.com/>

⁶⁰ <https://www.eia.gov/dnav/ng/hist/n3010us3M.htm>

⁶¹ <https://www.bls.gov/opub/ted/2022/food-prices-up-10-8-percent-for-year-ended-april-2022-largest-12-month-increase-since-november-1980.htm> and <https://www.agweb.com/news/policy/politics/usda-raises-2022-food-inflation-forecasts-again-highest-grocery-food-price>

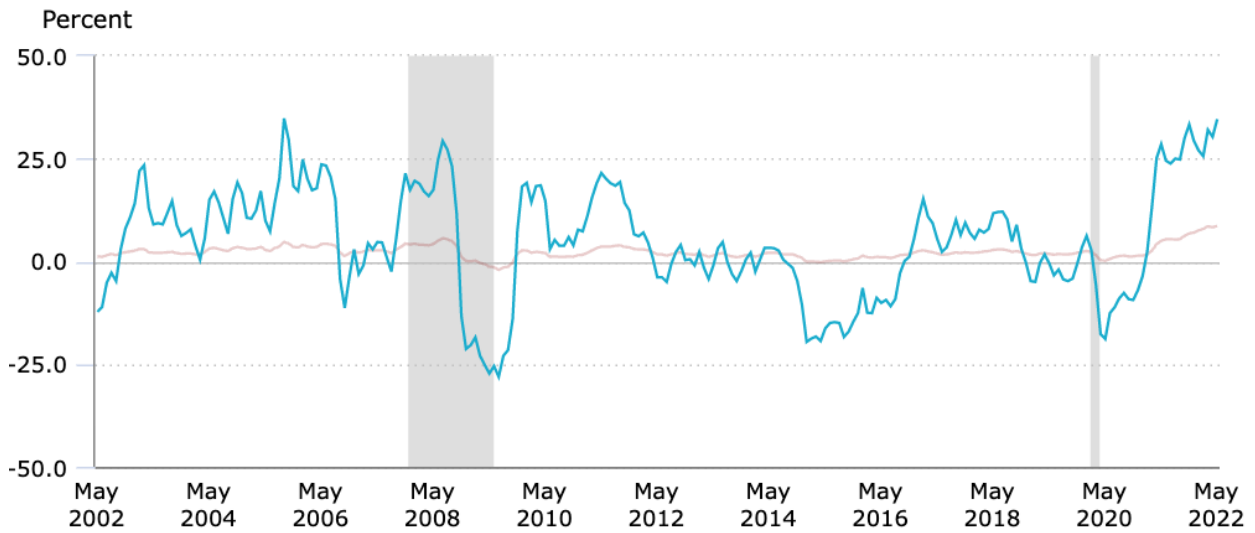
⁶² See, e.g., <https://www.youtube.com/watch?v=bfVxhTF9m0c>

Figure 29: 12-month Percent Change in CPI (nationwide), All Items



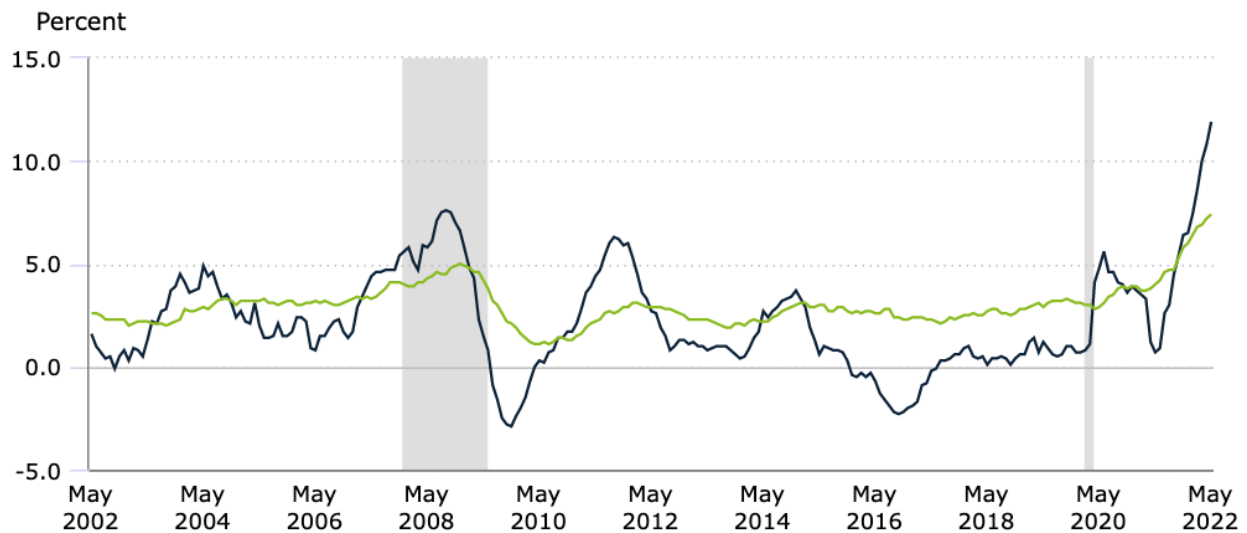
Source: <https://www.bls.gov/charts/consumer-price-index/consumer-price-index-by-category-line-chart.htm>

Figure 30: 12-month Percent Change in CPI (nationwide), Energy (blue) and All Items (pink)



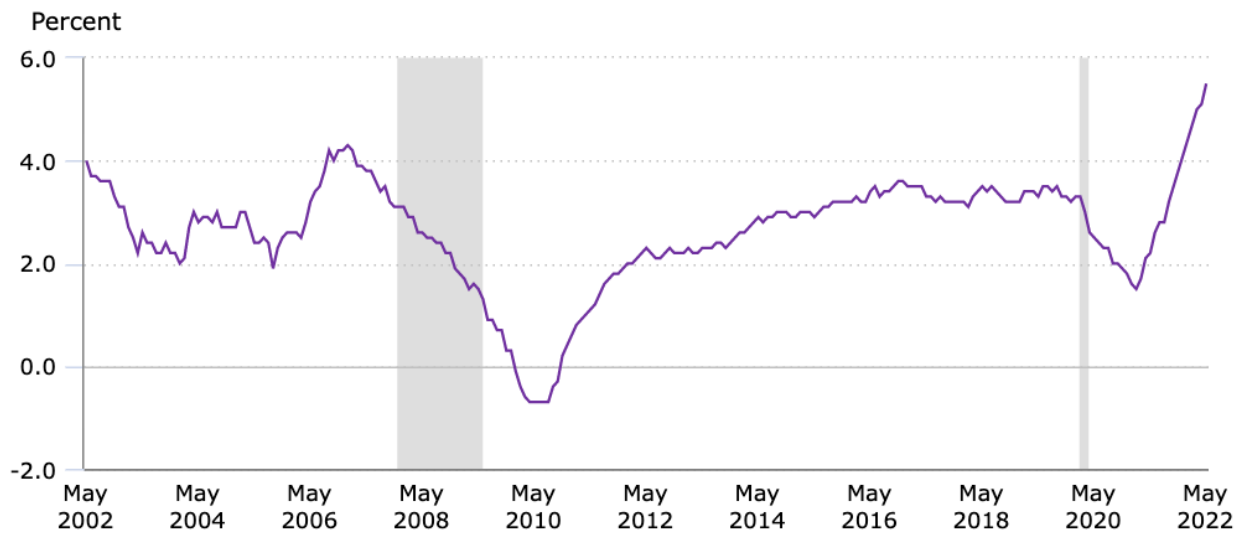
Source: <https://www.bls.gov/charts/consumer-price-index/consumer-price-index-by-category-line-chart.htm>

Figure 31: 12-month Percent Change in CPI (nationwide), Food at Home (black) and Food Away from Home (green)



Source: <https://www.bls.gov/charts/consumer-price-index/consumer-price-index-by-category-line-chart.htm>

Figure 32: 12-month Percent Change in CPI (nationwide), Shelter



Source: <https://www.bls.gov/charts/consumer-price-index/consumer-price-index-by-category-line-chart.htm>

At this point, we continue to believe that ***the global economy will remain in a state of flux (at least) through 2024. We expect that annualized inflation will be at least 6% through 2022, and at least 5% through 2023, and real GDP growth rates during 2022 will most likely come in at no more than 0.5% (Q/Q).***

Other Commentary

- “The higher cost of housing will still keep inflation rates elevated for some time to come. Gasoline prices and heating costs are likely to stay high for a good while because of the war in

Ukraine, but energy prices are likely to peak during the summer and ease after that.” (see <https://www.kiplinger.com/economic-forecasts/inflation>; June 10, 2022)

- “On balance, GDP growth will likely slow to 2.5% in 2022, and slow further to 1.9% in 2023. Growth in some quarters could be below 1.5%, but an actual contraction appears unlikely. The economy did contract 1.5% in the first quarter of 2022, but this was a small reversion after the previous quarter’s growth of 6.9%.” (<https://www.kiplinger.com/economic-forecasts/gdp>; May 27, 2022)

Employment

Analysis

We have previously discussed the evolution of the employment and unemployment situation in the US: as COVID took hold in 2020, many businesses retrenched and either laid-off staff, or had staff leave in order to explore new options. Additionally, many individuals retired earlier than expected, or sought new opportunities during the COVID pandemic. (See Table 2 and Figure 33.) During the COVID pandemic, over 5M new businesses were opened, resulting in an inordinate number of new job openings. Businesses that experienced a “net loss” of employees were compelled to increase wages (as well as offer increased benefits) to attract and/or retain talent. The more competitive compensation packages resulted in talent becoming less loyal and more willing to continuously re-evaluate their options. This “churn” in virtually all industries became a cyclic phenomenon, i.e., workers – particularly those that could work remotely -- “job-hopped” as increased levels of compensation became the norm.

Now, though, we are starting to see businesses contract as the changes in operating norms have taken hold: Walmart, Target, and Amazon have all missed investors’ targets during 1Q2022^{63,64}, and will be adapting their strategies accordingly. Per the Wall Street Journal, “Big employers, such as Twitter Inc. or Netflix Inc., have announced hiring freezes or staff cuts as the industry retrenches. ... Tesla Inc. Chief Executive Elon Musk told his staff he planned to cut 10% of salaried jobs.”⁶⁵

Table 2: US Population, Employment-Population ratio, Labor Force Level, and Unemployment Rate % during COVID-19

Date	Population (Adult Civ. Noninst.)	Employment-Population ratio	Labor Force Level	US Unemployment %
Feb 2022	263.3M	59.9%	164.0M	3.8%
May 2022	263.7M	60.1%	164.4M	3.6%

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

Looking at Table 2, which shows employment metrics for Feb and May 2022, we see a overall stagnancy in the US, and are expecting a challenging summer for businesses. Now that summer is approaching, we expect the market opportunities for younger (seasonal) 16- to 21-year-old employees to increase with respect to summer of 2021. Businesses that have needs for less-skilled workers, and that are being stressed by other rising costs, will likely be much more willing to take advantage of the less expensive and more eager young candidates.

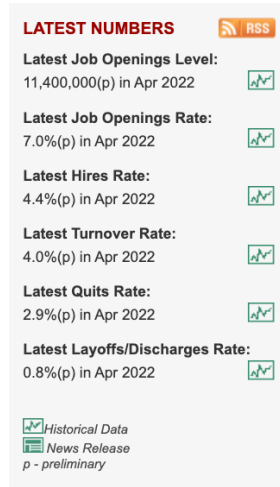
⁶³ <https://www.forbes.com/sites/sanfordstein/2022/05/18/walmart-and-target-miss-quarterly-estimates-dramatically>

⁶⁴ <https://www.barrons.com/articles/amazon-stock-price-earnings-51651098507>

⁶⁵ <https://www.wsj.com/articles/may-jobs-report-unemployment-rate-2022-11654195243>

Therefore, we expect to see a slight seasonal increase in the size labor force during the summer months that could be offset by layoffs and attrition of older workers. Unfortunately, we also expect 4Q2022 to be a bleak season for retail sales, with many consumers realizing that they will need to use any remaining savings that they still have stockpiled to weather out the expected downturn.

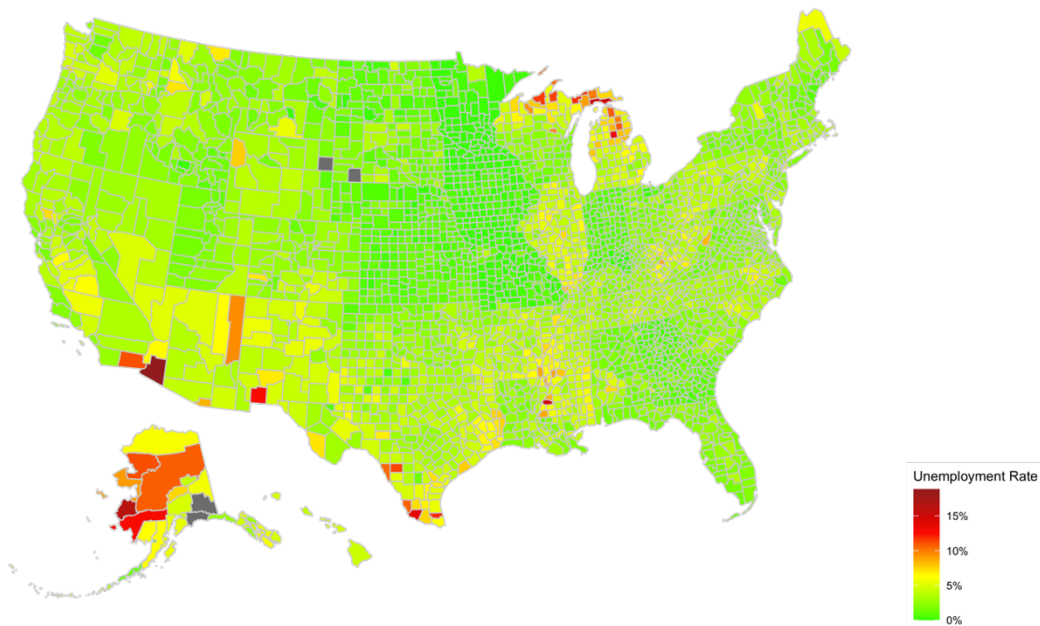
Figure 33: US Job Openings, Hires, and Turnover Rates



Source: Bureau of Labor Statistics (<https://www.bls.gov/jlt/>)

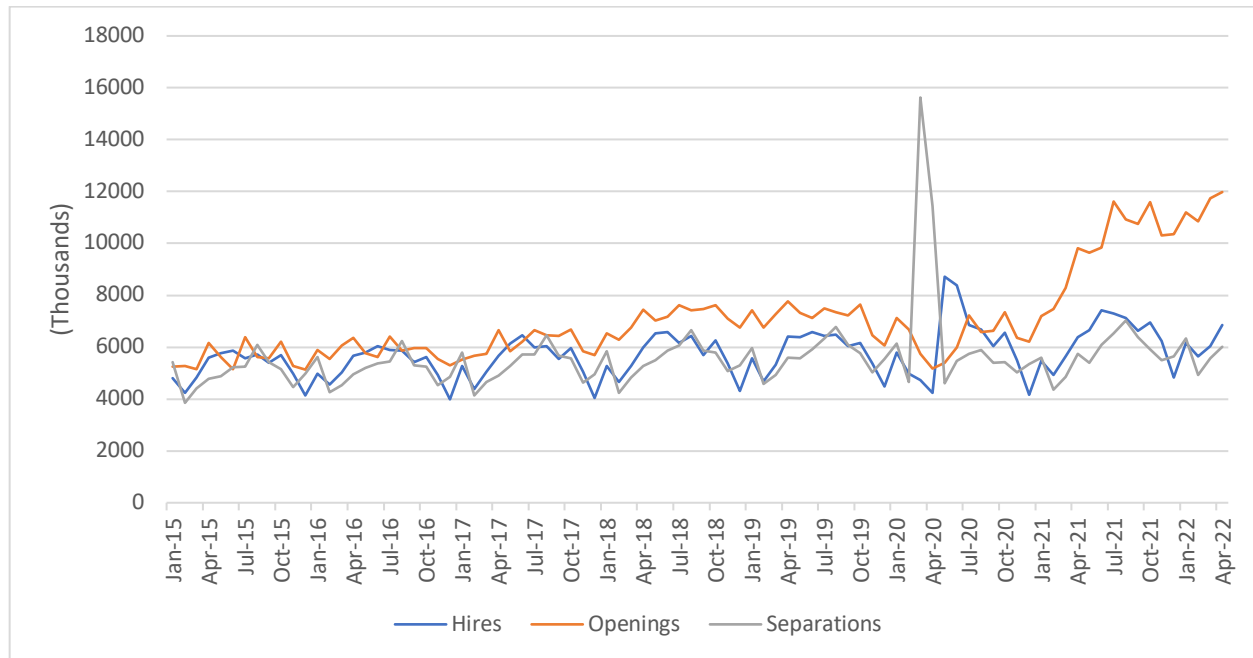
Figure 34: US Unemployment Rate per County

Unemployment Rate per County



Source(s): Bureau of Labor Statistics (<https://www.bls.gov>)

Figure 35: US Hirings, Openings, and Separations



Source: Bureau of Labor Statistics (<https://www.bls.gov/jlt/>)

Other Commentary

- “Economists expect unemployment to rise as the Fed raises rates, although they see it staying at relatively low levels by historical comparison. On average, they forecast unemployment rising from 3.6% in May to an average of 3.7% at the end of 2022 and 4.2% at the end of 2023.” (<https://www.wsj.com/articles/recession-probability-soars-as-inflation-worsens-11655631002>; June 19, 2022)
- “Hiring more teens is a national trend. According to data from Gusto, a payroll, benefits, and human resources provider, teens made up 9.3 percent of new hires in April 2022, up from 7.7 percent in April 2021 and 2 percent in April 2019. Meanwhile, the share of hires 25 to 54 years old fell to 62.9 percent this April from 75.3 percent in April 2021.” (<https://www.pbs.org/newshour/economy/inflation-pandemic-has-small-businesses-on-edge-this-summer>; June 10, 2022)
- “... [T]he economy is on track to recover all its pandemic job losses by mid-July. However, jobs will likely not recover to their 2019 upward trendline until late next year, and so the labor shortage will likely continue for a while. ... The unemployment rate held steady at 3.6%, and wage rate growth slowed a tad to 5.5%. It’s too early to say if this marks the beginning of a slight easing in the labor shortage, but if this continues, then the unemployment rate may slow its descent to near 3%, and wage growth could fall to 4% by the end of the year.” (Per <https://www.kiplinger.com/economic-forecasts/jobs>; May 6, 2022)

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.

The FOMC raised interest rates for the first time (post-pandemic) as part of its March 2022 meeting. They have subsequently raised rates during May and June 2022, putting overnight lending rates at 1.58%⁶⁶. (See Figure 36 and Figure 37Figure 36.) Furthermore, when the 75 bp increase was announced on June 15th, Chairman Jerome Powell stated that “... either a 50-basis-point or a 75-basis-point increase seems most likely at [the FOMC’s next] meeting” (in July, which would put rates at between 1.8% and 2.3%).⁶⁷ If that 75 bp increase occurs, it will have taken rates from zero to the “neutral” federal funds rate (where no economic pressure is applied by the overnight lending rate) inside of nine months.

Some economists, though, have started to question whether the “neutral” federal funds rate actually is 2.4%-2.5%. The President of the Federal Reserve Bank of Dallas estimates the “neutral” federal funds rate is actually between 2.75% and 3%⁶⁸; in conjunction with his comments, President Kaplan further suggested that other members of the FOMC at the time believed it to be higher still. Andrew Levin, an economist from Dartmouth College, believes that it is “in the range of 5%-6%”.⁶⁹ Wherever the neutral rate actually is, until the overnight lending rate reaches that point, we should expect inflation to continue to rise.

We previously suggested four separate interest rate increases during 2022; ***we now believe that there will be at least six increases (with three having already been made), and that they will total at least 250 bp, by YE2022.*** Further, we believe that interest rates will continue to rise to at least 5% by 2Q2023 in order to “catch up” with inflation; in other words, if the FOMC does not raise its target to 5% by the end of 1H2023, then it will be increasingly difficult to quell the current tide of inflation.

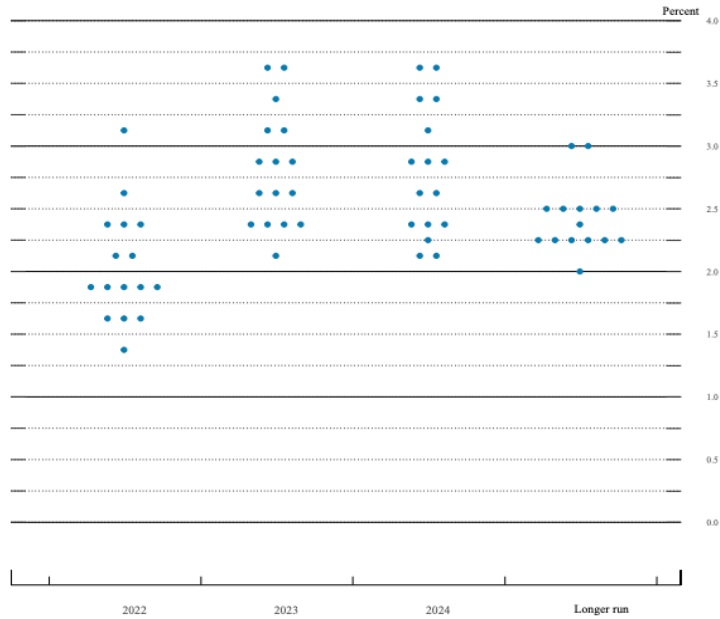
⁶⁶ See <https://fred.stlouisfed.org/series/DFF>

⁶⁷ <https://www.wsj.com/livecoverage/federal-reserve-meeting-interest-rates-june-2022/card/fed-s-powell-says-another-75-basis-point-hike-possible-at-july-fomc-i8KHwEvqwQnupCgry5hR>

⁶⁸ <https://www.dallasfed.org/news/speeches/kaplan/2018/rsk181024.asp>

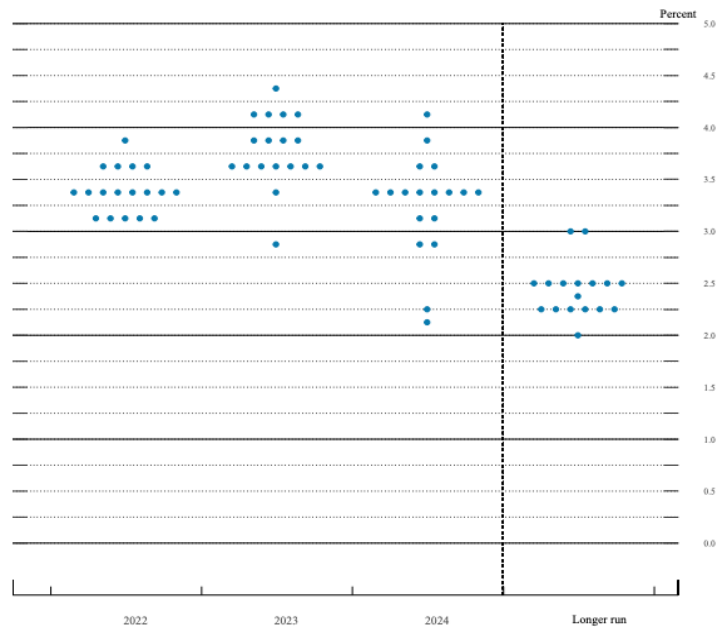
⁶⁹ See <https://www.marketwatch.com/story/powell-wants-to-get-closer-to-neutral-but-whats-that-think-between-5-and-6-former-top-fed-staffer-says-11651566417>

Figure 36: FOMC "Dot Plot" from March 2022 Board of Governors' Meeting



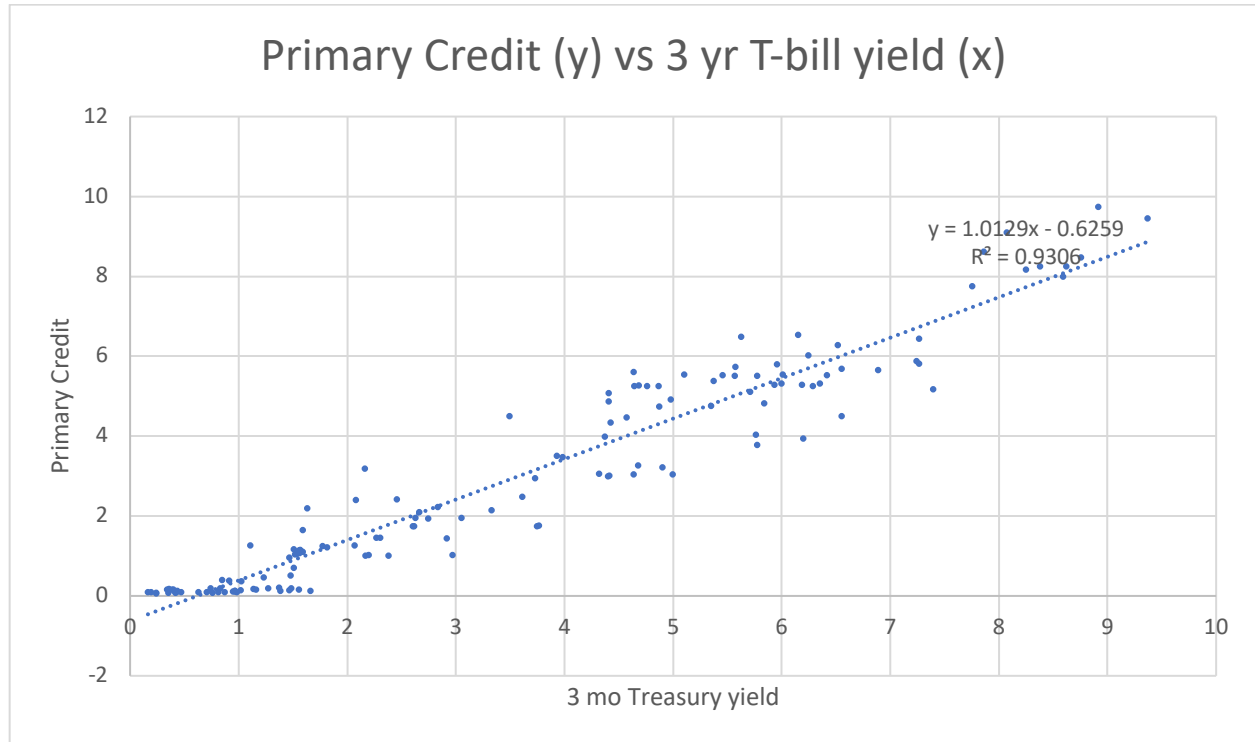
Source: <https://www.federalreserve.gov/monetarypolicy/files/fomcprojtabl20220316.pdf>

Figure 37: FOMC "Dot Plot" from June 2022 Board of Governors' Meeting



Source: <https://www.federalreserve.gov/monetarypolicy/files/fomcprojtabl20220615.pdf>

The following 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

- “Powell stated that it is the Fed’s intention to lower consumer demand in the economy, though not to cause a recession. As always, the Fed hopes to thread the needle of doing the first without the second, but interest rate policy is a blunt instrument, and the Fed has not always been successful in striking this balance. The central bank considers it to be worth the risk, however, because with inflation currently at 8.6%, it worries that today’s rising prices might cause businesses and workers to increase their expectations of future inflation, thus raising prices and wages in a self-fulfilling prophecy. Expect a half-point hike from the Fed on Sept. 21, and then four more quarter-point federal funds rate increases at the four meetings after that. That would bring the rate to 3.25% by the end of the year, and 3.75% early next year.” (<https://www.kiplinger.com/economic-forecasts/interest-rates>; June 15, 2022)
- “ ‘Powell should say that, while there is a lot of uncertainty, the Fed "needs to move to a neutral stance which means we need to move the federal funds rate to be roughly in line with, or slightly above, the level of inflation," [Andrew Levin, an economics professor at Dartmouth College and a long-time Fed staffer] said ... ‘If Powell would communicate that on Wednesday, I think the markets will understand that probably the federal funds rate is going to have to go up to 4% or 5% by the end of the year,’ he said.” (<https://www.marketwatch.com/story/powell-wants-to-get-closer-to-neutral-but-whats-that-think-between-5-and-6-former-top-fed-staffer-says-11651566417>; May 4, 2021)

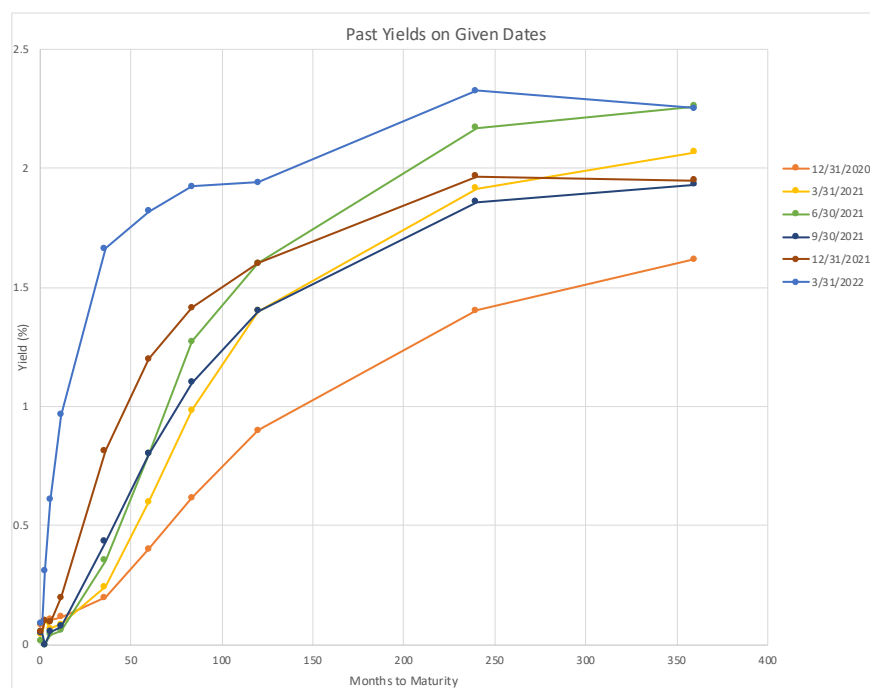
Treasury Yields (1, 3, & 6-month; 1, 3, 5, 7, 10, 20, & 30-year series)

Analysis

Figure 38 shows how the yield curve for T-bill’s has evolved over the past two years. Through 2021, rates peaked in mid-year, as concerns about the Fed’ pulling back on its supplements to the market, and inflation eroding returns became evident. Now, in 2022, we are seeing returns that are completely wiped out by current inflation rates. As interest rates are now increasing (likely beyond 3% by YE2022, as discussed previously), yields on T-bills (mostly directly short term, but also mid- and long-term notes to a lesser degree) will also rise.

We think that yields will continue to rise until overnight lending rates stabilize. Once rates (and equity prices) stabilize, and we expect that bond yields will fall slightly.

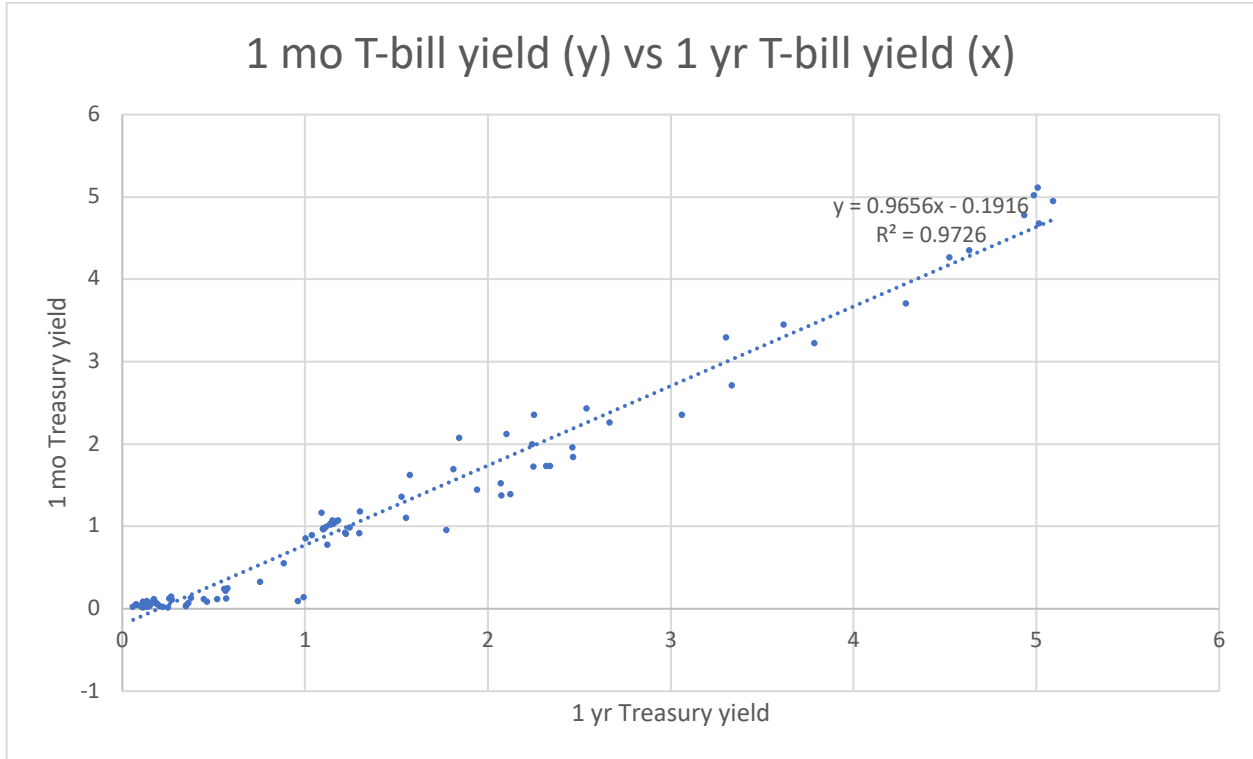
Figure 38: Treasury Yield Curves based on maturity duration



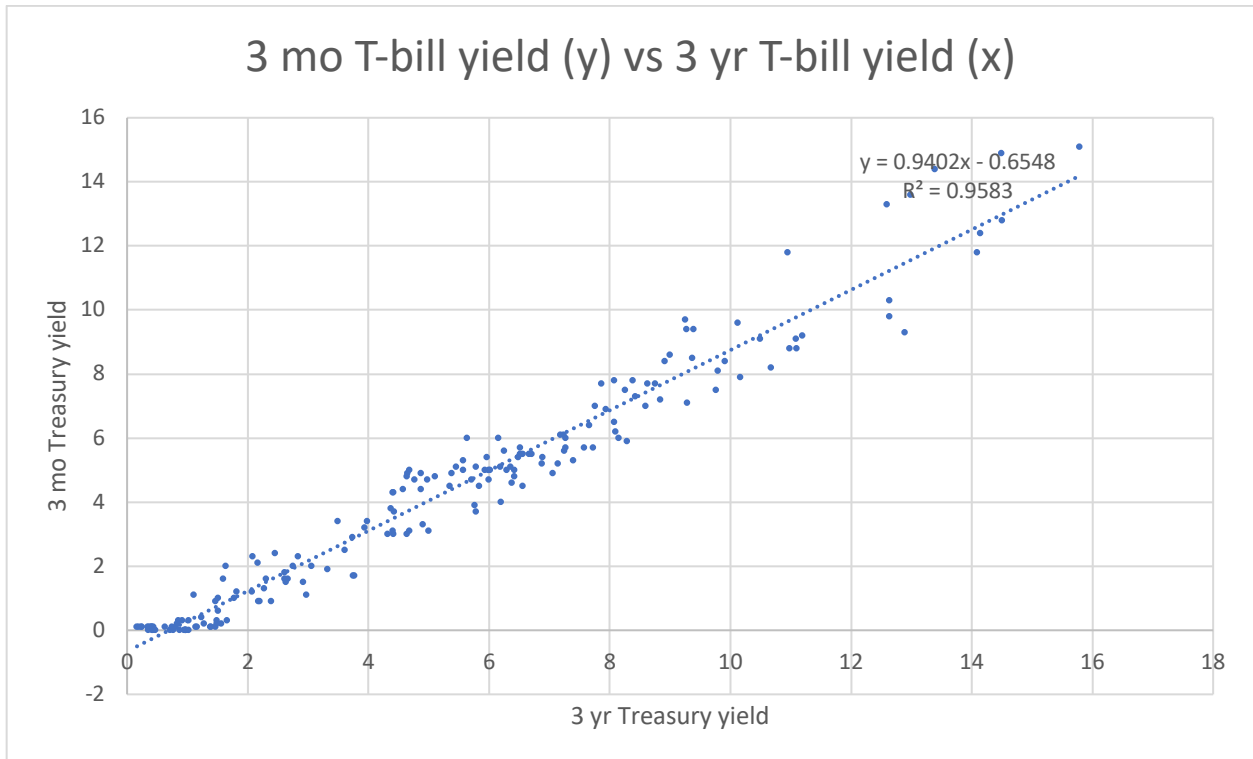
Source: US Treasury

Other Commentary

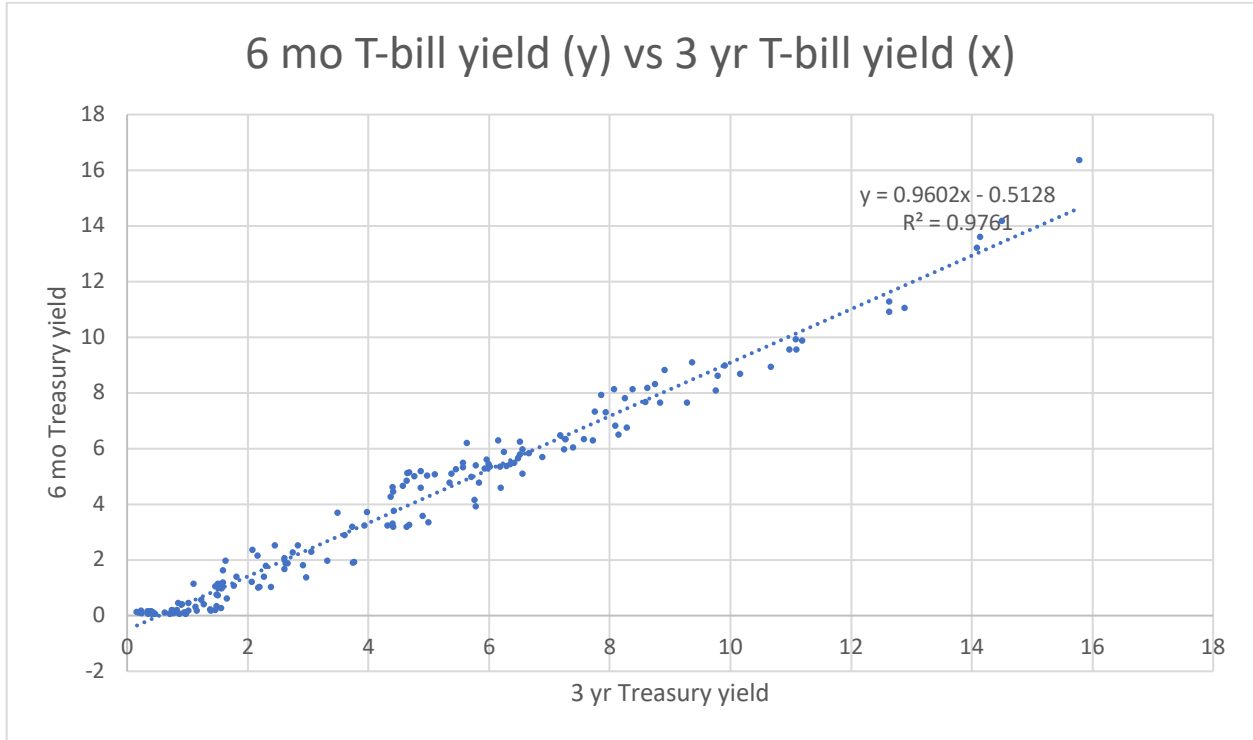
- “Expect the 10-year Treasury yield to peak at 3.5% sometime this year, before dipping back to 3.0% by the end of 2022.” (see <https://www.kiplinger.com/economic-forecasts/interest-rates>; Mar. 11, 2022)



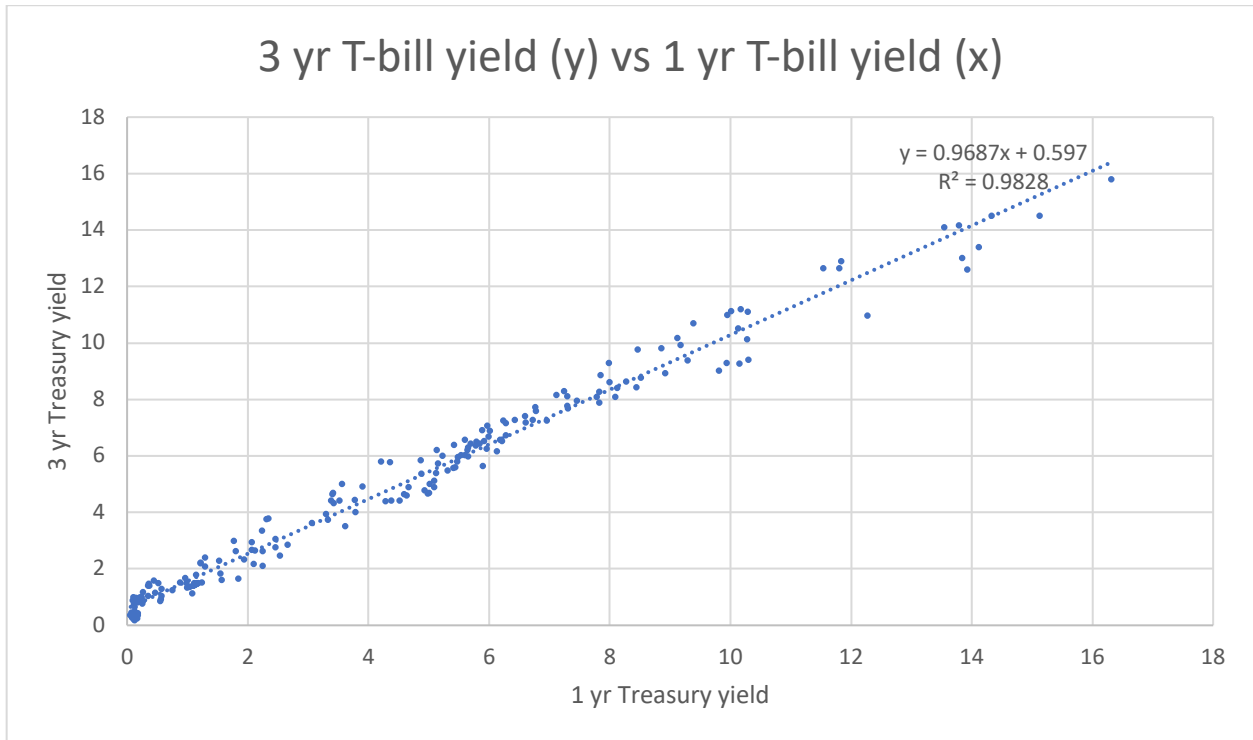
Source: Authors' calculation



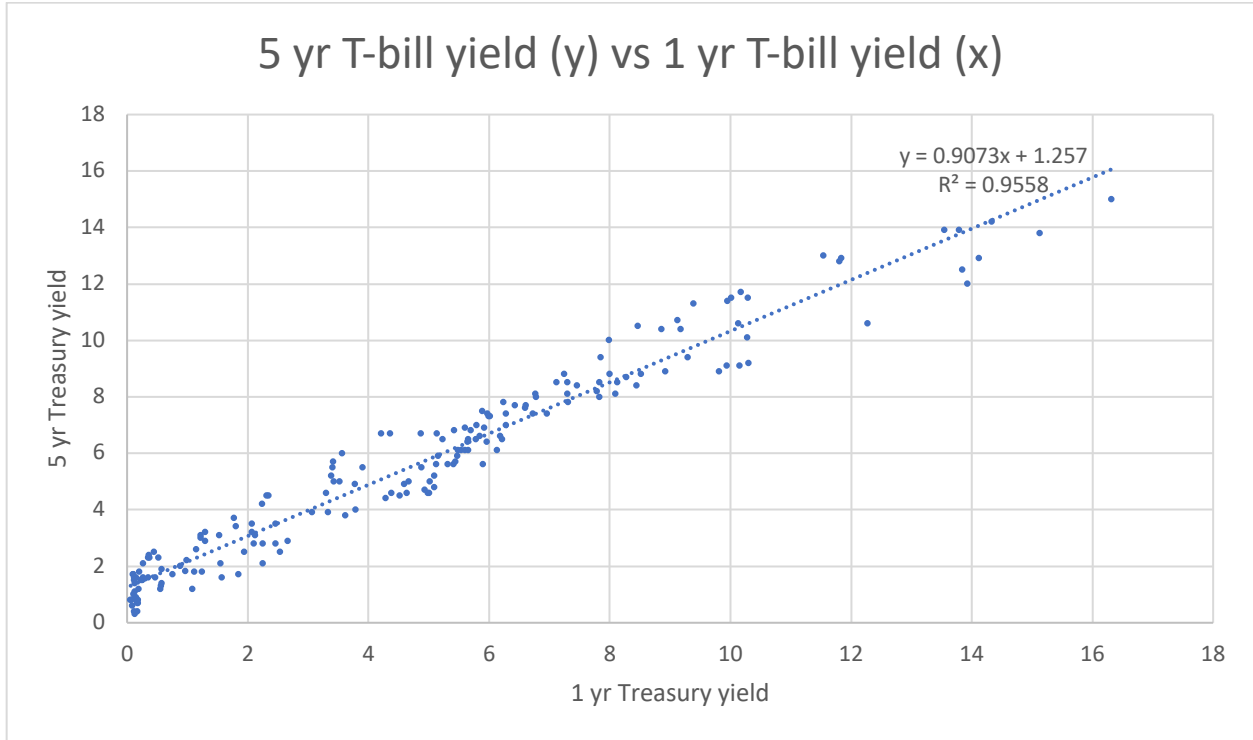
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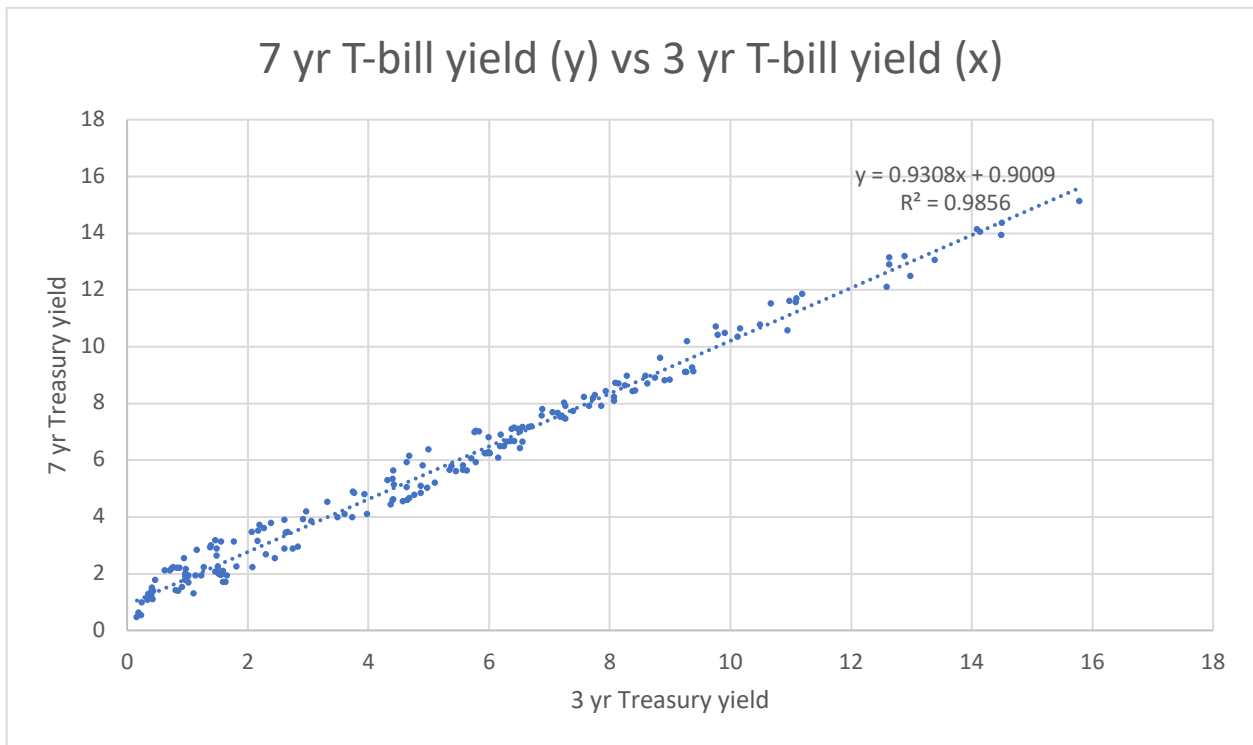
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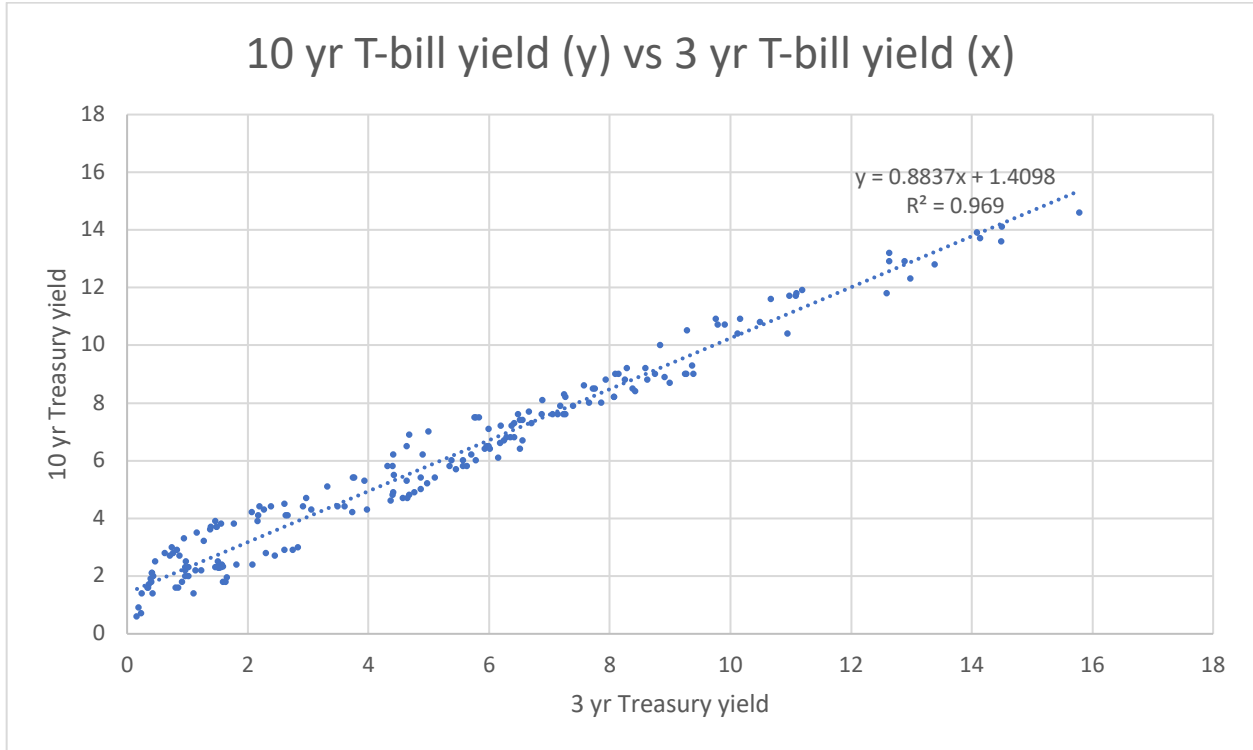
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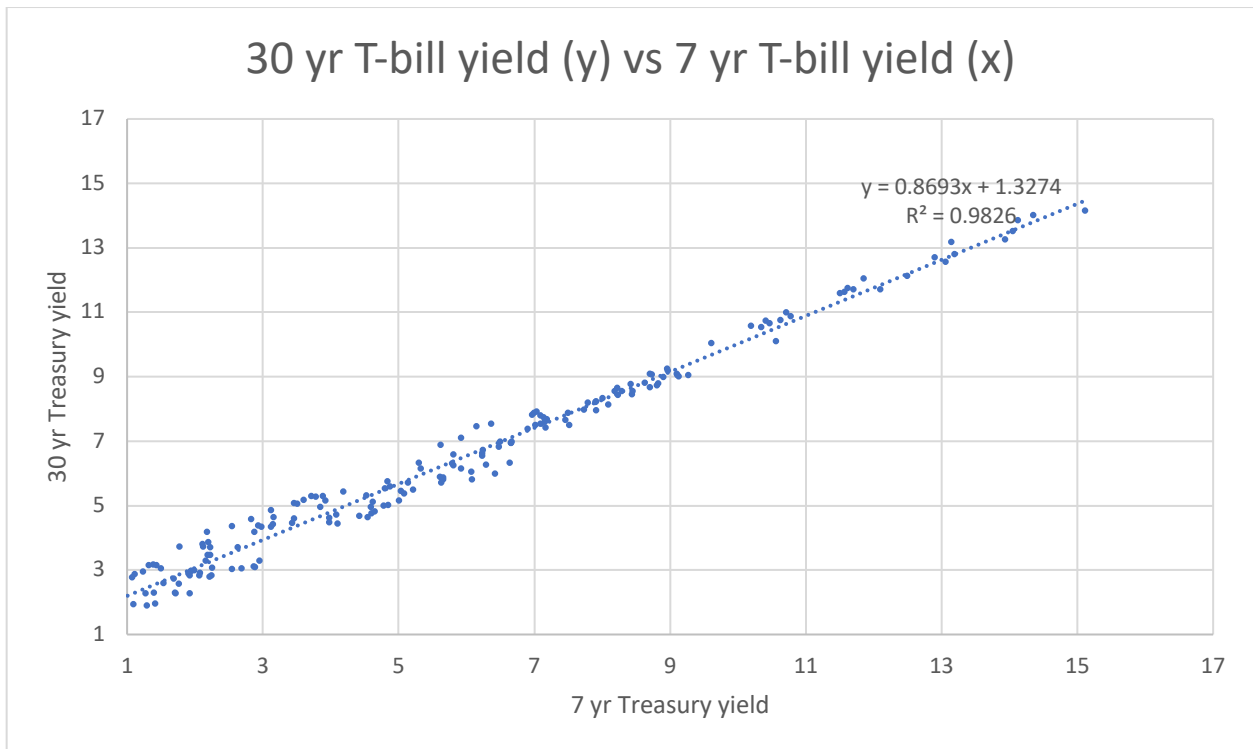
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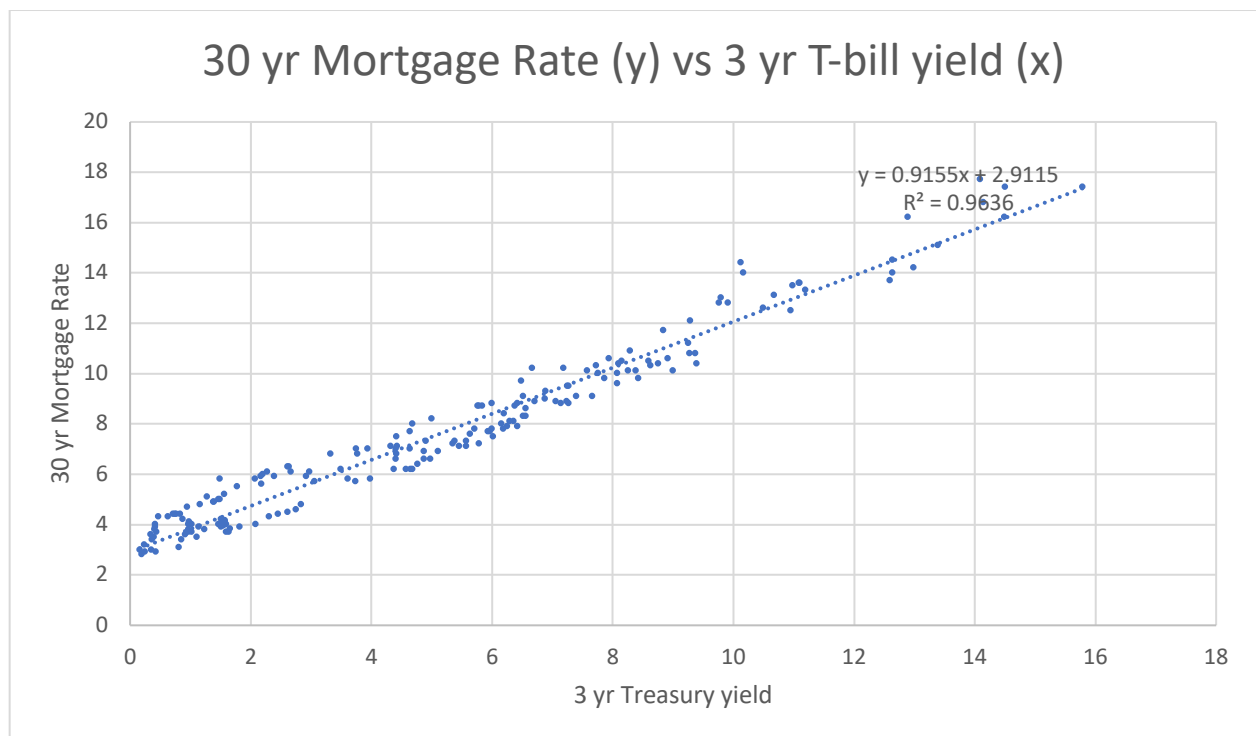
Source: Authors' calculation

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 the FOMC has raised overnight lending rates, so have banks raised mortgage rates. Daily 30-year fixed mortgage rates are 5.78% as of this writing, having peaked at 5.3% prior to the FOMC voting to raise rates to 1.58%. At their trough, mortgage rates were roughly 2.65%, but crept up to 3.0% as the hints of rate increases quaffed through the markets.

If Chairman Powell and the FOMC is willing to increase overnight lending rates to the 5.0% mark that we have previously suggested, ***we believe that mortgage rates could be as high as 9.5% by YE2023***. The effect of this would be to stifle the buyers in the housing market, and impact adjustable-rate mortgage and balloon mortgage holders.



Source: Authors' calculation

Other Commentary

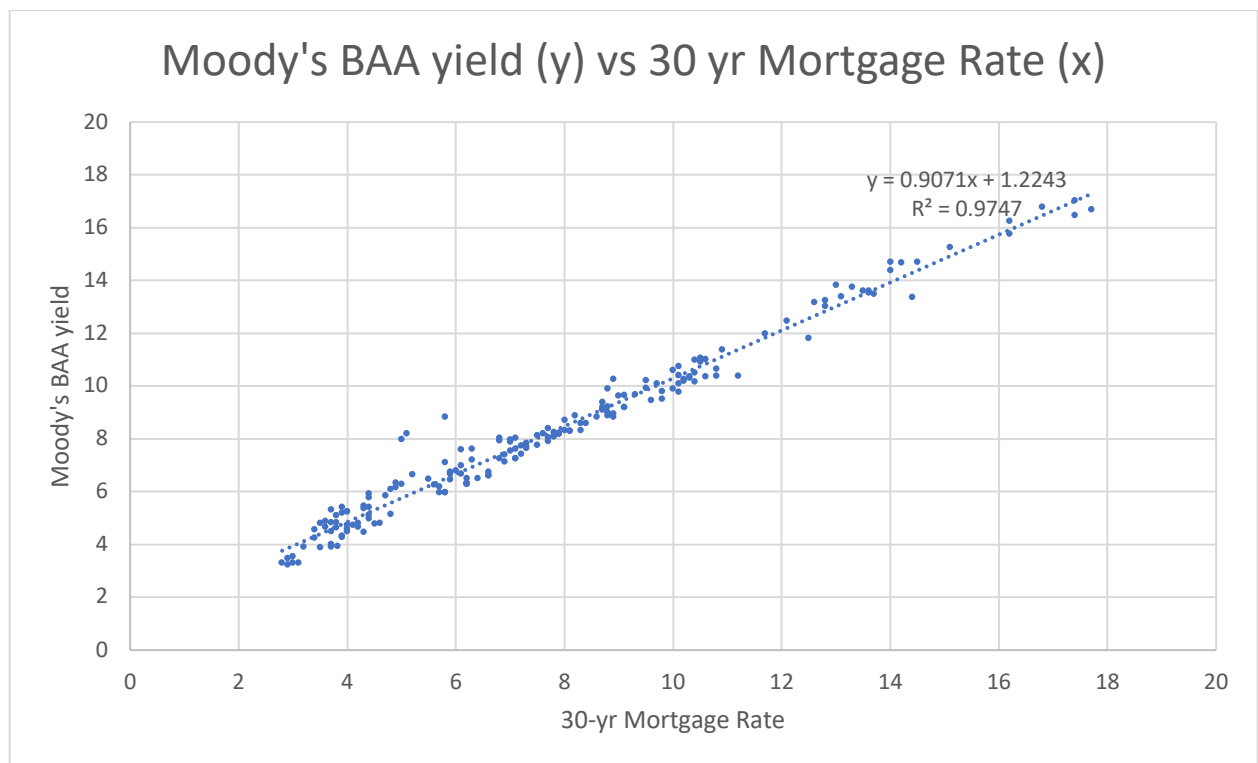
- “The rise in the 10-year rate will also push up mortgage rates, from the current average of 5.4% for 30-year fixed-rate loans, to just below 6.0% [by YE2022]. 15-year fixed-rate mortgages will rise from 4.75% to 5.25%.” (<https://www.kiplinger.com/economic-forecasts/interest-rates>; June 15, 2022)

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.

Capitalytics’ quantitative models see AAA rates slightly declining over the next several years (through 2024) from 3.2% in 3Q2022 to 3.0% 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 corporate debt will need to garner increasing returns to compensate for inflation adjusted returns, and for the risk of buying corporate (albeit low-risk) bonds over T-bills (that will have increasing yields). If inflation is checked with 5.0% rates, which will compare with 1- to 3- month T-bills (plus a slight premium), AAA yields will need to garner at least 6.5% to remain competitive. BAA yields will need to offer approximately 7.0%. BBB yields will remain about 15-25 bp lower than AAA yields.



Source: Authors' calculation

Other Commentary

- “Corporate high-yield bond rates have risen because of inflationary pressures and because of rising economic uncertainty. CCC-rated bond yields are at 14.1%. AAA bonds are yielding 4.2%

and BBB bonds, 5.3%.” (<https://www.kiplinger.com/economic-forecasts/interest-rates>; Mar. 11, 2022)

Prime Rate

Analysis

The Prime Rate has historically been very tightly coupled to overnight lending rates, and the yields for very short-term Treasury Bills. As of this writing, the Prime Rate is 4.75%⁷⁰ with the overnight lending rate by the FOMC being 1.58%. **We believe that trend will continue**, with the Prime Rate tracking with overnight rate increases. In other words, as the FOMC increases overnight lending rates, the Prime Rate will be comparably affected. As such, **we believe that it is likely that the Prime Rate will reach 8.25% by YE2022**, given our previous speculation about the Federal Funds Rate.

US Average Retail Gasoline Price

Analysis

Gasoline prices have been the most obvious sign to consumers about the rising inflation rates (see Figure 39); the daily reminder of rising rates (see Figure 40) has put the reality of increasing prices “front-and-center” of people’s minds. The US average retail gasoline price for regular unleaded gasoline is \$4.955/gallon⁷¹ as of this writing, rising about five cents in a week. This price is also a \$0.40 increase from one month ago, and a 61.5% increase over prices one year ago.

The petroleum industry is caught in a difficult position. On the supply side, West Texas crude (WTI) is selling for \$99/barrel at the time of this writing⁷², and this price is roughly a 25% contraction from its peak. There was a noticeable drop in crude production during mid-2020 (due to low gasoline demand during the pandemic), but production has been restored to capacity since 2021 per Figure 41. Refineries have been operating at 85% or higher since Autumn 2021, and 90% or higher since March 2022, similar to production over the past twenty years. (See Figure 42.) There was substantial press surrounding the sanctions against Russia, which only impacted 8% of the US’ petroleum imports. Even tapping the US Strategic Petroleum Reserve⁷³ did not appear to affect the retail price of oil.

On the demand side, while 2020 saw an obvious drop in miles and, assumably, gasoline consumption, drivers have resumed their use of gasoline in 2021 very similarly to consumption patterns in 2019. (See Figure 44.) Airline travel miles were 90M in Jan 2020, and were 74.7M miles in Feb 2022 despite press reports about significant numbers of flights being canceled due to personnel issues.

While the Russian invasion of Ukraine was a catalyst for pushing prices over an “inflection point”, and dramatically increasing the rate that prices rose, **we believe that much of the issue in the oil industry is due to labor issues that have been seen in other industries**. As the costs of labor for refinery workers,

⁷⁰ See <https://fred.stlouisfed.org/series/DPRIME>

⁷¹ <https://gasprices.aaa.com/>

⁷² <https://oilprice.com/oil-price-charts/>

⁷³ <https://www.cnn.com/2022/03/30/politics/strategic-petroleum-reserve-release-oil-joe-biden/index.html>

truck drivers, and other have increased, those costs have been passed on to the pump and will continue until employment issues are stabilized.

Figure 39: Crude Oil vs Retail Gasoline Prices

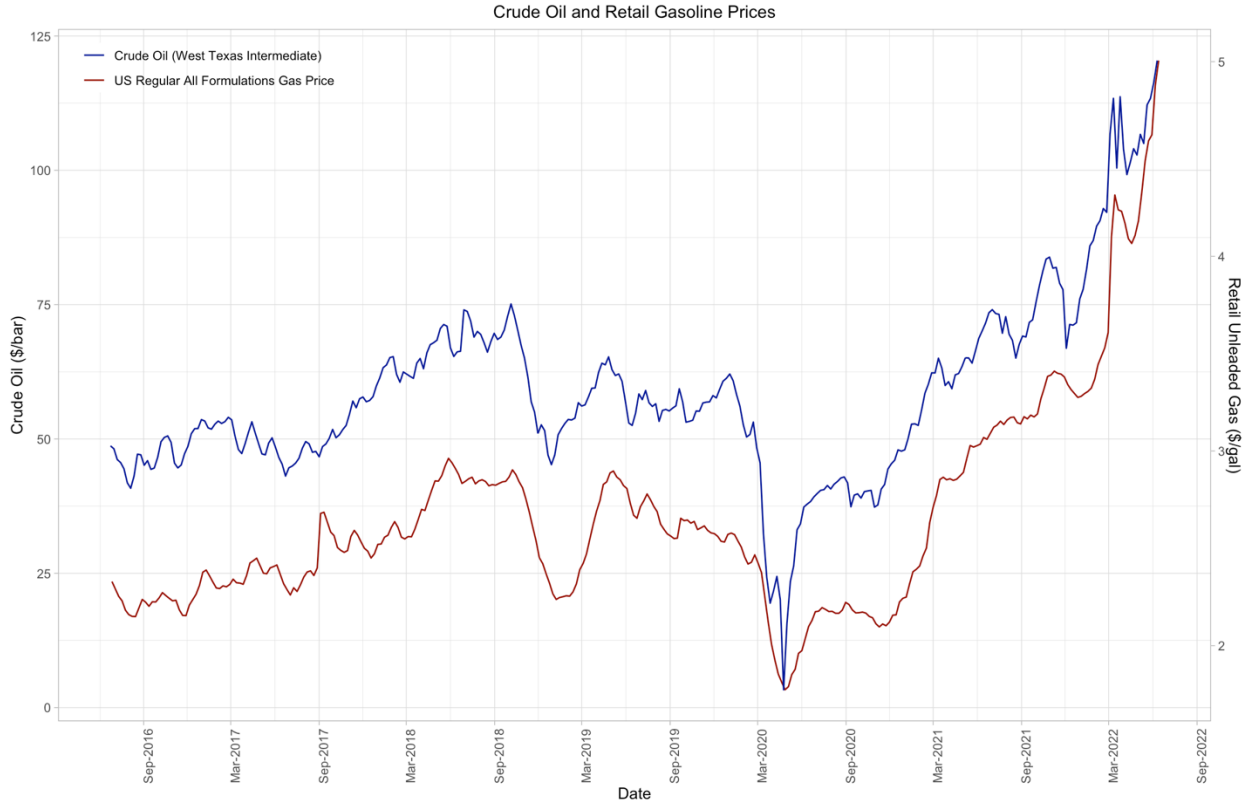
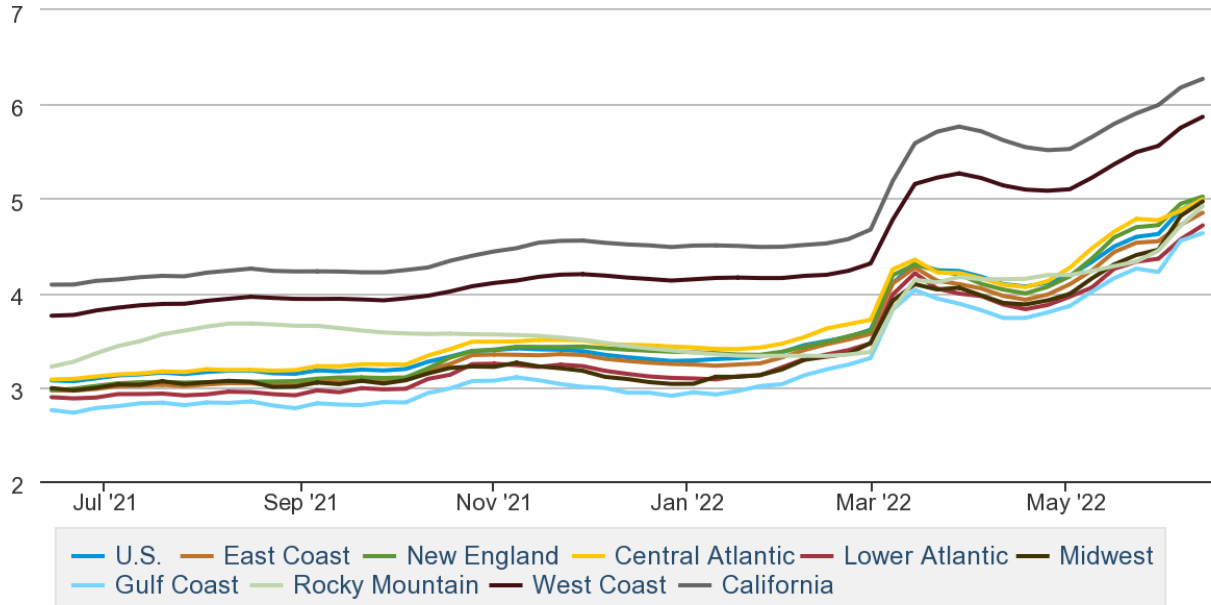


Figure 40: Regular-grade Gasoline Prices (US\$/gal) by region

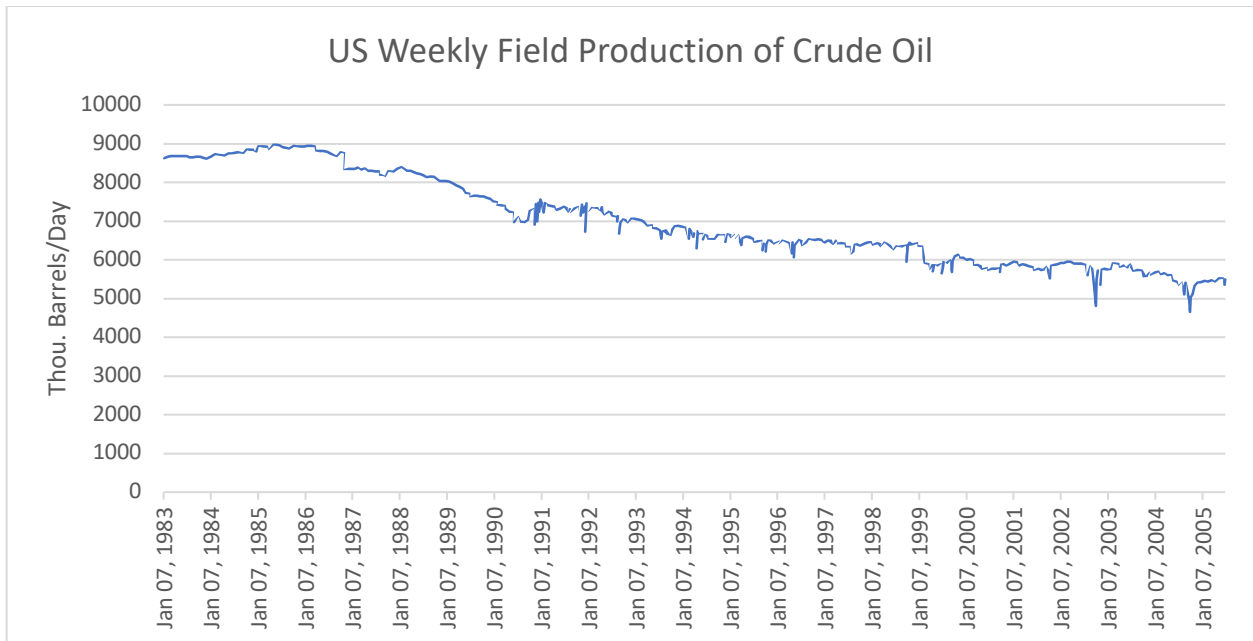
Regular Gasoline Prices

(dollars per gallon)



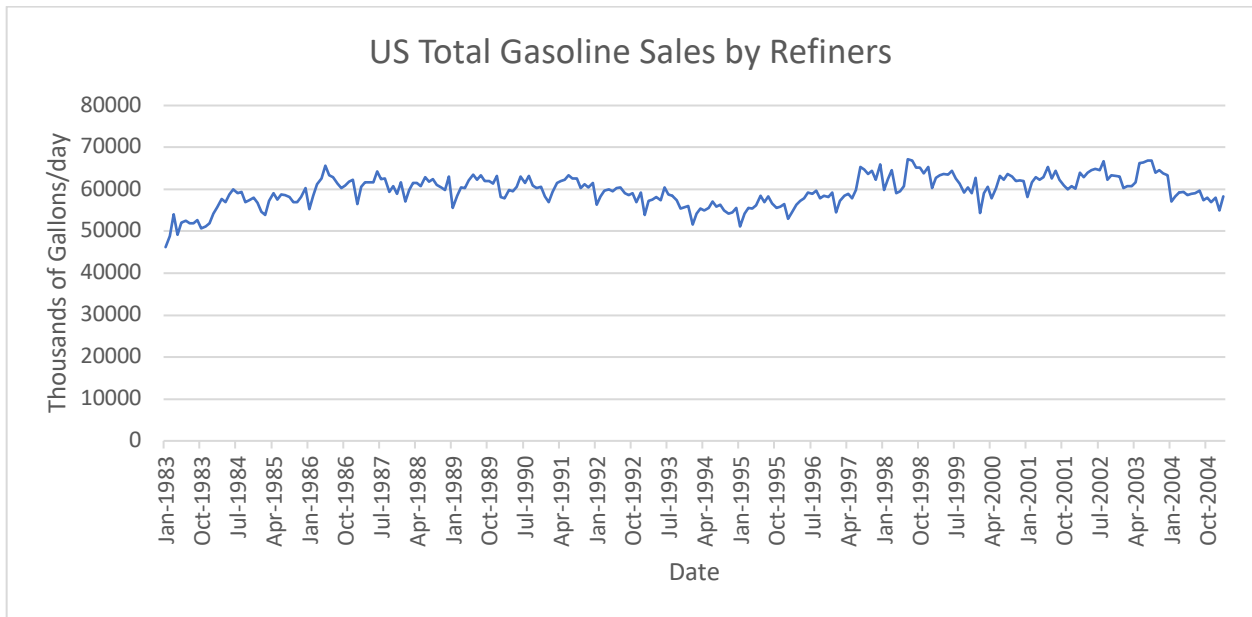
Source: <https://www.eia.gov/petroleum/gasdiesel/>

Figure 41: US Weekly Field Production of Crude Oil



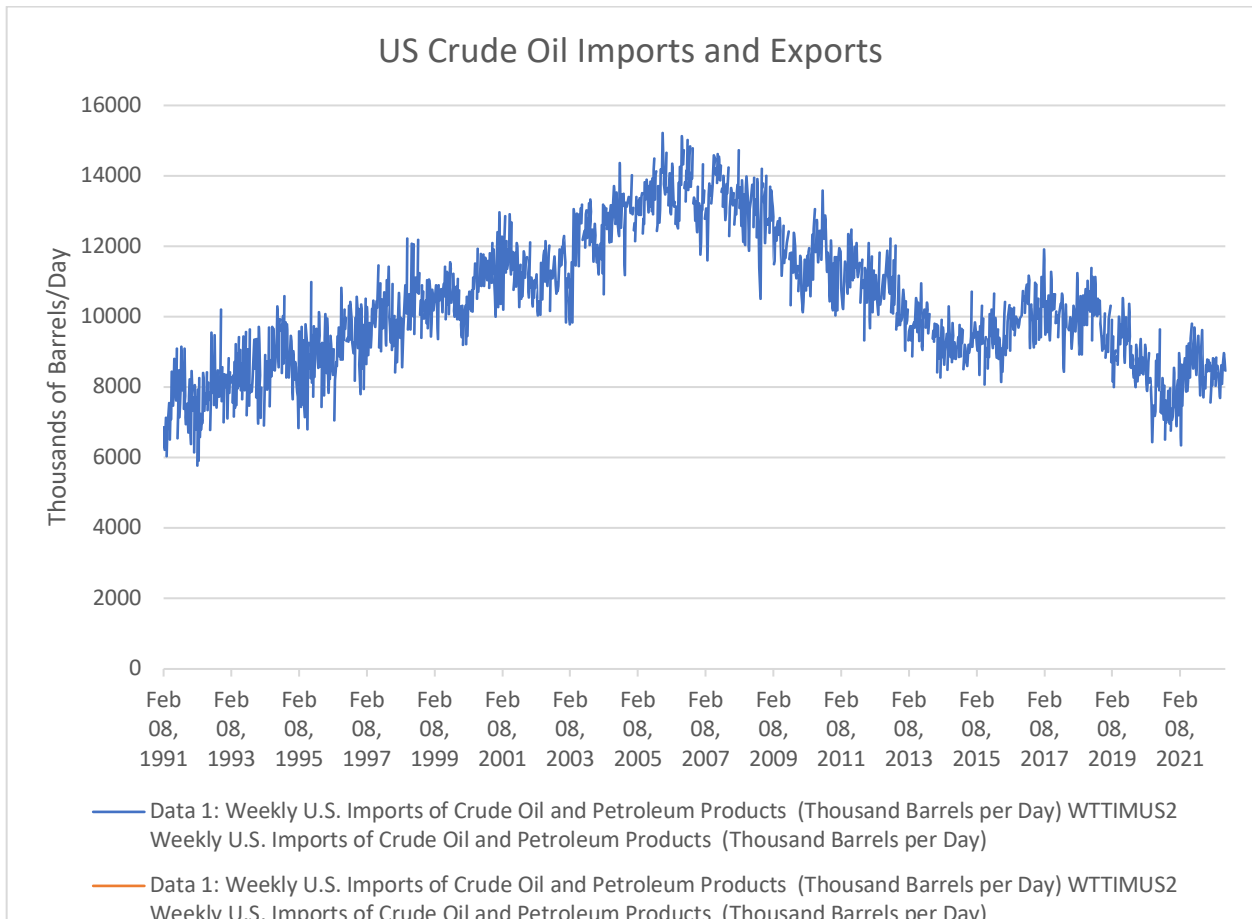
Source: <https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=WCRFPUS2&f=W>

Figure 42: US Total Gasoline Sales by Refiners



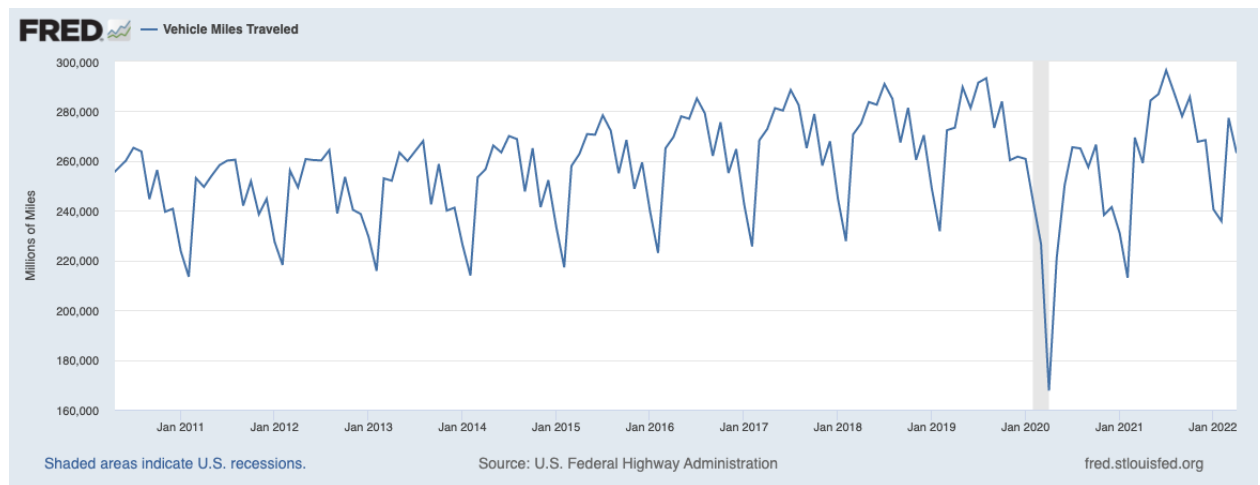
Source: <https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=A103600001&f=M>

Figure 43: US Crude Oil Imports and Exports



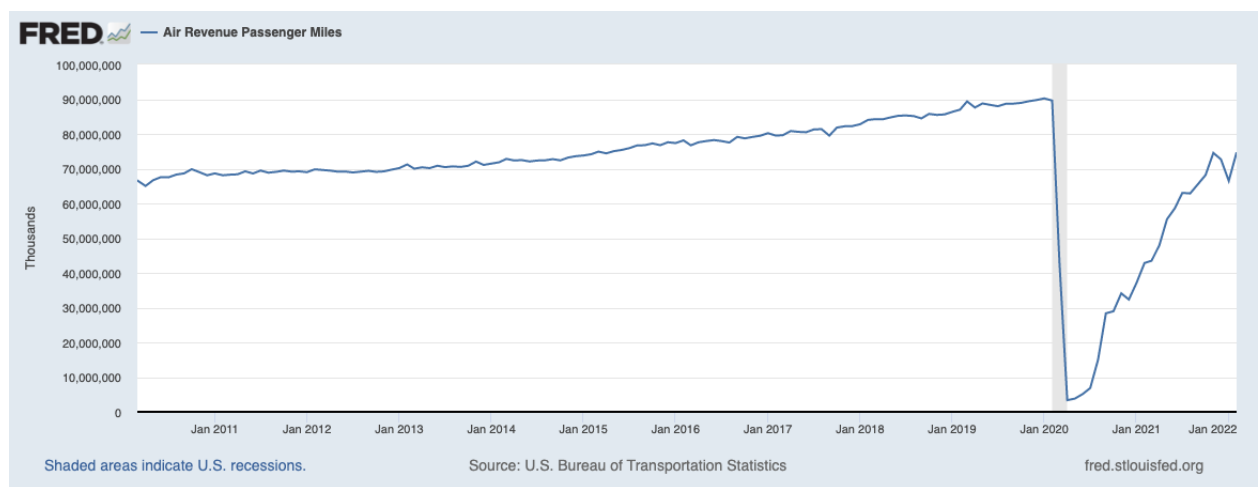
Source: <https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=WTTIMUS2&f=W> and <https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=WTTEXUS2&f=W>

Figure 44: Vehicle Miles Traveled



Source: <https://fred.stlouisfed.org/series/TRFVOLUSM227NFWA>

Figure 45: Air Revenue Passenger Miles (thou.)



Source: <https://fred.stlouisfed.org/series/AIRRPMTSID11>

The National Oceanic and Atmospheric Administration has forecasted above average activity for the 2022 season (from June to November), implying an increased risk for impacting oil production in the Gulf of Mexico⁷⁴. The agency is predicting between three and six major storms in the Atlantic Ocean, Caribbean, and Gulf of Mexico⁷⁵. Colorado State University also predicts that the 2022 hurricane season’s activity will be about 130% of an “average season” (anticipating five major storms, due to the likely absence of El Niño), whereas the 2021 hurricane season turned out to be about 140% of the “average season”⁷⁶. Finally, the warm start to the 2021 hurricane season is already fueling speculation about the weather.⁷⁷

⁷⁴ <https://www.noaa.gov/news-release/noaa-predicts-above-normal-2022-atlantic-hurricane-season>

⁷⁵ <https://www.usgs.gov/news/featured-story/2022-atlantic-hurricane-season-here>

⁷⁶ See <https://www.forbes.com/advisor/homeowners-insurance/2022-hurricane-season/>. Per this article, NOAA’s record for “predicting [the] number of major storms” is 82% over the past ten years; CSU’s record is 62% over the same period.

⁷⁷ <https://www.nbcnews.com/news/us-news/warm-gulf-water-raises-concern-hurricane-season-heat-wave-spreads-sout-rcna34738>

The National Weather Service has already predicted that the 2021-22 Winter Season will be wetter than normal in New England and the extreme Pacific Northwest. New England's conditions, despite being expected to be warmer than usual, if they do turn to significant snowfall, could tax the natural gas' markets requirements. The Southwest US (from Oregon, to Colorado & South Dakota, and to Texas) is anticipated to see a drier-than-usual winter season.⁷⁸

Other Commentary

- “In the first full week of June, gasoline sales at U.S. stations were down about 8.2% compared with the same week last year—the 14th consecutive week that sales have lagged behind 2021 levels, according to surveys by energy-data provider OPIS.” (<https://www.wsj.com/articles/high-gas-prices-hit-demand-as-drivers-cut-back-at-the-pump-11655890381>; June 22, 2021)
- “The U.S. average retail price for regular grade gasoline averaged \$4.44 per gallon (gal) in May, and the average retail diesel price was \$5.57/gal. Rising prices for gasoline and diesel reflect refining margins for those products that are at or near record highs amid low inventory levels. We expect the gasoline wholesale margins (the difference between the wholesale gasoline price and Brent crude oil price) to fall from \$1.17/gal in May to average 81 cents/gal in 3Q22, and we expect retail gasoline prices to average \$4.27/gal in 3Q22.” (<https://www.eia.gov/outlooks/steo/report/prices.php>; June 7, 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. Rates for 30-year, fixed rate mortgages, however, have already gone from 2.65% to 5.78%⁷⁹ (or higher) during 2022, and we have already projected that we expect that gap to double within the next twelve months.

Now that interest rates are rising, we would like to think that home price increases and sales would moderate. As first-time home buyers' budgets are typically stringent, and lenders may be flexible to a point, we don't expect lending standards to change appreciably from 2019. Adjustable-rate mortgages are already experiencing a resurgence⁸⁰ as buyers continue to push into the housing market fray. While home sales and mortgage applications are faltering, it is not clear if the Fed's 75 bp increase to overnight lending rates is a going to “pop” the housing bubble yet. **We believe that housing sales will quickly slow through the summer months, and purchase prices will significantly drop during the fall and winter** with drastically rising rates (with comparable increases in closing times, and more diligent negotiations between buyers and sellers to return to the norm). The big question is to what degree sellers will adjust prices, and what the home sales market will look like in Spring of 2023.

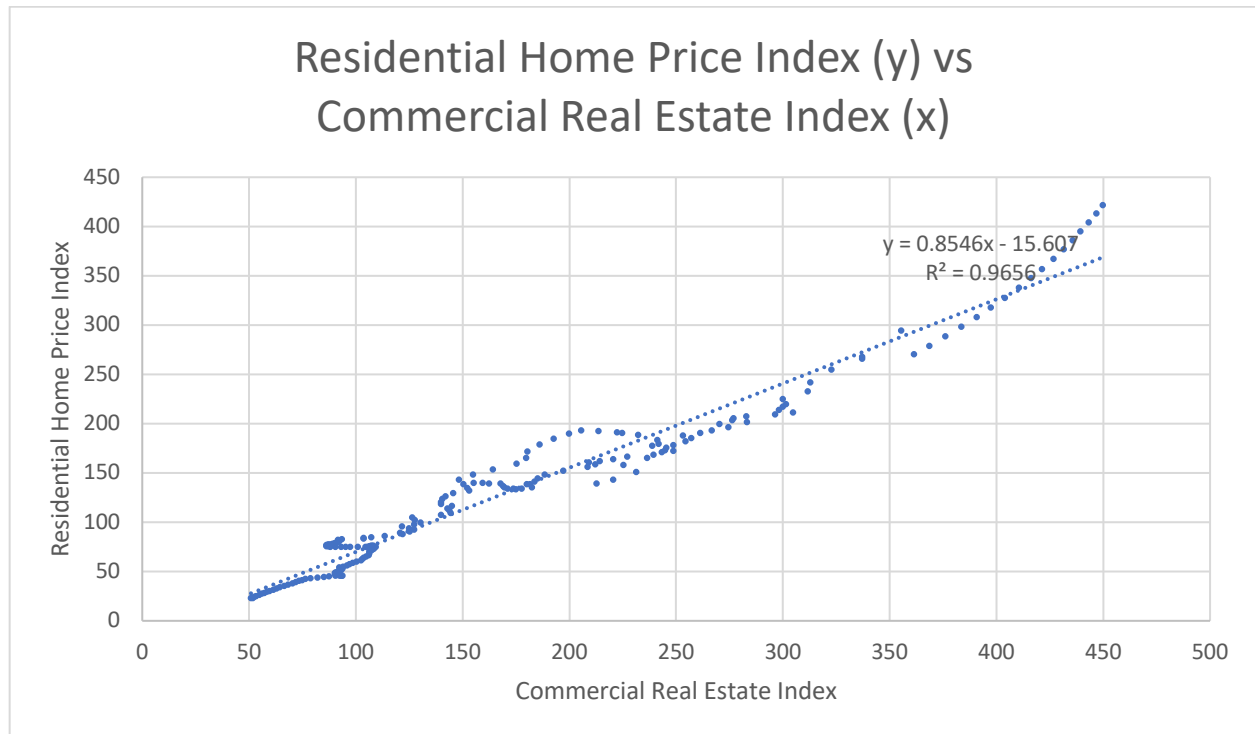
⁷⁸ <https://www.weather.gov/arx/winter2122>

⁷⁹ <https://fred.stlouisfed.org/series/MORTGAGE30US>

⁸⁰ <https://www.cnn.com/2022/06/22/demand-for-adjustable-rate-mortgages-surges-as-interest-rates-jump.html>

Regarding commercial real estate, holders seem to be developing a sense of the businesses that will demand workers return to the office⁸¹, and what real estate needs will be for the next twelve to twenty-four months (provided that a new COVID variant does not develop traction). The conversion of office space into residential units is a trend that is slowly increasing^{82,83} in several downtown areas including Pittsburgh⁸⁴, Manhattan⁸⁵, Dallas⁸⁶, and Portland (Maine)⁸⁷. Warehousing is another trend that is being viewed as a possibility⁸⁸.

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



Source: Authors' calculation

Other Commentary

- “A venture of two New York developers has purchased a one-third empty office building in the city’s financial district with plans to convert it into apartments, one of the largest such conversion schemes to be launched during the pandemic. ... The deal comes as the remote-working trend that became popular during the pandemic is sending vacancies soaring in office markets throughout the country. Businesses adopting hybrid workplace strategies are leasing

⁸¹ A Gallup poll (<https://www.gallup.com/workplace/357779/bet-desks-empty.aspx>) estimates that 37% of office space will be abandoned as tenants contract based on “work-from-home” policies.

⁸² <https://www.multihousingnews.com/the-rise-of-urban-residential-conversions/>

⁸³ <https://www.cnbc.com/2021/11/24/a-record-number-of-office-buildings-turned-into-apartments-this-year.html>

⁸⁴ <https://www.bizjournals.com/pittsburgh/news/2022/06/21/hertz-residential-conversion-three-gateway-center.html>

⁸⁵ <https://20broadst.com/about/>

⁸⁶ <https://www.thenationaldallas.com/location/>

⁸⁷ <https://boulos.com/office-conversion-projects-the-plan-to-make-them-affordable/>

⁸⁸ <https://www.naiop.org/en/Research-and-Publications/Magazine/2022/Summer-2022/Business-Trends/Office-to-Industrial-Conversions-A-Niche-Market-Worth-Exploring>

less space and migrating to newer buildings with modern designs, good locations and abundant amenities.” (<https://www.wsj.com/articles/empty-wall-street-offices-to-be-revived-as-apartments-11655812801>; June 21, 2022)

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 3, 2Q2022 has been a disappointment for the DWCF, with a loss of almost 8,000 points (17.2% of the level at the beginning of 2Q2022).

Table 3: Approximate Quarterly Milestones for the Dow-Jones Total Market Index

Period	Index Range ⁸⁹	Trading Days	Avg points/day
3Q2021 (7/1/2021-9/30/2021)	44904.32 → 44705.79	65	-3.1
4Q2021 (10/1/2021-12/31/2021)	44705.79 → 48634.31	61	64.4
1Q2022 (1/1/2022-3/31/2021)	48634.31 → 45847.30	63	-44.2
2Q2022 (4/1/2022-6/30/2022)	45847.30 → 37976.52	63	-124.93

We note in Table 4 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. During 2Q2022, we have seen a decrease of 750 points (i.e., 16.5%). Neither of these drops have been surprising as investors have seen increasing volatility in the markets and the risks of the markets being overvalued given the expected increases in interest rates. (Recall that, as the interest rates are increased, this pressures the short-term bond markets -- that compete for the same investment dollars – to raise their yields, which will in turn push the mid-term bond markets and mortgage rates.) As the market re-adjusts itself to the new market conditions, we expect for these indexes to have generally falling profiles; in doing so, investors will be extracting liquidity from the market, and diminished interest in the products will continue to push prices lower until rate neutrality is reached by the FOMC.

Table 4: Approximate Quarterly Milestones for the Standard and Poor’s 500 (“SP500”) Index

Period	Index Range ⁹⁰	Trading Days	Avg points/day
3Q2021 (7/1/2021-9/30/2021)	4297.50 → 4307.54	65	0.15
4Q2021 (10/1/2021-12/31/2021)	4307.54 → 4766.18	61	7.52
1Q2022 (1/1/2022-3/31/2021)	4766.18 → 4530.41	63	-3.74
2Q2022 (4/1/2022-6/30/2022)	4530.41 → 3785.38	63	-11.82

The VIX has risen from 25.4 in 1Q2022, to 27.3 as of this writing. This rise is not surprising given the Russian invasion of Ukraine, and its impact on grain and petroleum supplies, along with the US’ level of inflation, and the possibility of being drawn into a direct conflict with Russia. COVID seems to be

⁸⁹ Index values found at <https://www.marketwatch.com/investing/index/dwcf>

⁹⁰ Index values found at <https://www.marketwatch.com/investing/index/spx>

diminishing as a factor of instability in the markets as long as its severity and the message around its implications are carefully managed; however, this point could always change with little notice.

It is worth considering the possibility of President Biden will not serve his entire term in office; if that were to occur, the VIX would likely be affected, and it would hamper other indexes. An unscheduled change in US leadership could potentially cause traders to pull back given the uncertainties around the Vice President that we have previously discussed. Similarly, a substantive change in geopolitical policies (for handling Middle East or Far East countries, or Russia based on the Ukraine invasion) could be enough to impact US markets, and 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 2Q2012 and 1Q2022, inclusive.

Table 15: Regression Aggregate Errors for 2Q2012 through 1Q2022

Variable	Min Abs. Error	Average Error	Max Abs. Error
Real GDP Growth	***	***	***
Nominal GDP Growth	***	**	***
Real Disposable Income Growth	4.39%	-88.96%	***
Nominal Disposable Income Growth	2.49%	***	***
Inflation	0.00%	**	***
Unemployment Rate	732.06%	**	***
1-month Treasury Yield	1.52%	49.65%	***
3-month Treasury Yield	0.00%	26.24%	***
6-month Treasury Yield	2.65%	79.21%	***
1-year Treasury Yield	0.64%	37.09%	787.30%
3-year Treasury Yield	1.09%	11.71%	688.86%
5-year Treasury Yield	0.20%	9.54%	381.40%
7-year Treasury Yield	1.55%	0.99%	290.04%
10-year Treasury Yield	0.87%	14.36%	265.12%
20-year Treasury Yield	0.56%	0.47%	122.07%
30-year Treasury Yield	4.49%	-30.53%	97.51%
30-year Mortgage Rate	0.05%	1.52%	25.22%
Moody’s AAA Curve	10.45%	-31.00%	95.09%
Moody’s BAA Curve	0.03%	1.19%	38.12%
BBB Corporate Yield	4.41%	-27.59%	91.91%
Prime Rate	284.53%	**	***
US Average Retail Gasoline Price	14.85%	211.79%	424.04%
Cost of Federal Funds	2.17%	125.08%	***
Dow Jones Total Stock Market Index	0.09%	-16.86%	148.57%
S&P 500 Stock Price Index	0.00%	**	***
Commercial Real Estate Price Index	0.10%	-6.12%	47.30%
Residential Home Price Index	0.12%	-3.63%	62.60%
Market Volatility Index	0.36%	142.19%	599.83%

** 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	
	<i>Dependent variable (+/- SE):</i>
	Real GDP growth
Constant	134.119 (+/- 100.584) p = 0.200
SP500 Stock Price Index	-0.009 (+/- 0.001) p = 0.00000***
Real disposable income growth	-1.022 (+/- 0.279) p = 0.002***
Nominal disposable income growth	1.127 (+/- 0.275) p = 0.001***
Unemployment Rate	-11.296 (+/- 1.036) p = 0.000***
BBB corporate yield	12.740 (+/- 2.463) p = 0.0001***
30-year Mortgage Rate	-19.045 (+/- 4.286) p = 0.0004***
Prime Rate	10.173 (+/- 2.710) p = 0.002***
30-year Treasury Yield	-2,378.531 (+/- 445.724) p = 0.00005***
LN_30-year Treasury Yield	3,117.686 (+/- 562.247) p = 0.00003***
20-year Treasury Yield	1,983.824 (+/- 410.929) p = 0.0002***
LN_20-year Treasury Yield	-2,109.134 (+/- 487.551) p = 0.0005***
10-year Treasury Yield	126.319 (+/- 22.999) p = 0.00004***
LN_10-year Treasury Yield	-357.262 (+/- 44.294) p = 0.00000***
LN_1-month Treasury Yield	5.086 (+/- 1.234) p = 0.001***
7-year Treasury Yield	-79.144 (+/- 19.517) p = 0.001***
LN_7-year Treasury Yield	82.831 (+/- 19.770) p = 0.001***

5-year Treasury Yield	25.871 (+/- 7.583) p = 0.004***
LN_6-month Treasury Yield	-13.120 (+/- 2.054) p = 0.00001***
3-month Treasury Yield_2	-2.894 (+/- 0.708) p = 0.001***
20-year Treasury Yield_2	-204.130 (+/- 42.656) p = 0.0002***
30-year Treasury Yield_2	214.334 (+/- 43.784) p = 0.0002***
Observations	40
R ²	0.986
Adjusted R ²	0.970
Residual Std. Error	1.314 (df = 18)
F Statistic	62.035*** (df = 21; 18)
Note:	*p<0.1; **p<0.05; ***p<0.01

REGRESSION FOR NOMINAL GDP GROWTH	
	<i>Dependent variable (+/- SE):</i>
	Nominal GDP growth
Constant	20.715 (+/- 11.415) p = 0.113
US Fed Reserve O-N Loan Rate	115.752 (+/- 4.213) p = 0.00000***
Moody's BAA Curve	16.653 (+/- 0.517) p = 0.000***
Real disposable income growth	0.106 (+/- 0.005) p = 0.00000***
Unemployment Rate	-11.182 (+/- 0.227) p = 0.000***
CPI Inflation Rate	2.663 (+/- 0.071) p = 0.000***
Prime Rate	44.175 (+/- 2.683) p = 0.00000***
Dow Total Stock Market Index	0.002 (+/- 0.0001) p = 0.00000***
Home Price Index	-1.209 (+/- 0.033) p = 0.000***
LN_Market Volatility Index	14.521 (+/- 0.469) p = 0.000***
30-year Treasury Yield	-368.563 (+/- 17.981) p = 0.00000***
LN_30-year Treasury Yield	673.654 (+/- 41.544) p = 0.00000***
20-year Treasury Yield	488.976 (+/- 21.609) p = 0.00000***
LN_20-year Treasury Yield	-820.796 (+/- 43.537) p = 0.00000***
10-year Treasury Yield	187.349 (+/- 11.124) p = 0.00000***
LN_10-year Treasury Yield	-463.378 (+/- 8.340) p = 0.000***
1-month Treasury Yield	-172.994 (+/- 4.441) p = 0.000***
LN_1-month Treasury Yield	11.704 (+/- 0.316)

MACROECONOMIC FORECASTS, 2Q2022 – DRAFT VERSION

	p = 0.000 ^{***}
7-year Treasury Yield	-498.969 (+/- 14.386)
	p = 0.000 ^{***}
LN_7-year Treasury Yield	634.901 (+/- 17.322)
	p = 0.000 ^{***}
3-month Treasury Yield	-37.759 (+/- 3.504)
	p = 0.00002 ^{***}
5-year Treasury Yield	-217.043 (+/- 10.161)
	p = 0.00000 ^{***}
LN_6-month Treasury Yield	-16.772 (+/- 1.004)
	p = 0.00000 ^{***}
3-year Treasury Yield	438.712 (+/- 13.081)
	p = 0.000 ^{***}
LN_3-year Treasury Yield	-98.420 (+/- 2.970)
	p = 0.000 ^{***}
1-year Treasury Yield	42.987 (+/- 2.184)
	p = 0.00000 ^{***}
LN_1-year Treasury Yield	-33.692 (+/- 1.186)
	p = 0.00000 ^{***}
3-year Treasury Yield_2	-70.894 (+/- 2.373)
	p = 0.000 ^{***}
5-year Treasury Yield_2	53.010 (+/- 2.530)
	p = 0.00000 ^{***}
3-month Treasury Yield_2	-24.419 (+/- 2.677)
	p = 0.00004 ^{***}
1-month Treasury Yield_2	26.565 (+/- 2.160)
	p = 0.00001 ^{***}
10-year Treasury Yield_2	12.986 (+/- 2.421)
	p = 0.002 ^{***}
Market Volatility Index_2	0.001 (+/- 0.0002)
	p = 0.003 ^{***}
<hr/>	
Observations	40
R ²	1.000
Adjusted R ²	1.000
Residual Std. Error	0.185 (df = 7)
F Statistic	2,653.741 ^{***} (df = 32; 7)
<hr/>	
Note:	* p<0.1; ** p<0.05; *** p<0.01

REGRESSION FOR REAL DISPOSABLE INCOME GROWTH

<i>Dependent variable (+/- SE):</i>	
Real disposable income growth	
Constant	-8.083 (+/- 6.391) p = 0.214
Unemployment Rate	1.977 (+/- 1.082) p = 0.076*
Observations	40
R ²	0.081
Adjusted R ²	0.057
Residual Std. Error	12.929 (df = 38)
F Statistic	3.337* (df = 1; 38)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

REGRESSION FOR NOMINAL DISPOSABLE INCOME GROWTH

	<i>Dependent variable (+/- SE):</i>
	Nominal disposable income growth
Constant	256.072 (+/- 136.512) p = 0.073*
Unemployment Rate	18.550 (+/- 2.818) p = 0.00000***
Dow Total Stock Market Index	-0.003 (+/- 0.001) p = 0.008***
Commercial Real Estate Price Index	1.083 (+/- 0.262) p = 0.0004***
7-year Treasury Yield	-2,309.079 (+/- 437.501) p = 0.00002***
LN_7-year Treasury Yield	1,835.467 (+/- 331.394) p = 0.00001***
3-month Treasury Yield	142.655 (+/- 40.686) p = 0.002***
5-year Treasury Yield	1,835.156 (+/- 365.460) p = 0.00004***
LN_5-year Treasury Yield	-1,128.967 (+/- 221.930) p = 0.00003***
1-year Treasury Yield	-321.020 (+/- 79.787) p = 0.0005***
LN_1-year Treasury Yield	48.479 (+/- 14.371) p = 0.003***
1-year Treasury Yield_2	99.114 (+/- 28.492) p = 0.002***
5-year Treasury Yield_2	-323.276 (+/- 68.800) p = 0.0001***
3-month Treasury Yield_2	-58.653 (+/- 19.374) p = 0.006***
7-year Treasury Yield_2	341.522 (+/- 69.924) p = 0.0001***
Observations	40
R ²	0.681
Adjusted R ²	0.502
Residual Std. Error	9.276 (df = 25)
F Statistic	3.807*** (df = 14; 25)

Note:

*p<0.1; **p<0.05; ***p<0.01

REGRESSION FOR CPI INFLATION RATE

	<i>Dependent variable (+/- SE):</i>
	CPI Inflation Rate
Constant	-20.233 (+/- 0.194) p = 0.00001***
SP500 Stock Price Index	-0.0004 (+/- 0.00002) p = 0.0002***
US Fed Reserve O-N Loan Rate	-12.155 (+/- 0.078) p = 0.00000***
Moody's AAA Curve	1.328 (+/- 0.051) p = 0.0002***
Moody's BAA Curve	-3.978 (+/- 0.044) p = 0.00001***
Real GDP growth	-0.266 (+/- 0.004) p = 0.00002***
Nominal GDP growth	0.219 (+/- 0.005) p = 0.00003***
Real disposable income growth	-1.106 (+/- 0.003) p = 0.00000***
Nominal disposable income growth	1.054 (+/- 0.003) p = 0.00000***
Unemployment Rate	-0.128 (+/- 0.008) p = 0.0005***
BBB corporate yield	3.180 (+/- 0.040) p = 0.00001***
30-year Mortgage Rate	-0.760 (+/- 0.039) p = 0.0003***
Commercial Real Estate Price Index	0.052 (+/- 0.0005) p = 0.00001***
Market Volatility Index	0.055 (+/- 0.001) p = 0.00001***
LN_Market Volatility Index	-2.169 (+/- 0.018) p = 0.00001***
LN_30-year Treasury Yield	56.664 (+/- 0.442) p = 0.00001***
20-year Treasury Yield	-6.107 (+/- 0.215) p = 0.0001***
LN_10-year Treasury Yield	-21.956 (+/- 0.346)

	p = 0.00001 ^{***}
1-month Treasury Yield	17.915 (+/- 0.085)
	p = 0.00000 ^{***}
LN_1-month Treasury Yield	-0.243 (+/- 0.017)
	p = 0.001 ^{***}
LN_7-year Treasury Yield	-9.797 (+/- 0.295)
	p = 0.0001 ^{***}
3-month Treasury Yield	-11.869 (+/- 0.066)
	p = 0.00000 ^{***}
LN_5-year Treasury Yield	11.540 (+/- 0.193)
	p = 0.00002 ^{***}
6-month Treasury Yield	14.774 (+/- 0.209)
	p = 0.00001 ^{***}
LN_6-month Treasury Yield	-1.329 (+/- 0.056)
	p = 0.0002 ^{***}
LN_3-year Treasury Yield	-3.742 (+/- 0.063)
	p = 0.00002 ^{***}
1-year Treasury Yield	-7.382 (+/- 0.194)
	p = 0.00005 ^{***}
LN_1-year Treasury Yield	2.174 (+/- 0.045)
	p = 0.00002 ^{***}
1-year Treasury Yield_2	2.800 (+/- 0.059)
	p = 0.00003 ^{***}
3-year Treasury Yield_2	1.697 (+/- 0.025)
	p = 0.00001 ^{***}
6-month Treasury Yield_2	-9.320 (+/- 0.092)
	p = 0.00001 ^{***}
5-year Treasury Yield_2	-2.440 (+/- 0.030)
	p = 0.00001 ^{***}
3-month Treasury Yield_2	5.561 (+/- 0.055)
	p = 0.00001 ^{***}
7-year Treasury Yield_2	0.651 (+/- 0.056)
	p = 0.002 ^{***}
10-year Treasury Yield_2	1.945 (+/- 0.037)
	p = 0.00002 ^{***}
20-year Treasury Yield_2	0.228 (+/- 0.039)
	p = 0.010 ^{***}
30-year Treasury Yield_2	-1.768 (+/- 0.025)
	p = 0.00001 ^{***}

MACROECONOMIC FORECASTS, 2Q2022 – DRAFT VERSION

Observations	40
R ²	1.000
Adjusted R ²	1.000
Residual Std. Error	0.005 (df = 3)
F Statistic	272,775.600 ^{***} (df = 36; 3)
<hr/>	
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

Unemployment Rate

REGRESSION FOR UNEMPLOYMENT RATE

	<i>Dependent variable (+/- SE):</i>
	Unemployment Rate
Constant	-23.452 (+/- 1.022) p = 0.00000***
SP500 Stock Price Index	-0.001 (+/- 0.00005) p = 0.00000***
US Fed Reserve O-N Loan Rate	-6.424 (+/- 0.340) p = 0.00001***
Real GDP growth	-0.407 (+/- 0.017) p = 0.00000***
Nominal GDP growth	0.329 (+/- 0.016) p = 0.00000***
Real disposable income growth	-0.488 (+/- 0.023) p = 0.00000***
Nominal disposable income growth	0.472 (+/- 0.022) p = 0.00000***
CPI Inflation Rate	-0.576 (+/- 0.023) p = 0.00000***
BBB corporate yield	1.322 (+/- 0.034) p = 0.00000***
30-year Mortgage Rate	-2.880 (+/- 0.099) p = 0.00000***
Prime Rate	3.213 (+/- 0.140) p = 0.00000***
Dow Total Stock Market Index	0.0002 (+/- 0.00001) p = 0.00001***
Home Price Index	-0.017 (+/- 0.002) p = 0.0002***
LN_Market Volatility Index	-0.639 (+/- 0.031) p = 0.00000***
US Avg Retail Gasoline Price (\$-gal; all grades, all formulations)	0.208 (+/- 0.036) p = 0.002***
30-year Treasury Yield	-58.789 (+/- 1.661) p = 0.00000***
LN_30-year Treasury Yield	150.484 (+/- 4.543) p = 0.00000***

MACROECONOMIC FORECASTS, 2Q2022 – DRAFT VERSION

20-year Treasury Yield	56.816 (+/- 1.695) p = 0.00000***
LN_20-year Treasury Yield	-111.510 (+/- 3.649) p = 0.00000***
10-year Treasury Yield	45.165 (+/- 1.686) p = 0.00000***
LN_10-year Treasury Yield	-53.727 (+/- 1.517) p = 0.00000***
1-month Treasury Yield	14.225 (+/- 0.530) p = 0.00000***
7-year Treasury Yield	-45.139 (+/- 2.825) p = 0.00001***
LN_7-year Treasury Yield	27.862 (+/- 1.259) p = 0.00000***
3-month Treasury Yield	-10.160 (+/- 0.455) p = 0.00000***
5-year Treasury Yield	6.851 (+/- 0.875) p = 0.0003***
3-year Treasury Yield	3.354 (+/- 0.345) p = 0.0001***
6-month Treasury Yield_2	-4.194 (+/- 0.134) p = 0.00000***
5-year Treasury Yield_2	-1.149 (+/- 0.230) p = 0.003***
3-month Treasury Yield_2	5.308 (+/- 0.215) p = 0.00000***
7-year Treasury Yield_2	5.149 (+/- 0.460) p = 0.00004***
1-month Treasury Yield_2	-1.876 (+/- 0.142) p = 0.00002***
10-year Treasury Yield_2	-4.878 (+/- 0.257) p = 0.00001***
Market Volatility Index_2	0.001 (+/- 0.00002) p = 0.00000***
Observations	40
R ²	1.000
Adjusted R ²	1.000
Residual Std. Error	0.018 (df = 6)
F Statistic	14,088.040*** (df = 33; 6)

Note:

*p<0.1; **p<0.05; ***p<0.01

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

REGRESSION FOR 1-MONTH TREASURY YIELD	
	<i>Dependent variable (+/- SE):</i>
	1-month Treasury Yield
Constant	0.867 (+/- 1.330) p = 0.519
Moody's AAA Curve	-4.195 (+/- 0.578) p = 0.00000***
Unemployment Rate	-0.142 (+/- 0.042) p = 0.002***
BBB corporate yield	1.564 (+/- 0.220) p = 0.00000***
Home Price Index	-0.033 (+/- 0.007) p = 0.0001***
Commercial Real Estate Price Index	0.030 (+/- 0.007) p = 0.0001***
30-year Treasury Yield	2.979 (+/- 0.454) p = 0.00000***
Observations	40
R ²	0.845
Adjusted R ²	0.817
Residual Std. Error	0.338 (df = 33)
F Statistic	29.937*** (df = 6; 33)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

REGRESSION FOR 3-MONTH TREASURY YIELD	
	<i>Dependent variable (+/- SE):</i>
	3-month Treasury Yield
Constant	2.721 (+/- 0.653) p = 0.0002***
Moody's BAA Curve	-2.098 (+/- 0.432) p = 0.00003***
Unemployment Rate	-0.137 (+/- 0.046) p = 0.006***
BBB corporate yield	2.143 (+/- 0.411) p = 0.00001***
Observations	40
R ²	0.633
Adjusted R ²	0.603
Residual Std. Error	0.497 (df = 36)
F Statistic	20.731*** (df = 3; 36)
<i>Note:</i>	* p<0.1; ** p<0.05; *** p<0.01

REGRESSION FOR 6-MONTH TREASURY YIELD	
	<i>Dependent variable (+/- SE):</i>
	6-month Treasury Yield
Constant	2.790 (+/- 0.633) p = 0.0001***
Moody's BAA Curve	-2.203 (+/- 0.419) p = 0.00001***
Unemployment Rate	-0.147 (+/- 0.045) p = 0.003***
BBB corporate yield	2.289 (+/- 0.398) p = 0.00001***
Observations	40
R ²	0.679
Adjusted R ²	0.653
Residual Std. Error	0.482 (df = 36)
F Statistic	25.431*** (df = 3; 36)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

REGRESSION FOR 1-YEAR TREASURY YIELD	
	<i>Dependent variable (+/- SE):</i>
	1-year Treasury Yield
Constant	2.810 (+/- 0.588) p = 0.00003***
Moody's BAA Curve	-2.225 (+/- 0.389) p = 0.00001***
Unemployment Rate	-0.158 (+/- 0.042) p = 0.001***
BBB corporate yield	2.350 (+/- 0.370) p = 0.00000***
Observations	40
R ²	0.729
Adjusted R ²	0.706
Residual Std. Error	0.447 (df = 36)
F Statistic	32.288*** (df = 3; 36)
<i>Note:</i>	* p<0.1; ** p<0.05; *** p<0.01

REGRESSION FOR 3-YEAR TREASURY YIELD	
	<i>Dependent variable (+/- SE):</i>
	3-year Treasury Yield
Constant	2.698 (+/- 0.257) p = 0.000***
Unemployment Rate	-0.282 (+/- 0.043) p = 0.00000***
Observations	40
R ²	0.526
Adjusted R ²	0.513
Residual Std. Error	0.519 (df = 38)
F Statistic	42.137*** (df = 1; 38)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

REGRESSION FOR 5-YEAR TREASURY YIELD	
	<i>Dependent variable (+/- SE):</i>
	5-year Treasury Yield
Constant	2.868 (+/- 0.236) p = 0.000***
Unemployment Rate	-0.248 (+/- 0.040) p = 0.00000***
Observations	40
R ²	0.503
Adjusted R ²	0.490
Residual Std. Error	0.477 (df = 38)
F Statistic	38.441 *** (df = 1; 38)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

REGRESSION FOR 7-YEAR TREASURY YIELD

	<i>Dependent variable (+/- SE):</i>
	7-year Treasury Yield
Constant	3.785 (+/- 0.339) p = 0.000***
Unemployment Rate	-0.235 (+/- 0.038) p = 0.00000***
Dow Total Stock Market Index	-0.00003 (+/- 0.00001) p = 0.003***
Observations	40
R ²	0.534
Adjusted R ²	0.509
Residual Std. Error	0.436 (df = 37)
F Statistic	21.222*** (df = 2; 37)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

REGRESSION FOR 10-YEAR TREASURY YIELD

	<i>Dependent variable (+/- SE):</i>
	10-year Treasury Yield
Constant	4.065 (+/- 0.340) p = 0.000***
Unemployment Rate	-0.192 (+/- 0.038) p = 0.00001***
Dow Total Stock Market Index	-0.00003 (+/- 0.00001) p = 0.0001***
Observations	40
R ²	0.498
Adjusted R ²	0.471
Residual Std. Error	0.436 (df = 37)
F Statistic	18.353*** (df = 2; 37)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

REGRESSION FOR 20-YEAR TREASURY YIELD

	<i>Dependent variable (+/- SE):</i>
	20-year Treasury Yield
Constant	-0.314 (+/- 0.743) p = 0.676
US Fed Reserve O-N Loan Rate	-0.760 (+/- 0.198) p = 0.001***
Unemployment Rate	-0.115 (+/- 0.032) p = 0.001***
Prime Rate	0.946 (+/- 0.204) p = 0.0001***
Dow Total Stock Market Index	-0.00004 (+/- 0.00001) p = 0.00000***
US Avg Retail Gasoline Price (\$-gal; all grades, all formulations)	0.458 (+/- 0.089) p = 0.00002***
Observations	40
R ²	0.771
Adjusted R ²	0.738
Residual Std. Error	0.291 (df = 34)
F Statistic	22.921*** (df = 5; 34)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

REGRESSION FOR 30-YEAR TREASURY YIELD	
	<i>Dependent variable (+/- SE):</i>
	30-year Treasury Yield
Constant	7.486 (+/- 0.577) p = 0.000***
SP500 Stock Price Index	-0.001 (+/- 0.0001) p = 0.000***
US Fed Reserve O-N Loan Rate	-5.462 (+/- 1.184) p = 0.0001***
Unemployment Rate	-0.204 (+/- 0.042) p = 0.00004***
LN_Market Volatility Index	-0.530 (+/- 0.148) p = 0.002***
1-month Treasury Yield	5.250 (+/- 1.136) p = 0.0001***
Observations	40
R ²	0.773
Adjusted R ²	0.740
Residual Std. Error	0.302 (df = 34)
F Statistic	23.206*** (df = 5; 34)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

30-year Mortgage Rate

REGRESSION FOR 30-YEAR MORTGATE RATE	
	<i>Dependent variable (+/- SE):</i>
	30-year Mortgage Rate
Constant	4.384 (+/- 0.177) p = 0.000***
Dow Total Stock Market Index	-0.00003 (+/- 0.00001) p = 0.00004***
1-month Treasury Yield	0.347 (+/- 0.073) p = 0.00003***
Observations	40
R ²	0.517
Adjusted R ²	0.491
Residual Std. Error	0.356 (df = 37)
F Statistic	19.786*** (df = 2; 37)
Note:	*p<0.1; **p<0.05; ***p<0.01

Moody's AAA & BAA Rates

REGRESSION FOR MOODY'S AAA CURVE	
	<i>Dependent variable (+/- SE):</i>
	Moody's AAA Curve
Constant	3.236 (+/- 0.696) p = 0.00005***
SP500 Stock Price Index	-0.001 (+/- 0.0001) p = 0.000***
Unemployment Rate	-0.132 (+/- 0.032) p = 0.0003***
Prime Rate	0.535 (+/- 0.137) p = 0.0004***
LN_1-month Treasury Yield	-0.247 (+/- 0.057) p = 0.0002***
Observations	40
R ²	0.782
Adjusted R ²	0.757
Residual Std. Error	0.298 (df = 35)
F Statistic	31.369*** (df = 4; 35)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

REGRESSION FOR MOODY'S BAA CURVE	
	<i>Dependent variable (+/- SE):</i>
	Moody's BAA Curve
Constant	4.894 (+/- 0.162) p = 0.000***
US Fed Reserve O-N Loan Rate	4.044 (+/- 1.280) p = 0.004***
Real GDP growth	0.246 (+/- 0.060) p = 0.0003***
Nominal GDP growth	-0.237 (+/- 0.053) p = 0.0001***
3-month Treasury Yield	-5.579 (+/- 1.473) p = 0.001***
3-month Treasury Yield_2	4.076 (+/- 0.996) p = 0.0003***
1-month Treasury Yield_2	-3.322 (+/- 0.874) p = 0.001***
Observations	40
R ²	0.540
Adjusted R ²	0.456
Residual Std. Error	0.464 (df = 33)
F Statistic	6.458*** (df = 6; 33)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

BBB Corporate Yield

REGRESSION FOR BBB CORPORATE YIELD	
	<i>Dependent variable (+/- SE):</i>
	BBB corporate yield
Constant	4.504 (+/- 0.228) p = 0.000***
SP500 Stock Price Index	-0.001 (+/- 0.0001) p = 0.000***
US Fed Reserve O-N Loan Rate	-1.393 (+/- 0.387) p = 0.002***
6-month Treasury Yield	1.913 (+/- 0.426) p = 0.0001***
LN_6-month Treasury Yield	-0.905 (+/- 0.209) p = 0.0002***
LN_1-year Treasury Yield	0.880 (+/- 0.227) p = 0.0005***
Observations	40
R ²	0.845
Adjusted R ²	0.822
Residual Std. Error	0.283 (df = 34)
F Statistic	37.063*** (df = 5; 34)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

Prime Rate

REGRESSION FOR PRIME RATE	
	<i>Dependent variable (+/- SE):</i>
	Prime Rate
Constant	-18.966 (+/- 3.522) p = 0.00002***
Moody's AAA Curve	-4.133 (+/- 0.417) p = 0.000***
Real disposable income growth	-0.304 (+/- 0.069) p = 0.0002***
Nominal disposable income growth	0.289 (+/- 0.066) p = 0.0002***
CPI Inflation Rate	-0.275 (+/- 0.062) p = 0.0002***
BBB corporate yield	1.013 (+/- 0.156) p = 0.00000***
Dow Total Stock Market Index	-0.0001 (+/- 0.00002) p = 0.005***
Commercial Real Estate Price Index	0.028 (+/- 0.003) p = 0.000***
30-year Treasury Yield	-8.181 (+/- 2.849) p = 0.008***
LN_30-year Treasury Yield	37.675 (+/- 6.583) p = 0.00001***
20-year Treasury Yield	26.957 (+/- 3.883) p = 0.00000***
LN_20-year Treasury Yield	-46.594 (+/- 5.663) p = 0.000***
20-year Treasury Yield_2	-1.922 (+/- 0.443) p = 0.0002***
Observations	40
R ²	0.951
Adjusted R ²	0.929
Residual Std. Error	0.195 (df = 27)
F Statistic	43.815*** (df = 12; 27)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

US Average Retail Gasoline Price

REGRESSION FOR US AVG RETAIL GASOLINE PRICE (-GAL; ALL GRADES, ALL FORMULATIONS)	
	<i>Dependent variable (+/- SE):</i>
	US Avg Retail Gasoline Price (\$-gal; all grades, all formulations)
Constant	7.246 (+/- 1.884) p = 0.003***
US Fed Reserve O-N Loan Rate	14.592 (+/- 1.779) p = 0.00001***
Real GDP growth	-0.287 (+/- 0.034) p = 0.00001***
Nominal GDP growth	0.261 (+/- 0.029) p = 0.00001***
Unemployment Rate	0.318 (+/- 0.051) p = 0.00005***
BBB corporate yield	-0.636 (+/- 0.119) p = 0.0002***
Prime Rate	-4.779 (+/- 0.507) p = 0.00000***
Dow Total Stock Market Index	0.0002 (+/- 0.00003) p = 0.00003***
Home Price Index	-0.049 (+/- 0.007) p = 0.00002***
Market Volatility Index	-0.047 (+/- 0.009) p = 0.0004***
LN_Market Volatility Index	1.163 (+/- 0.272) p = 0.002***
LN_30-year Treasury Yield	-6.115 (+/- 1.879) p = 0.007***
20-year Treasury Yield	6.085 (+/- 0.567) p = 0.00000***
10-year Treasury Yield	2.696 (+/- 0.770) p = 0.005***
1-month Treasury Yield	-19.420 (+/- 2.217) p = 0.00001***
LN_1-month Treasury Yield	0.273 (+/- 0.086) p = 0.009***
7-year Treasury Yield	-5.601 (+/- 0.888) p = 0.00004***

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LN_7-year Treasury Yield	-10.368 (+/- 1.898) p = 0.0002***
3-month Treasury Yield	-6.542 (+/- 0.981) p = 0.00003***
LN_5-year Treasury Yield	12.573 (+/- 1.868) p = 0.00003***
6-month Treasury Yield	22.440 (+/- 2.182) p = 0.00000***
3-year Treasury Yield	17.438 (+/- 1.868) p = 0.00000***
LN_3-year Treasury Yield	-7.234 (+/- 1.175) p = 0.00005***
1-year Treasury Yield	-15.941 (+/- 1.622) p = 0.00000***
1-year Treasury Yield_2	3.755 (+/- 0.595) p = 0.00004***
6-month Treasury Yield_2	-5.886 (+/- 1.143) p = 0.0003***
5-year Treasury Yield_2	-2.337 (+/- 0.359) p = 0.00003***
3-month Treasury Yield_2	3.953 (+/- 0.796) p = 0.0004***
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Observations	40
R ²	0.993
Adjusted R ²	0.977
Residual Std. Error	0.084 (df = 12)
F Statistic	61.870*** (df = 27; 12)

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

Cost of Federal Funds (Primary Credit Rate)

REGRESSION FOR US FED RESERVE O-N LOAN RATE	
	<i>Dependent variable (+/- SE):</i>
	US Fed Reserve O-N Loan Rate
Constant	-4.762 (+/- 1.128) p = 0.0002***
Home Price Index	-0.047 (+/- 0.010) p = 0.00005***
Commercial Real Estate Price Index	0.048 (+/- 0.008) p = 0.00000***
30-year Treasury Yield	0.730 (+/- 0.202) p = 0.001***
Observations	40
R ²	0.548
Adjusted R ²	0.510
Residual Std. Error	0.543 (df = 36)
F Statistic	14.538*** (df = 3; 36)
Note:	*p<0.1; **p<0.05; ***p<0.01

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

REGRESSION FOR DOW TOTAL STOCK MARKET INDEX	
	<i>Dependent variable (+/- SE):</i>
	Dow Total Stock Market Index
Constant	-3,773.570 (+/- 16,792.540) p = 0.825
Real GDP growth	-293.835 (+/- 55.960) p = 0.00003***
Real disposable income growth	-1,534.257 (+/- 177.784) p = 0.00000***
Nominal disposable income growth	1,485.576 (+/- 171.709) p = 0.00000***
Unemployment Rate	-1,442.941 (+/- 443.362) p = 0.004***
Prime Rate	23,628.970 (+/- 3,143.385) p = 0.00000***
LN_Market Volatility Index	4,525.809 (+/- 1,282.136) p = 0.002***
10-year Treasury Yield	-141,029.700 (+/- 11,589.880) p = 0.000***
LN_1-month Treasury Yield	-1,961.670 (+/- 552.791) p = 0.002***
LN_7-year Treasury Yield	93,405.690 (+/- 11,171.080) p = 0.00000***
3-year Treasury Yield	92,951.530 (+/- 9,912.551) p = 0.000***
LN_3-year Treasury Yield	-37,366.830 (+/- 5,703.331) p = 0.00001***
LN_1-year Treasury Yield	-12,133.940 (+/- 1,373.631) p = 0.000***
3-year Treasury Yield_2	-5,231.357 (+/- 1,726.165) p = 0.007***
3-month Treasury Yield_2	-28,384.030 (+/- 5,006.741) p = 0.00002***
7-year Treasury Yield_2	-23,433.050 (+/- 2,203.787) p = 0.000***
1-month Treasury Yield_2	18,078.860 (+/- 4,173.914) p = 0.0003***

10-year Treasury Yield_2	33,740.030 (+/- 2,686.111) p = 0.000 ***
Observations	40
R ²	0.988
Adjusted R ²	0.979
Residual Std. Error	1,308.102 (df = 22)
F Statistic	108.901 *** (df = 17; 22)
Note:	*p<0.1; **p<0.05; ***p<0.01

REGRESSION FOR SP500 STOCK PRICE INDEX

	<i>Dependent variable (+/- SE):</i>
	SP500 Stock Price Index
Constant	1,768.830 (+/- 4,192.021) p = 0.677
Nominal GDP growth	-50.046 (+/- 9.254) p = 0.00002***
Real disposable income growth	-166.516 (+/- 33.839) p = 0.0001***
Nominal disposable income growth	168.517 (+/- 33.775) p = 0.00005***
Unemployment Rate	-718.596 (+/- 113.655) p = 0.00001***
BBB corporate yield	634.470 (+/- 195.179) p = 0.004***
Prime Rate	1,257.135 (+/- 241.855) p = 0.00003***
30-year Treasury Yield	-159,412.000 (+/- 32,610.220) p = 0.0001***
LN_30-year Treasury Yield	197,859.500 (+/- 42,973.490) p = 0.0002***
20-year Treasury Yield	148,166.000 (+/- 29,350.830) p = 0.00004***
LN_20-year Treasury Yield	-162,701.200 (+/- 34,165.950) p = 0.0001***
LN_10-year Treasury Yield	-5,142.065 (+/- 1,287.144) p = 0.001***
LN_1-year Treasury Yield	-821.615 (+/- 123.804) p = 0.00000***
1-month Treasury Yield_2	-232.317 (+/- 57.488) p = 0.0005***
20-year Treasury Yield_2	-15,352.050 (+/- 3,045.890) p = 0.00004***
30-year Treasury Yield_2	14,988.940 (+/- 3,054.693) p = 0.0001***
Observations	40
R ²	0.980
Adjusted R ²	0.967

Residual Std. Error	163.248 (df = 24)
F Statistic	77.976*** (df = 15; 24)
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<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

House and Commercial Real Estate Price Indexes

REGRESSION FOR HOME PRICE INDEX	
	<i>Dependent variable (+/- SE):</i>
	Home Price Index
Constant	-277.396 (+/- 62.834) p = 0.0003***
Real disposable income growth	-16.661 (+/- 3.462) p = 0.0001***
Nominal disposable income growth	15.991 (+/- 3.337) p = 0.0001***
CPI Inflation Rate	-8.563 (+/- 3.050) p = 0.010***
Prime Rate	90.994 (+/- 17.672) p = 0.00004***
Market Volatility Index	1.097 (+/- 0.220) p = 0.00005***
7-year Treasury Yield	348.852 (+/- 60.581) p = 0.00001***
LN_7-year Treasury Yield	-743.459 (+/- 113.199) p = 0.00001***
3-month Treasury Yield	-175.968 (+/- 31.187) p = 0.00001***
5-year Treasury Yield	-664.681 (+/- 101.605) p = 0.00001***
LN_5-year Treasury Yield	886.355 (+/- 167.486) p = 0.00003***
3-year Treasury Yield	383.130 (+/- 72.832) p = 0.00003***
LN_3-year Treasury Yield	-236.650 (+/- 71.863) p = 0.004***
1-year Treasury Yield	299.510 (+/- 67.033) p = 0.0002***
LN_1-year Treasury Yield	-84.637 (+/- 12.846) p = 0.00001***
6-month Treasury Yield_2	-159.773 (+/- 18.078) p = 0.000***
1-month Treasury Yield_2	105.363 (+/- 13.904) p = 0.00000***

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Observations	40
R ²	0.971
Adjusted R ²	0.951
Residual Std. Error	8.159 (df = 23)
F Statistic	48.309 ^{***} (df = 16; 23)
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<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

REGRESSION FOR COMMERCIAL REAL ESTATE PRICE INDEX

	<i>Dependent variable (+/- SE):</i>
	Commercial Real Estate Price Index
Constant	111.512 (+/- 33.605) p = 0.003 ^{***}
US Fed Reserve O-N Loan Rate	-185.018 (+/- 27.094) p = 0.00000 ^{***}
Real disposable income growth	-9.006 (+/- 1.392) p = 0.00000 ^{***}
Nominal disposable income growth	9.226 (+/- 1.404) p = 0.00000 ^{***}
US Avg Retail Gasoline Price (\$-gal; all grades, all formulations)	-30.809 (+/- 5.758) p = 0.00002 ^{***}
LN_5-year Treasury Yield	-241.735 (+/- 34.452) p = 0.00000 ^{***}
LN_3-year Treasury Yield	209.971 (+/- 32.506) p = 0.00000 ^{***}
1-year Treasury Yield	521.356 (+/- 56.670) p = 0.000 ^{***}
LN_1-year Treasury Yield	-145.844 (+/- 14.464) p = 0.000 ^{***}
1-year Treasury Yield_2	-89.787 (+/- 15.878) p = 0.00001 ^{***}
3-month Treasury Yield_2	-163.163 (+/- 50.100) p = 0.003 ^{***}
1-month Treasury Yield_2	179.682 (+/- 39.866) p = 0.0002 ^{***}
Observations	40
R ²	0.924
Adjusted R ²	0.895
Residual Std. Error	14.999 (df = 28)
F Statistic	31.073 ^{***} (df = 11; 28)
<i>Note:</i>	* p<0.1; ** p<0.05; *** p<0.01

Market Volatility Index

REGRESSION FOR MARKET VOLATILITY INDEX	
	<i>Dependent variable (+/- SE):</i>
	Market Volatility Index
Constant	30.429 (+/- 31.130) p = 0.339
US Fed Reserve O-N Loan Rate	-131.369 (+/- 40.523) p = 0.004***
Real disposable income growth	-6.886 (+/- 2.233) p = 0.006***
Nominal disposable income growth	6.546 (+/- 2.105) p = 0.005***
Unemployment Rate	5.573 (+/- 1.799) p = 0.005***
CPI Inflation Rate	-6.340 (+/- 1.975) p = 0.004***
Prime Rate	-49.610 (+/- 8.989) p = 0.00002***
Dow Total Stock Market Index	-0.004 (+/- 0.001) p = 0.0001***
Home Price Index	1.262 (+/- 0.209) p = 0.00001***
20-year Treasury Yield	-249.950 (+/- 46.671) p = 0.00002***
LN_20-year Treasury Yield	495.112 (+/- 93.644) p = 0.00003***
1-month Treasury Yield	186.828 (+/- 41.032) p = 0.0002***
7-year Treasury Yield	239.115 (+/- 43.459) p = 0.00002***
LN_7-year Treasury Yield	-188.862 (+/- 35.628) p = 0.00002***
3-year Treasury Yield	-118.956 (+/- 27.416) p = 0.0003***
LN_1-year Treasury Yield	20.748 (+/- 5.179) p = 0.001***
Observations	40

R ²	0.905
Adjusted R ²	0.846
Residual Std. Error	4.983 (df = 24)
F Statistic	15.314*** (df = 15; 24)
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Note:	*p<0.1; **p<0.05; ***p<0.01

Appendix A: Data Sources

The following table lists the attributes provided by Capitalytics as part of its macro-economic forecast service. The sources for data that are defined by the document “2022 Stress Test Scenarios” (found at <https://www.federalreserve.gov/newsevents/pressreleases/files/bcreg20220210a1.pdf>) are listed. Please note that shaded attributes are not discussed within this report.

Table 16: Data Values and Referenced Sources

Attribute	Referenced Source ⁹¹
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), “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 ⁹²

⁹¹ Per <https://www.federalreserve.gov/newsevents/pressreleases/files/bcreg20190213a1.pdf>

⁹² 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.

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) ⁹³ .
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) ⁹⁴ .
Market Volatility Index (VIX)	VIX converted to quarterly frequency using the maximum close-of-day value in any quarter, Chicago Board Options Exchange.
Euro Area Real GDP Growth	Percent change in real gross domestic product at an annualized rate, staff calculations based on Statistical Office of the European Communities via Haver, extended back using ECB Area Wide Model dataset (ECB Working Paper series no. 42).
Euro Area Inflation	Percent change in the quarterly average of the harmonized index of consumer prices 16 Federal Reserve Supervisory Scenarios at an annualized rate, staff calculations based on Statistical Office of the European Communities via Haver.
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

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.

⁹³ Capalitytics 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

⁹⁴ Capalitytics 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

	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/2022-table_1a_historic_domestic.csv and https://www.federalreserve.gov/supervisionreg/files/2022-table_1b_historic_international.csv (shown below, as of Feb 2022) by clicking the links marked “2022 Historical Domestic (CSV)” and “2022 Historical International (CSV)”. Alternatively, downloading the files at https://www.federalreserve.gov/supervisionreg/files/2022-table_1a_historic_domestic.csv and https://www.federalreserve.gov/supervisionreg/files/2022-table_1b_historic_international.csv using HTTP client software will also download the official datasets⁹⁵.

⁹⁵ Again, due to the requirements of this client, international data elements are not being discussed in this document.



Since the CCAR dataset is only released annually (through 1Q2022 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) 1Q2022.

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/BAMLCOA4CBBBEY), 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-qr 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/2022-table_1a_historic_domestic.csv and https://www.federalreserve.gov/supervisionreg/files/2022-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) 1Q2022.

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/sp500
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's⁹⁶ "forecast" package⁹⁷; specifically, the "ets" function (see p.39 of <https://cran.r-project.org/web/packages/forecast/forecast.pdf>)⁹⁸ 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 $n+1^{\text{st}}$ forecasted value given the first n values of the metric's sequence (the "fitted" values)⁹⁹, and the determined parameters. While fitting forecasts to previous values,

- "forecast error" is defined as being actual values less forecasted values,
- "% error" is defined as forecast error divided by actual value, and

⁹⁶ As of this writing, v.4.1.2 of the "R" language is available at <https://cran.r-project.org/>.

⁹⁷ As of this writing, v.8.16 of the forecast package is available at <https://CRAN.R-project.org/package=forecast>.

⁹⁸ 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.

⁹⁹ While this procedure does generate fitted values for intermediate samples within a sequence -- and allow for generating a forecasted set of samples to extend a sequence -- according to the identified parameter set, it does not directly provide for determining the optimal parameter set of a sub-sequence. Capitalytics is currently codifying the process herein so that we may prescribe a "most likely" long term representation for each forecast, and determine the likely effects of errors in the forecasts by estimating the "recent term" values of dy/dx_i (where y is the metric being estimated and x_i is each of the parameters within the representation) and then compensating for recent quantified errors. We can 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.

- “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)¹⁰⁰.
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 -186.360685 -12.520593 1119.860980 -252.112424
2009  1119.860980 -252.112424  127.978126  113.868293
...

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

3. The third forecast uses the sequence of numbers from the second forecast, but partitions the dataset based on the quarter in which they are incurred. Assuming that the differences between quarters are associated with the ending points of each quarter (i.e., the difference between third and fourth quarter values are associated with a date of December 31st), four sequences of numbers are now created, with annual forecasts now being produced for each sequence using the same procedures as previously outlined. The final sequence appropriately interleaves the forecasted data-points.
4. The fourth forecast builds three sequences of values based the history of the metric to an observed point:
 - the slope of the “best fitting” line (based on minimizing the total absolute error) using the immediately preceding 2 years of values¹⁰¹;
 - 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

¹⁰⁰ It bears noting that a lower value for the “score” indicates better accuracy of an algorithm.

¹⁰¹ 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.

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 slopes¹⁰².

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

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

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.

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

¹⁰² See the SP500 metric’s analysis.

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

The challenge with these forecasting techniques is to estimate the value of α such that some criteria is optimized, e.g., minimizing the sum of squared errors (SSE), across all values of a set of historical values. There are other forms of exponential smoothing methods that may account for any combination of forecasting *levels* (as in the Theta method), *trends* (for which a metric may, for instance, be growing or lessening according to a linear or higher order function), and *seasonality* (for which a metric may have engrained “cycles” on, e.g., a monthly, quarterly, or annual basis).

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

Table 18: Mathematical Methods Associated with Trend & Seasonal Components

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

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

Section III: Regression Construction

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

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

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

Appendix C: Variable Correlations

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

Table 5: Correlation Factors found as of 1Q2022

Variable 1	Variable 2	Correlation
S&P 500 Stock Price Index	Moody's AAA Curve	-0.706588
S&P 500 Stock Price Index	Moody's BAA Curve	-0.804993
S&P 500 Stock Price Index	BBB Corporate Yield	-0.683002
S&P 500 Stock Price Index	Dow Jones Total Stock Market Index	0.981882
S&P 500 Stock Price Index	Residential Home Price Index	0.981851
S&P 500 Stock Price Index	Commercial Real Estate Price Index	0.95568
S&P 500 Stock Price Index	30-year Treasury Yield	-0.653052
Cost of Federal Funds	Moody's AAA Curve	0.811103
Cost of Federal Funds	Moody's BAA Curve	0.75265
Cost of Federal Funds	BBB Corporate Yield	0.767471
Cost of Federal Funds	30-year Mortgage Rate	0.875306
Cost of Federal Funds	Prime Rate	0.996605
Cost of Federal Funds	Residential Home Price Index	-0.602392
Cost of Federal Funds	US Average Retail Gasoline Price	-0.637366
Cost of Federal Funds	30-year Treasury Yield	0.796269
Cost of Federal Funds	20-year Treasury Yield	0.797663
Cost of Federal Funds	10-year Treasury Yield	0.85924
Cost of Federal Funds	1-month Treasury Yield	0.993438
Cost of Federal Funds	7-year Treasury Yield	0.897157
Cost of Federal Funds	3-month Treasury Yield	0.996604
Cost of Federal Funds	5-year Treasury Yield	0.923209
Cost of Federal Funds	6-month Treasury Yield	0.994235
Cost of Federal Funds	3-year Treasury Yield	0.956351
Cost of Federal Funds	1-year Treasury Yield	0.987714
Moody's AAA Curve	Moody's BAA Curve	0.979114
Moody's AAA Curve	BBB Corporate Yield	0.951495
Moody's AAA Curve	30-year Mortgage Rate	0.985037
Moody's AAA Curve	Prime Rate	0.795249
Moody's AAA Curve	Dow Jones Total Stock Market Index	-0.833873
Moody's AAA Curve	Residential Home Price Index	-0.877332
Moody's AAA Curve	Commercial Real Estate Price Index	-0.883021
Moody's AAA Curve	US Average Retail Gasoline Price	-0.731641
Moody's AAA Curve	30-year Treasury Yield	0.985075
Moody's AAA Curve	20-year Treasury Yield	0.984238
Moody's AAA Curve	10-year Treasury Yield	0.985528
Moody's AAA Curve	7-year Treasury Yield	0.967417
Moody's AAA Curve	3-month Treasury Yield	0.818164
Moody's AAA Curve	5-year Treasury Yield	0.94867
Moody's AAA Curve	6-month Treasury Yield	0.823285
Moody's AAA Curve	3-year Treasury Yield	0.907192
Moody's AAA Curve	1-year Treasury Yield	0.840286
Moody's BAA Curve	BBB Corporate Yield	0.986774
Moody's BAA Curve	30-year Mortgage Rate	0.956937
Moody's BAA Curve	Prime Rate	0.735772
Moody's BAA Curve	Dow Jones Total Stock Market Index	-0.856182
Moody's BAA Curve	Residential Home Price Index	-0.865034
Moody's BAA Curve	Commercial Real Estate Price Index	-0.856985
Moody's BAA Curve	US Average Retail Gasoline Price	-0.694129
Moody's BAA Curve	30-year Treasury Yield	0.948453
Moody's BAA Curve	20-year Treasury Yield	0.933117

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Moody's BAA Curve	10-year Treasury Yield	0.948485
Moody's BAA Curve	7-year Treasury Yield	0.918967
Moody's BAA Curve	3-month Treasury Yield	0.756752
Moody's BAA Curve	5-year Treasury Yield	0.897175
Moody's BAA Curve	6-month Treasury Yield	0.763192
Moody's BAA Curve	3-year Treasury Yield	0.850194
Moody's BAA Curve	1-year Treasury Yield	0.780465
Real GDP Growth	Nominal GDP Growth	0.977656
Real Disposable Income Growth	Nominal Disposable Income Growth	0.975953
BBB Corporate Yield	30-year Mortgage Rate	0.942212
BBB Corporate Yield	Prime Rate	0.751243
BBB Corporate Yield	Dow Jones Total Stock Market Index	-0.806387
BBB Corporate Yield	Residential Home Price Index	-0.809739
BBB Corporate Yield	Commercial Real Estate Price Index	-0.783929
BBB Corporate Yield	US Average Retail Gasoline Price	-0.651535
BBB Corporate Yield	30-year Treasury Yield	0.908726
BBB Corporate Yield	20-year Treasury Yield	0.887383
BBB Corporate Yield	10-year Treasury Yield	0.925911
BBB Corporate Yield	7-year Treasury Yield	0.901965
BBB Corporate Yield	3-month Treasury Yield	0.76963
BBB Corporate Yield	5-year Treasury Yield	0.886984
BBB Corporate Yield	6-month Treasury Yield	0.77708
BBB Corporate Yield	3-year Treasury Yield	0.849381
BBB Corporate Yield	1-year Treasury Yield	0.791742
30-year Mortgage Rate	Prime Rate	0.859605
30-year Mortgage Rate	Dow Jones Total Stock Market Index	-0.779679
30-year Mortgage Rate	Residential Home Price Index	-0.81559
30-year Mortgage Rate	Commercial Real Estate Price Index	-0.822482
30-year Mortgage Rate	US Average Retail Gasoline Price	-0.737249
30-year Mortgage Rate	30-year Treasury Yield	0.975947
30-year Mortgage Rate	20-year Treasury Yield	0.980852
30-year Mortgage Rate	10-year Treasury Yield	0.993478
30-year Mortgage Rate	1-month Treasury Yield	0.678532
30-year Mortgage Rate	7-year Treasury Yield	0.98883
30-year Mortgage Rate	3-month Treasury Yield	0.883187
30-year Mortgage Rate	5-year Treasury Yield	0.980944
30-year Mortgage Rate	6-month Treasury Yield	0.889104
30-year Mortgage Rate	3-year Treasury Yield	0.95487
30-year Mortgage Rate	1-year Treasury Yield	0.904047
Prime Rate	US Average Retail Gasoline Price	-0.628199
Prime Rate	30-year Treasury Yield	0.776307
Prime Rate	20-year Treasury Yield	0.790157
Prime Rate	10-year Treasury Yield	0.843557
Prime Rate	1-month Treasury Yield	0.991082
Prime Rate	7-year Treasury Yield	0.882943
Prime Rate	3-month Treasury Yield	0.992436
Prime Rate	5-year Treasury Yield	0.91064
Prime Rate	6-month Treasury Yield	0.99033
Prime Rate	3-year Treasury Yield	0.947271
Prime Rate	1-year Treasury Yield	0.983251
Dow Jones Total Stock Market Index	Residential Home Price Index	0.891579
Dow Jones Total Stock Market Index	Commercial Real Estate Price Index	0.911444
Dow Jones Total Stock Market Index	30-year Treasury Yield	-0.829922
Dow Jones Total Stock Market Index	20-year Treasury Yield	-0.787646
Dow Jones Total Stock Market Index	10-year Treasury Yield	-0.782907
Dow Jones Total Stock Market Index	7-year Treasury Yield	-0.732709
Dow Jones Total Stock Market Index	5-year Treasury Yield	-0.696567
Dow Jones Total Stock Market Index	3-year Treasury Yield	-0.636565
Residential Home Price Index	Commercial Real Estate Price Index	0.968609
Residential Home Price Index	US Average Retail Gasoline Price	0.648821
Residential Home Price Index	30-year Treasury Yield	-0.865987
Residential Home Price Index	20-year Treasury Yield	-0.819104
Residential Home Price Index	10-year Treasury Yield	-0.824653

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Residential Home Price Index	7-year Treasury Yield	-0.789273
Residential Home Price Index	3-month Treasury Yield	-0.607148
Residential Home Price Index	5-year Treasury Yield	-0.75697
Residential Home Price Index	6-month Treasury Yield	-0.608132
Residential Home Price Index	3-year Treasury Yield	-0.701748
Residential Home Price Index	1-year Treasury Yield	-0.626063
Commercial Real Estate Price Index	US Average Retail Gasoline Price	0.672217
Commercial Real Estate Price Index	30-year Treasury Yield	-0.887323
Commercial Real Estate Price Index	20-year Treasury Yield	-0.870594
Commercial Real Estate Price Index	10-year Treasury Yield	-0.841025
Commercial Real Estate Price Index	7-year Treasury Yield	-0.804083
Commercial Real Estate Price Index	3-month Treasury Yield	-0.604913
Commercial Real Estate Price Index	5-year Treasury Yield	-0.76851
Commercial Real Estate Price Index	6-month Treasury Yield	-0.606988
Commercial Real Estate Price Index	3-year Treasury Yield	-0.71061
Commercial Real Estate Price Index	1-year Treasury Yield	-0.627459
US Average Retail Gasoline Price	30-year Treasury Yield	-0.714574
US Average Retail Gasoline Price	20-year Treasury Yield	-0.718823
US Average Retail Gasoline Price	10-year Treasury Yield	-0.739067
US Average Retail Gasoline Price	7-year Treasury Yield	-0.750261
US Average Retail Gasoline Price	3-month Treasury Yield	-0.656702
US Average Retail Gasoline Price	5-year Treasury Yield	-0.753291
US Average Retail Gasoline Price	6-month Treasury Yield	-0.657069
US Average Retail Gasoline Price	3-year Treasury Yield	-0.731506
US Average Retail Gasoline Price	1-year Treasury Yield	-0.67684
30-year Treasury Yield	20-year Treasury Yield	0.996274
30-year Treasury Yield	10-year Treasury Yield	0.987766
30-year Treasury Yield	7-year Treasury Yield	0.970078
30-year Treasury Yield	3-month Treasury Yield	0.808096
30-year Treasury Yield	5-year Treasury Yield	0.948256
30-year Treasury Yield	6-month Treasury Yield	0.813208
30-year Treasury Yield	3-year Treasury Yield	0.904078
30-year Treasury Yield	1-year Treasury Yield	0.832312
20-year Treasury Yield	10-year Treasury Yield	0.992826
20-year Treasury Yield	7-year Treasury Yield	0.973052
20-year Treasury Yield	3-month Treasury Yield	0.806818
20-year Treasury Yield	5-year Treasury Yield	0.948763
20-year Treasury Yield	6-month Treasury Yield	0.81618
20-year Treasury Yield	3-year Treasury Yield	0.905124
20-year Treasury Yield	1-year Treasury Yield	0.838749
10-year Treasury Yield	1-month Treasury Yield	0.657898
10-year Treasury Yield	7-year Treasury Yield	0.993858
10-year Treasury Yield	3-month Treasury Yield	0.870706
10-year Treasury Yield	5-year Treasury Yield	0.982402
10-year Treasury Yield	6-month Treasury Yield	0.876786
10-year Treasury Yield	3-year Treasury Yield	0.952117
10-year Treasury Yield	1-year Treasury Yield	0.893872
1-month Treasury Yield	7-year Treasury Yield	0.764587
1-month Treasury Yield	3-month Treasury Yield	0.998722
1-month Treasury Yield	5-year Treasury Yield	0.841532
1-month Treasury Yield	6-month Treasury Yield	0.994656
1-month Treasury Yield	3-year Treasury Yield	0.925263
1-month Treasury Yield	1-year Treasury Yield	0.986855
7-year Treasury Yield	3-month Treasury Yield	0.909792
7-year Treasury Yield	5-year Treasury Yield	0.996453
7-year Treasury Yield	6-month Treasury Yield	0.915757
7-year Treasury Yield	3-year Treasury Yield	0.97818
7-year Treasury Yield	1-year Treasury Yield	0.931203
3-month Treasury Yield	5-year Treasury Yield	0.935661
3-month Treasury Yield	6-month Treasury Yield	0.998847
3-month Treasury Yield	3-year Treasury Yield	0.968368
3-month Treasury Yield	1-year Treasury Yield	0.994914
5-year Treasury Yield	6-month Treasury Yield	0.941498

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5-year Treasury Yield	3-year Treasury Yield	0.991416
5-year Treasury Yield	1-year Treasury Yield	0.955129
6-month Treasury Yield	3-year Treasury Yield	0.973973
6-month Treasury Yield	1-year Treasury Yield	0.998079
3-year Treasury Yield	1-year Treasury Yield	0.984044

Appendix D: Mortgage Delinquencies

The following tables, Table 6 through Table 10, 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 6: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30+ dpd) as of February 2022: 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	1326	1299	15	1	1	10	1.13%	0.91%	2.04%
	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	5229	5180	20	8	1	20	0.38%	0.56%	0.94%
	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%
Birmingham-Hoover, AL	1 unit	34309	33907	188	29	19	166	0.55%	0.62%	1.17%
	2 units	27	27	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	17	17	0	0	0	0	0.00%	0.00%	0.00%
Columbus, GA-AL	1 unit	402	395	2	0	0	5	0.50%	1.24%	1.74%
	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	8849	8755	49	6	3	36	0.55%	0.51%	1.06%
	2 units	17	17	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	2451	2426	13	1	1	10	0.53%	0.49%	1.02%
	2 units	5	5	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	12	12	0	0	0	0	0.00%	0.00%	0.00%
Dothan, AL	1 unit	2344	2314	14	0	3	13	0.60%	0.68%	1.28%
	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	3008	2959	24	1	2	22	0.80%	0.83%	1.63%
	2 units	3	3	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	1	1	0	0	0	0	0.00%	0.00%	0.00%
Gadsden, AL	1 unit	1378	1350	11	2	1	14	0.80%	1.23%	2.03%
	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	15740	15610	62	5	4	59	0.39%	0.43%	0.83%
	2 units	22	22	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	50	50	0	0	0	0	0.00%	0.00%	0.00%
Mobile, AL	1 unit	6280	6185	45	2	5	43	0.72%	0.80%	1.51%
	2 units	14	14	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	6	6	0	0	0	0	0.00%	0.00%	0.00%
Montgomery, AL	1 unit	6786	6714	29	5	1	37	0.43%	0.63%	1.06%

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	2 units	19	19	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	11	11	0	0	0	0	0.00%	0.00%	0.00%
Tuscaloosa, AL	1 unit	5677	5602	38	3	4	30	0.67%	0.65%	1.32%
	2 units	4	4	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	1	1	0	0	0	0	0.00%	0.00%	0.00%
Outside all MSAs	1 unit	11954	11743	91	14	8	98	0.76%	1.00%	1.77%
	2 units	45	45	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	11	11	0	0	0	0	0.00%	0.00%	0.00%

Source: STACR Freddie Mac, as of 23 May 2022

MACROECONOMIC FORECASTS, 2Q2022 – DRAFT VERSION

Table 7: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30+ dpd) as of February 2022: 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	29880	29576	140	24	15	125	0.47%	0.55%	1.02%
	2 units	389	382	5	0	0	2	1.29%	0.51%	1.80%
	3+ units	43	42	1	0	0	0	2.33%	0.00%	2.33%
Crestview-Fort Walton Beach-Destin, FL	1 unit	8145	8059	38	11	4	33	0.47%	0.59%	1.06%
	2 units	17	17	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	19	19	0	0	0	0	0.00%	0.00%	0.00%
Deltona-Daytona Beach-Ormond Beach, FL	1 unit	20989	20760	104	22	10	93	0.50%	0.60%	1.09%
	2 units	167	166	1	0	0	0	0.60%	0.00%	0.60%
	3+ units	52	49	0	0	0	3	0.00%	5.77%	5.77%
Gainesville, FL	1 unit	6748	6694	22	7	2	23	0.33%	0.47%	0.80%
	2 units	24	24	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	3489	3458	10	2	3	16	0.29%	0.60%	0.89%
	2 units	25	25	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	45760	45312	181	49	27	191	0.40%	0.58%	0.98%
	2 units	196	195	1	0	0	0	0.51%	0.00%	0.51%
	3+ units	116	116	0	0	0	0	0.00%	0.00%	0.00%
Lakeland-Winter Haven, FL	1 unit	17078	16898	62	18	15	85	0.36%	0.69%	1.05%
	2 units	108	106	2	0	0	0	1.85%	0.00%	1.85%
	3+ units	37	35	0	0	0	2	0.00%	5.41%	5.41%
Miami-Fort Lauderdale-Pompano Beach, FL	1 unit	152667	149957	913	241	158	1398	0.60%	1.18%	1.78%
	2 units	1282	1257	6	2	4	13	0.47%	1.48%	1.95%
	3+ units	568	556	6	0	0	6	1.06%	1.06%	2.11%
Naples-Marco Island, FL	1 unit	14108	13978	56	10	9	55	0.40%	0.53%	0.92%
	2 units	50	50	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	17	17	0	0	0	0	0.00%	0.00%	0.00%
North Port-Sarasota-Bradenton, FL	1 unit	35228	34919	131	39	11	128	0.37%	0.51%	0.88%
	2 units	186	185	1	0	0	0	0.54%	0.00%	0.54%
	3+ units	32	32	0	0	0	0	0.00%	0.00%	0.00%
Ocala, FL	1 unit	8513	8410	48	9	7	39	0.56%	0.65%	1.21%
	2 units	26	26	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	21	21	0	0	0	0	0.00%	0.00%	0.00%

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Orlando-Kissimmee-Sanford, FL	1 unit	82225	81121	407	98	77	522	0.50%	0.85%	1.34%
	2 units	325	323	1	0	0	1	0.31%	0.31%	0.62%
	3+ units	92	92	0	0	0	0	0.00%	0.00%	0.00%
Palm Bay-Melbourne-Titusville, FL	1 unit	21176	20927	120	28	6	95	0.57%	0.61%	1.18%
	2 units	60	60	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	27	26	0	0	0	1	0.00%	3.70%	3.70%
Panama City, FL	1 unit	4872	4804	37	4	3	24	0.76%	0.64%	1.40%
	2 units	44	44	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	10811	10651	70	13	7	70	0.65%	0.83%	1.48%
	2 units	75	73	2	0	0	0	2.67%	0.00%	2.67%
	3+ units	43	43	0	0	0	0	0.00%	0.00%	0.00%
Port St. Lucie, FL	1 unit	17718	17478	112	30	11	87	0.63%	0.72%	1.36%
	2 units	70	67	0	0	0	3	0.00%	4.29%	4.29%
	3+ units	17	17	0	0	0	0	0.00%	0.00%	0.00%
Punta Gorda, FL	1 unit	8178	8105	25	9	3	36	0.31%	0.59%	0.89%
	2 units	34	33	1	0	0	0	2.94%	0.00%	2.94%
	3+ units	7	7	0	0	0	0	0.00%	0.00%	0.00%
Sebastian-Vero Beach, FL	1 unit	6198	6129	30	3	1	35	0.48%	0.63%	1.11%
	2 units	15	14	0	0	0	1	0.00%	6.67%	6.67%
	3+ units	8	8	0	0	0	0	0.00%	0.00%	0.00%
Sebring-Avon Park, FL	1 unit	2076	2051	10	3	3	9	0.48%	0.72%	1.20%
	2 units	18	18	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	4	4	0	0	0	0	0.00%	0.00%	0.00%
Tallahassee, FL	1 unit	9670	9573	49	9	5	34	0.51%	0.50%	1.00%
	2 units	54	54	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	37	37	0	0	0	0	0.00%	0.00%	0.00%
Tampa-St. Petersburg-Clearwater, FL	1 unit	102025	100840	451	106	71	557	0.44%	0.72%	1.16%
	2 units	534	526	6	0	0	2	1.12%	0.38%	1.50%
	3+ units	276	274	1	0	1	0	0.36%	0.36%	0.73%
The Villages, FL	1 unit	2903	2888	6	0	1	8	0.21%	0.31%	0.52%
	2 units	1	1	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	0	0	0	0	0	0	0.00%	0.00%	0.00%
Outside all MSAs	1 unit	10099	9951	56	16	10	66	0.56%	0.91%	1.47%
	2 units	347	341	3	0	0	3	0.87%	0.87%	1.73%
	3+ units	56	54	1	0	0	1	1.79%	1.79%	3.57%

MACROECONOMIC FORECASTS, 2Q2022 – DRAFT VERSION

Source: STACR Freddie Mac, as of 23 May 2022

MACROECONOMIC FORECASTS, 2Q2022 – DRAFT VERSION

Table 8: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30+ dpd) as of February 2022: 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	1762	1736	8	3	2	13	0.45%	1.02%	1.48%
	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	22784	22409	130	37	18	190	0.57%	1.08%	1.65%
	2 units	59	57	2	0	0	0	3.39%	0.00%	3.39%
	3+ units	65	65	0	0	0	0	0.00%	0.00%	0.00%
Hammond, LA	1 unit	2267	2228	14	4	2	19	0.62%	1.10%	1.72%
	2 units	13	13	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	10	10	0	0	0	0	0.00%	0.00%	0.00%
Houma-Thibodaux, LA	1 unit	3623	3525	35	11	3	49	0.97%	1.74%	2.71%
	2 units	5	4	0	0	0	1	0.00%	20.00%	20.00%
	3+ units	4	4	0	0	0	0	0.00%	0.00%	0.00%
Lafayette, LA	1 unit	9496	9276	75	19	8	118	0.79%	1.53%	2.32%
	2 units	12	12	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	28	27	1	0	0	0	3.57%	0.00%	3.57%
Lake Charles, LA	1 unit	3739	3666	25	8	4	36	0.67%	1.28%	1.95%
	2 units	14	14	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	2747	2687	19	4	5	32	0.69%	1.49%	2.18%
	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	30084	29486	170	39	30	359	0.57%	1.42%	1.99%
	2 units	1560	1532	11	0	0	17	0.71%	1.09%	1.80%
	3+ units	391	378	2	1	4	6	0.51%	2.81%	3.33%
Shreveport-Bossier City, LA	1 unit	7288	7143	68	5	4	68	0.93%	1.06%	1.99%
	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%
Outside all MSAs	1 unit	5991	5828	61	14	10	78	1.02%	1.70%	2.72%
	2 units	468	455	3	0	0	10	0.64%	2.14%	2.78%
	3+ units	96	96	0	0	0	0	0.00%	0.00%	0.00%

Source: STACR Freddie Mac, as of 23 May 2022

MACROECONOMIC FORECASTS, 2Q2022 – DRAFT VERSION

Table 9: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30+ dpd) as of February 2022: 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	4568	4499	27	3	9	30	0.59%	0.92%	1.51%
	2 units	29	28	1	0	0	0	3.45%	0.00%	3.45%
	3+ units	13	13	0	0	0	0	0.00%	0.00%	0.00%
Hattiesburg, MS	1 unit	2286	2248	19	6	2	11	0.83%	0.83%	1.66%
	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	8899	8771	42	11	5	70	0.47%	0.97%	1.44%
	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%
Memphis, TN-MS-AR	1 unit	5642	5563	36	8	5	30	0.64%	0.76%	1.40%
	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	10739	10512	79	23	5	120	0.74%	1.38%	2.11%
	2 units	15	15	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	3	3	0	0	0	0	0.00%	0.00%	0.00%

Source: STACR Freddie Mac, as of 23 May 2022

MACROECONOMIC FORECASTS, 2Q2022 – DRAFT VERSION

Table 10: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30 + dpd) as of February 2022: 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	3786	3730	22	6	3	25	0.58%	0.90%	1.48%
	2 units	19	19	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	4379	4314	24	4	10	27	0.55%	0.94%	1.48%
	2 units	14	14	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	5	5	0	0	0	0	0.00%	0.00%	0.00%
Austin-Round Rock-Georgetown, TX	1 unit	96805	95962	363	78	46	356	0.38%	0.50%	0.87%
	2 units	1085	1079	5	0	0	1	0.46%	0.09%	0.55%
	3+ units	230	227	0	0	0	3	0.00%	1.30%	1.30%
Beaumont-Port Arthur, TX	1 unit	5454	5336	36	16	12	54	0.66%	1.50%	2.16%
	2 units	4	4	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	7	7	0	0	0	0	0.00%	0.00%	0.00%
Brownsville-Harlingen, TX	1 unit	2684	2624	24	6	7	23	0.89%	1.34%	2.24%
	2 units	34	34	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	29	29	0	0	0	0	0.00%	0.00%	0.00%
College Station-Bryan, TX	1 unit	6778	6711	27	8	2	30	0.40%	0.59%	0.99%
	2 units	100	100	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	62	62	0	0	0	0	0.00%	0.00%	0.00%
Corpus Christi, TX	1 unit	6959	6815	62	10	10	62	0.89%	1.18%	2.07%
	2 units	17	17	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	16	16	0	0	0	0	0.00%	0.00%	0.00%
Dallas-Fort Worth-Arlington, TX	1 unit	262031	259084	1183	232	176	1356	0.45%	0.67%	1.13%
	2 units	819	811	4	0	0	4	0.49%	0.49%	0.98%
	3+ units	221	218	1	0	0	2	0.45%	0.91%	1.36%
El Paso, TX	1 unit	6245	6125	43	6	4	67	0.69%	1.23%	1.92%
	2 units	65	64	0	0	0	1	0.00%	1.54%	1.54%
	3+ units	32	32	0	0	0	0	0.00%	0.00%	0.00%
Houston-The Woodlands-Sugar Land, TX	1 unit	188344	185445	1059	229	181	1430	0.56%	0.98%	1.54%
	2 units	318	311	1	1	0	5	0.31%	1.89%	2.20%
	3+ units	280	273	2	0	0	5	0.71%	1.79%	2.50%
Killeen-Temple, TX	1 unit	6331	6243	37	7	5	39	0.58%	0.81%	1.39%
	2 units	202	197	3	0	0	2	1.49%	0.99%	2.48%
	3+ units	179	177	0	0	1	1	0.00%	1.12%	1.12%

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Laredo, TX	1 unit	1831	1797	14	4	0	16	0.77%	1.09%	1.86%
	2 units	3	1	2	0	0	0	66.67%	0.00%	66.67%
	3+ units	10	10	0	0	0	0	0.00%	0.00%	0.00%
Longview, TX	1 unit	2718	2681	13	1	2	21	0.48%	0.88%	1.36%
	2 units	13	13	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	8099	8002	46	13	3	35	0.57%	0.63%	1.20%
	2 units	111	111	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	16	16	0	0	0	0	0.00%	0.00%	0.00%
McAllen-Edinburg-Mission, TX	1 unit	4199	4089	38	7	4	61	0.91%	1.72%	2.62%
	2 units	17	16	0	0	0	1	0.00%	5.88%	5.88%
	3+ units	186	183	1	1	0	1	0.54%	1.08%	1.61%
Midland, TX	1 unit	6030	5920	30	16	3	61	0.50%	1.33%	1.82%
	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	2258	2188	27	4	6	33	1.20%	1.90%	3.10%
	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	2483	2444	15	3	2	19	0.60%	0.97%	1.57%
	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	54224	53537	295	55	29	308	0.54%	0.72%	1.27%
	2 units	373	371	1	0	0	1	0.27%	0.27%	0.54%
	3+ units	212	211	0	0	0	1	0.00%	0.47%	0.47%
Sherman-Denison, TX	1 unit	4305	4244	29	8	6	18	0.67%	0.74%	1.42%
	2 units	33	33	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	1194	1168	15	2	0	9	1.26%	0.92%	2.18%
	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	4512	4444	26	6	2	34	0.58%	0.93%	1.51%
	2 units	11	11	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	1139	1115	9	1	1	13	0.79%	1.32%	2.11%
	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%

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Waco, TX	1 unit	4933	4861	41	3	6	22	0.83%	0.63%	1.46%
	2 units	47	47	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	1473	1445	8	2	0	18	0.54%	1.36%	1.90%
	2 units	7	7	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	35013	34387	259	61	34	272	0.74%	1.05%	1.79%
	2 units	471	469	0	0	0	2	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 May 2022

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