Macroeconomic Forecasts, 3Q2022
Domestic Metrics

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Table of Contents

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 crisis[1]), 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.

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[1] See https://money.cnn.com/2008/03/14/news/economy/krugman_subprime.fortune/index.htm and https://www.lobservateur.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. Although COVID isn't the front-page story of the current economic trends (with the exception of President Biden declaring that the pandemic is over[2]), it is important to keep an eye on this trend. (ref. Figure 1) 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 illness), and we acknowledge that COVID is one of the underlying causes (along with the conflict between Russia and Ukraine) of the issues the country is experiencing. We strongly believe that the recessionary trends that the US is experiencing is the fall-out from the pandemic.

*Figure 1: Daily and Weekly Average of New COVID Cases in the United States*
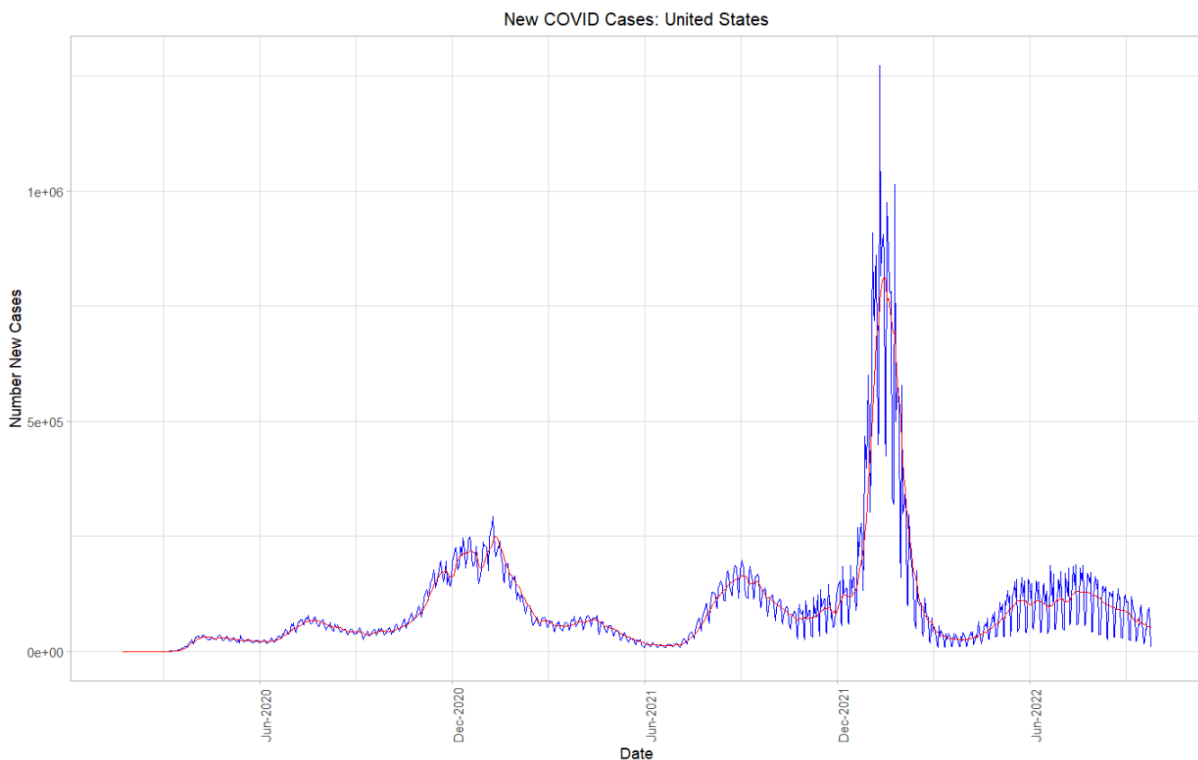
Source: Centers for Disease Control & Prevention (https://www.cdc.org): https://covid.cdc.gov/covid-data-tracker

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[2] https://www.bbc.com/news/world-us-canada-62959089

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: energy[3], food[4], and housing[5] (although there is evidence that the housing market is "cooling" relative to its upward price pressures). We begin by discussing overall inflation in the US. (See Figure 2.)

Figure 2: National Overall Rate of Inflation, 2008-Present

Source: Federal Reserve Economic Database (https://fred.stlouisfed.org/)
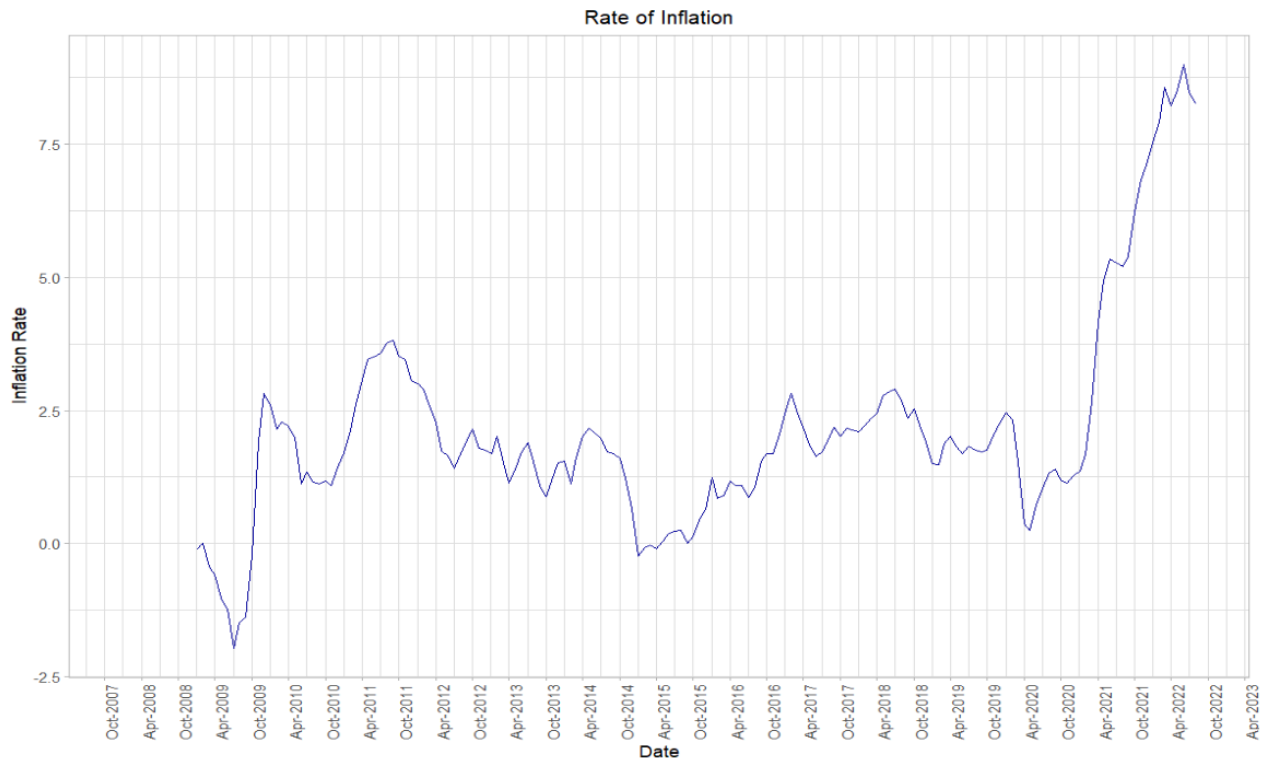
To paint the picture, the rate of inflation (as measured by annual changes in the CPI) is still over 8.0% annually. Historically, this rate of inflation is the highest since near double-digit annual inflation in the early 1980's that resulted from the OPEC oil embargoes and easy-money policy by the Federal Reserve Bank. The Federal Reserve, at its September 20-21, 2022 meeting, has indicated that its interest rate hikes are not going to stop because of the persistent inflationary issues[6] and that the Federal Reserve may very well contribute to an economic recession through its contractionary interest rate policies[7].

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 and Figure 3 highlight the issues that are

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[3] https://www.bloomberg.com/news/articles/2022-06-09/gasoline-food-and-power-inflation-slam-us-households-and-it-could-get-worse
[4] ibid
[5] https://money.com/housing-market-cooldown-signs-predictions/?ref=/housing-market-correction-federal-reserve/
[6] https://www.federalreserve.gov/mediacenter/files/FOMCpresconf20220921.pdf
[7] ibid

troubling consumers – double-digit year-over-year inflation for gas prices. Although we are seeing deflationary elements for gas prices in September 2022 (as compared to August 2022), we are still seeing 16.9% year-over-year inflation for regular gas. Diesel prices are showing 47.6% inflation from a year ago. The high prices of diesel are likely to contribute to more supply-chain issues related to long-haul truck transportation prices[8], which will contribute to overall inflationary pressures.

Table 1: Average Gas Prices (per Gallon) in US, as of late-Sept 2022

	Regular	Mid-Grade	Premium	Diesel	E85
Current Avg.	$3.75	$4.17	$4.49	$4.89	$3.07
Yesterday Avg.	$3.73	$4.15	$4.47	$4.90	$3.05
Week Ago Avg.	$3.67	$4.12	$4.43	$4.94	$3.02
Month Ago Avg.	$3.86	$4.30	$4.60	$5.04	$3.15
Year Ago Avg.	$3.19	$3.54	$3.82	$3.32	$2.70

Source: https://gasprices.aaa.com

Figure 3: US National Gasoline Price Inflation, 2009-Present
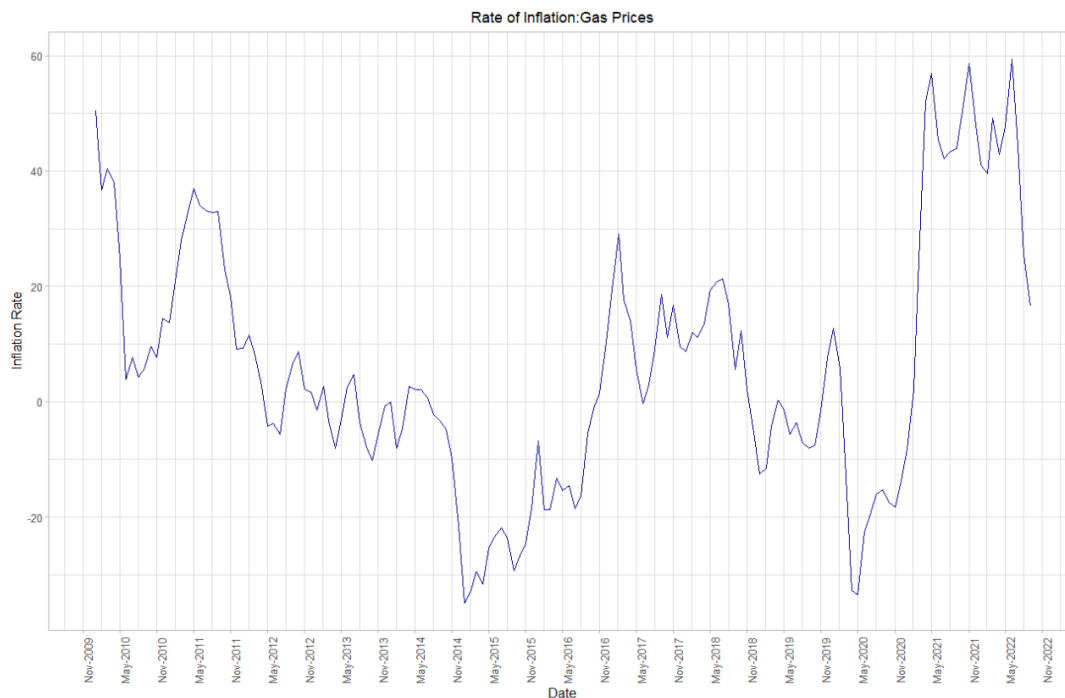
Source: https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=emm_epm0_pte_nus_dpg&f=m

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[8] https://www.advantagenews.com/news/rising-diesel-costs-worsen-supply-chain-issues/article_9ab7bea8-e00e-11ec-9849-1f4a0cb1a2ca.html

The current rate of inflation for gas prices is falling as of this writing -- that is, we are experiencing dis-inflation. The price per gallon for gasoline decreased so dramatically during the recession that a return to "normal" will correspond to quite high inflation rates. The year-over-year price changes peaked during the Spring of 2022, but have now fallen to levels consistent with the Winter of 2016. We anticipate that average gas prices will remain between $3.50/gallon and $3.95/gallon throughout the next quarter, which would be consistent with lower inflationary pressures.

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, per Figure 4). These prices are being driven by increased prices in meat and poultry[9] and less so from changes in prices of corn and other crops[10]. The supply-chain issues that the US experienced early in the pandemic, from meat-processing closures[11] to trucking and logistics[12] issues have continued to cause disruptions in the food supply chain, increasing production and transportation costs and contributing to overall inflationary trends.

Figure 4: US National Food Price Inflation, 2000-Present

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

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[9] https://gro-intelligence.com/insights/a-look-at-rising-food-inflation
[10] ibid
[11] https://www.cnn.com/2020/04/26/business/meat-processing-plants-coronavirus/index.html
[12] https://www.redwoodlogistics.com/five-challenges-in-food-and-beverage-supply-chains/
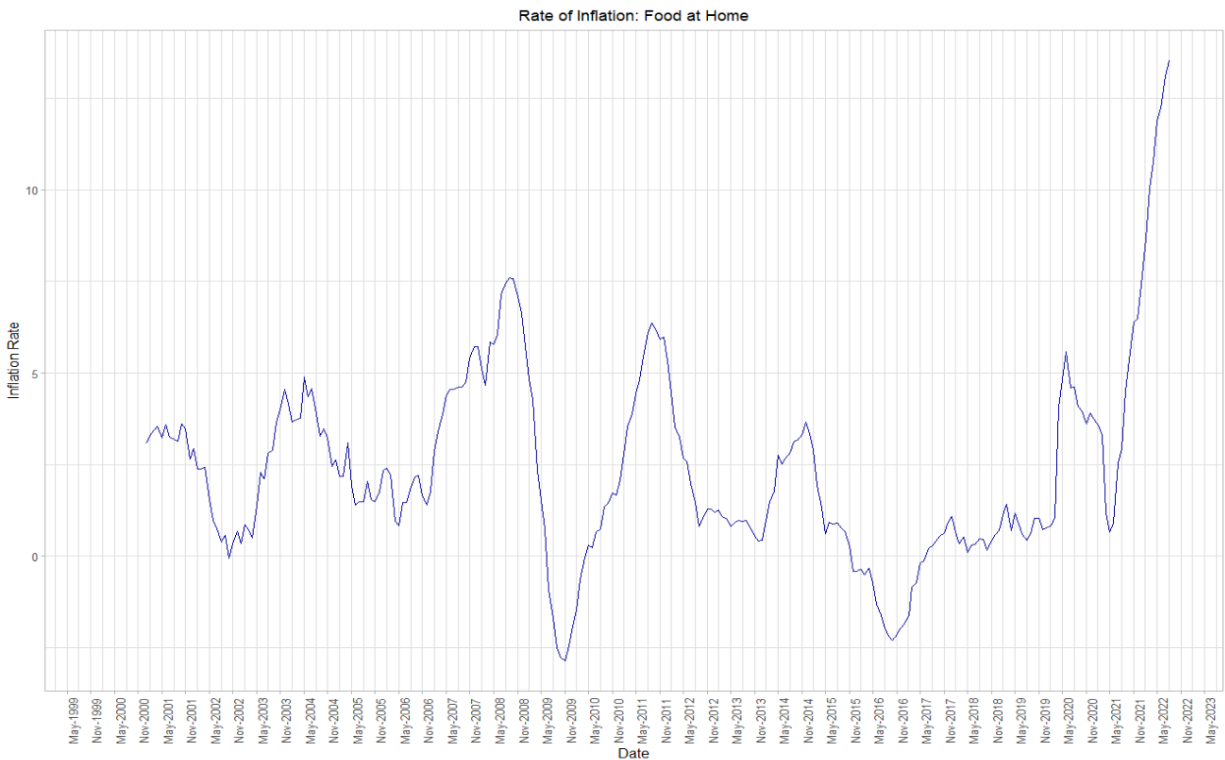
Figure 5: US National Prepared Food Price Inflation, 2008-Present

Source: Federal Reserve Economic Database (https://fred.stlouisfed.org/)
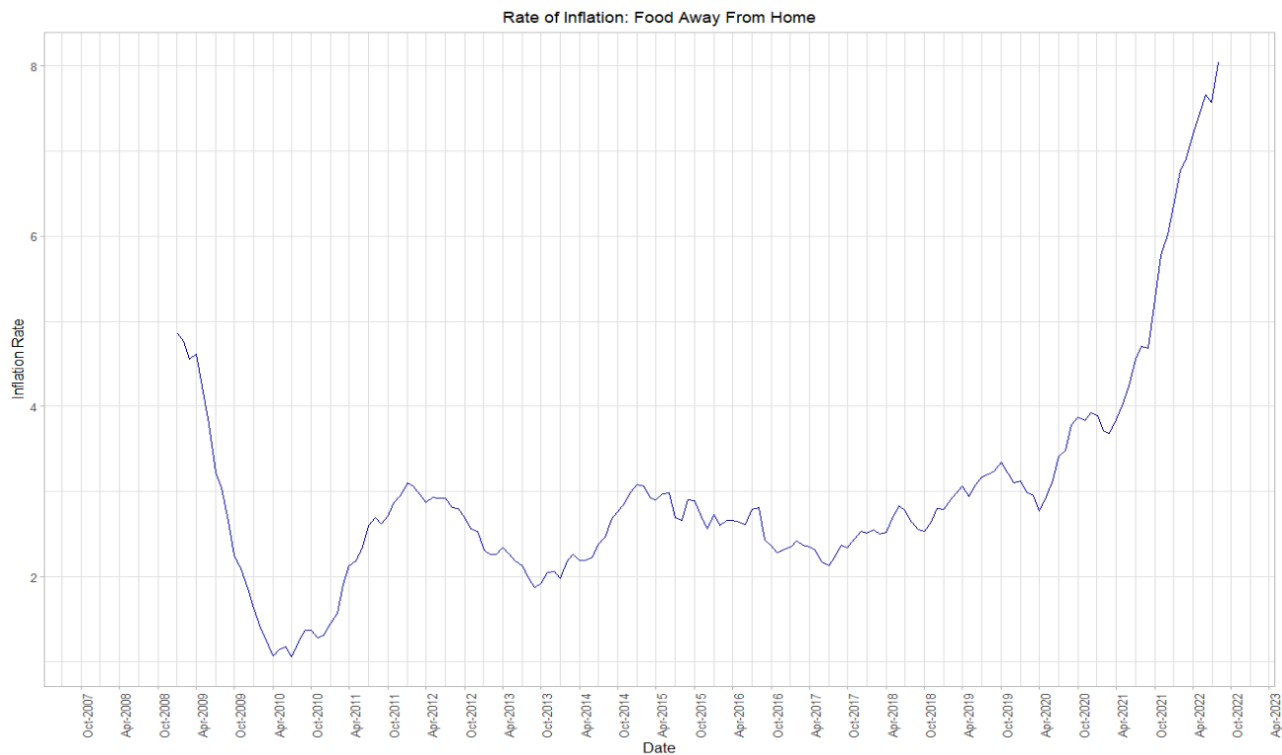
The upward pressure on food prices is not likely to abate in the near future; record droughts across Europe have decreased crop yields[13] and, with a decrease in food supplies, will result in continued upward pressure in prices.

The price inflation of food away from home (restaurant meals) is smaller than that for food consumed in home. (See Figure 5.) In 1980 the US experienced year-over-year inflation for food away from the home at rates above 10%. The availability of less-expensive "fast food" options in the US and creates a system with a little less upward pressure than we saw in 1980 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. The year-over-year inflation for housing is now hovering between 7 and 8%. Figure 6 uses the Case-Shiller home price index to estimate annual inflation for single-family housing units.

We've 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 indicated[14] that its interest rate target changes will be 75 basis points for, perhaps, one more meeting and then a 50 bp increase towards the end of the year.

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[13] https://phys.org/news/2022-07-drought-impacts-global-agricultural-production.html
[14] https://www.businessinsider.com/federal-reserve-interest-rate-hikes-double-sized-future-meetings-powell-2022-5 and

The uptick in inventory (existing homes, per Figure 7) is coinciding with a pronounced decrease in new-home permits (Figure 8). The increase in the interest rates (Figure 9) 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 (Figure 10), but the increase in inventory and the higher mortgage rates will slow demand and ultimate aid in stabilizing prices. (Rental rates are experiencing similar issues; see Figure 11.) We are unlikely to suffer from a repeat of the housing bubble we saw in 2008. Instead, we believe that a "softer landing" in the housing market is most likely to occur.

Figure 6: US National Home Price Inflation, 2008-Present

Source: Federal Reserve Economic Database (https://fred.stlouisfed.org/)
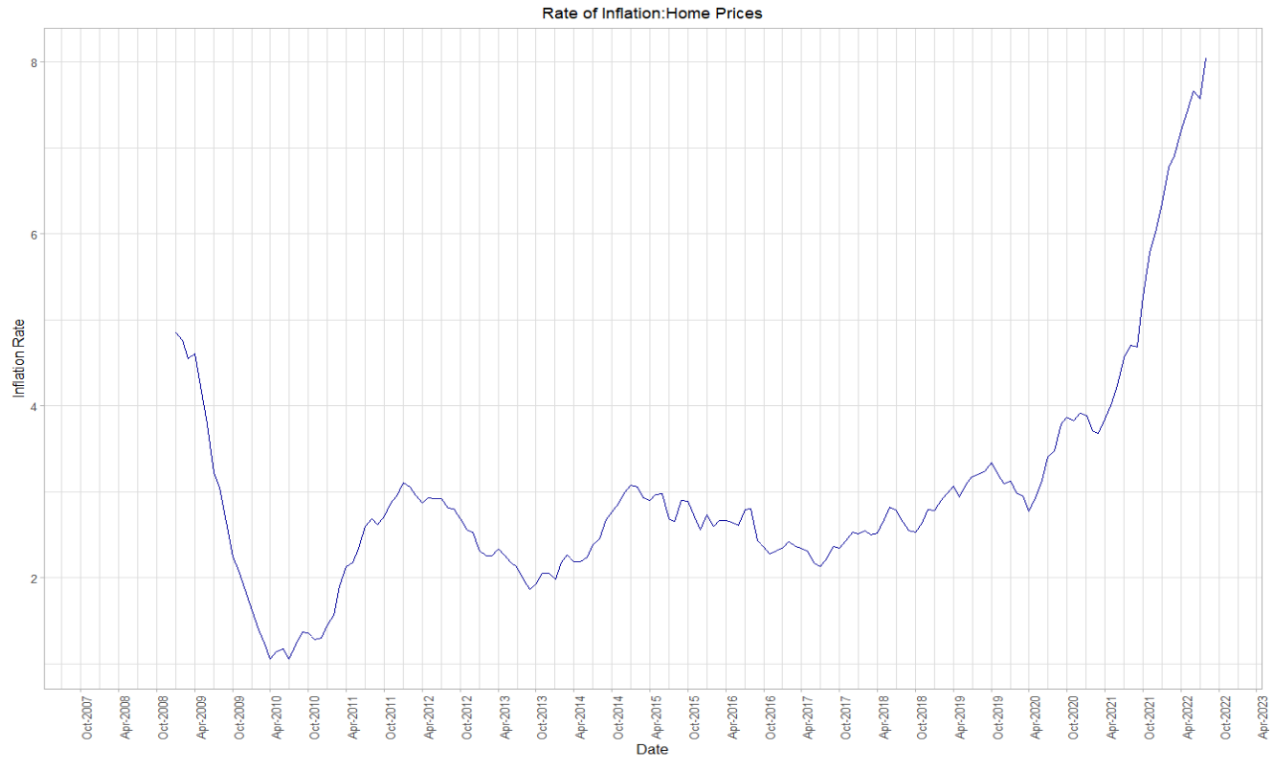
Figure 7: US National Residential Housing Inventory, August 2021-August 2022

Source: Federal Reserve Economic Database (https://fred.stlouisfed.org/)
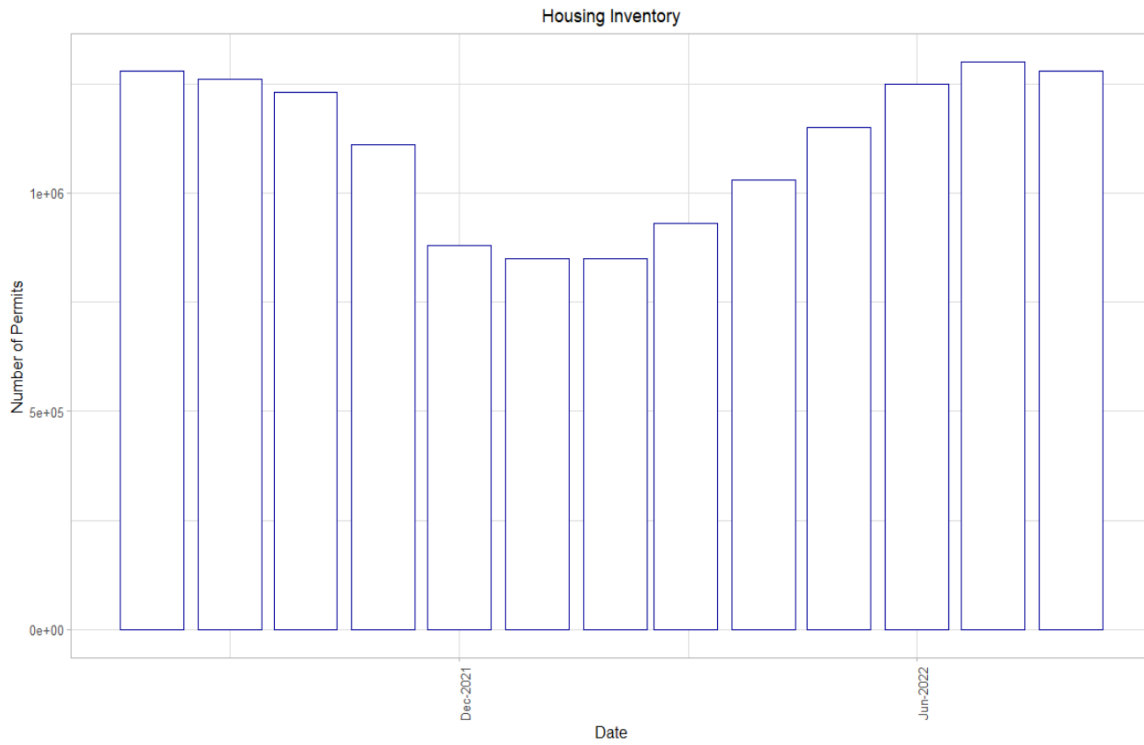
Figure 8: US National New Home Construction Permits, 2015-Present
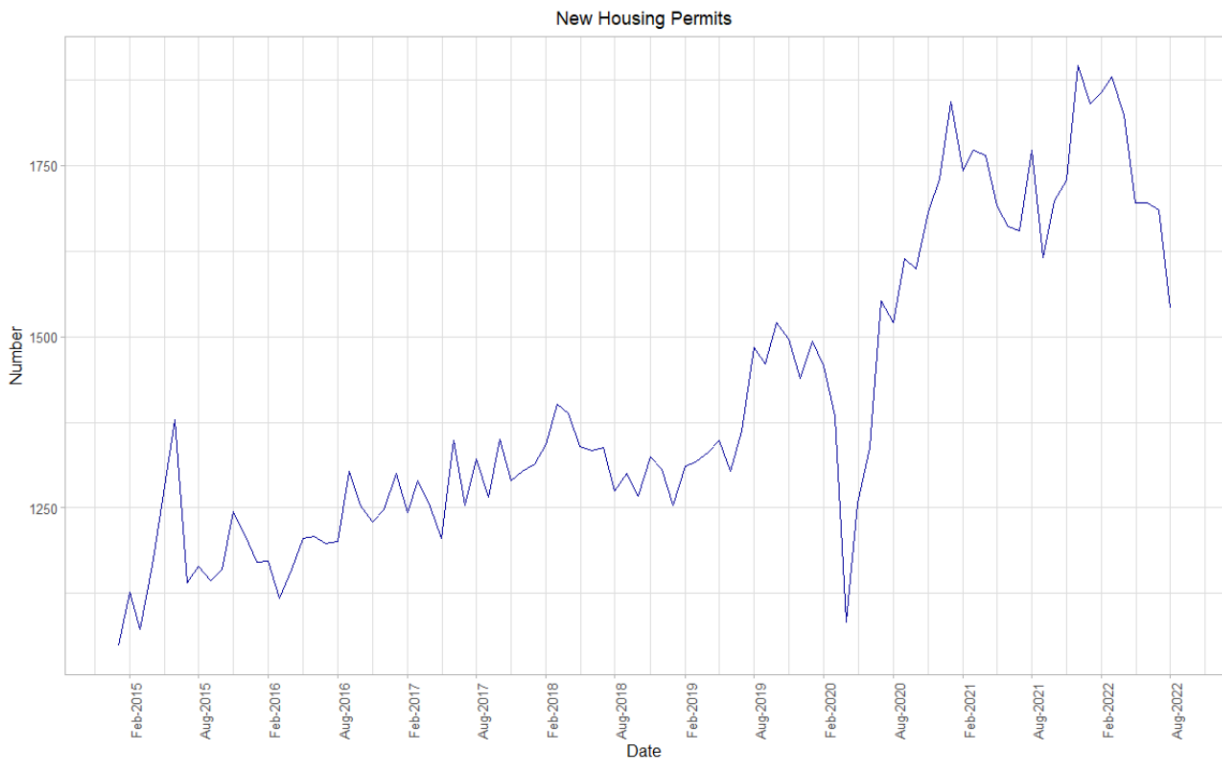
Source: Zillow.com

Figure 9: 30-year Fixed Mortgage Rate

Source: Federal Reserve Economic Database (https://fred.stlouisfed.org/)
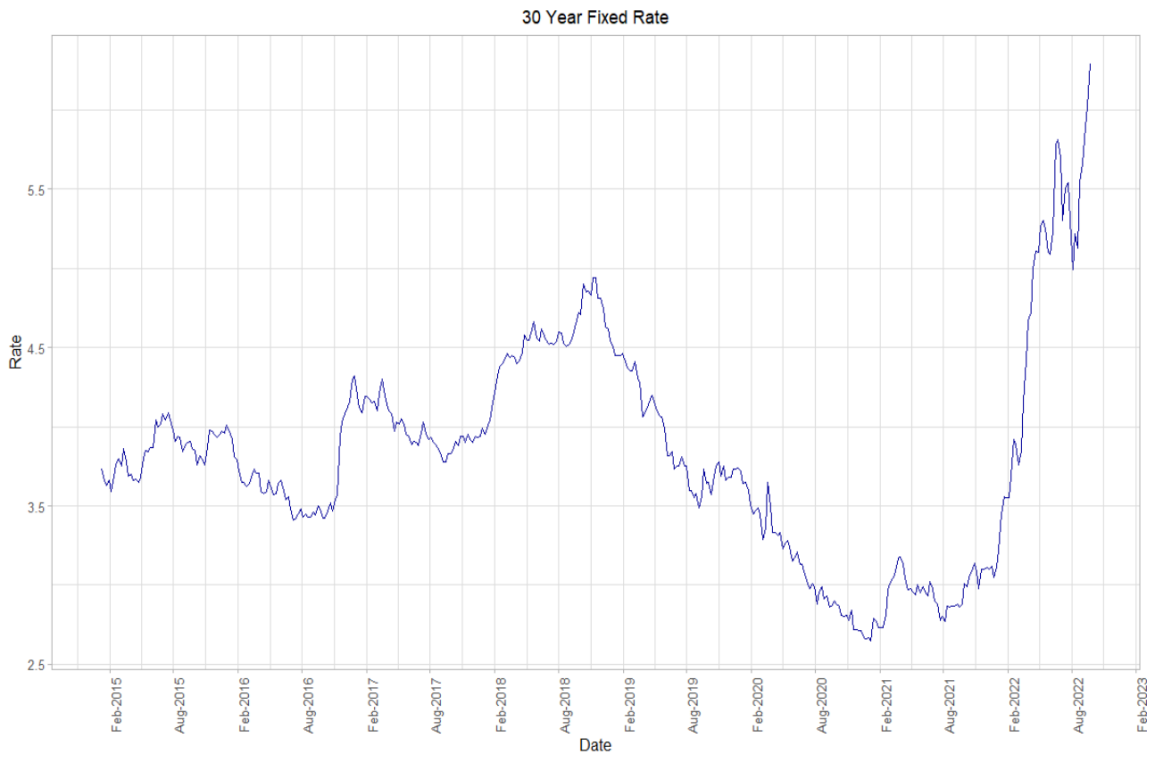
Figure 10: US National Residential Median Price per Square Foot, July 2016-Present

Source: Federal Reserve Economic Database (https://fred.stlouisfed.org/)
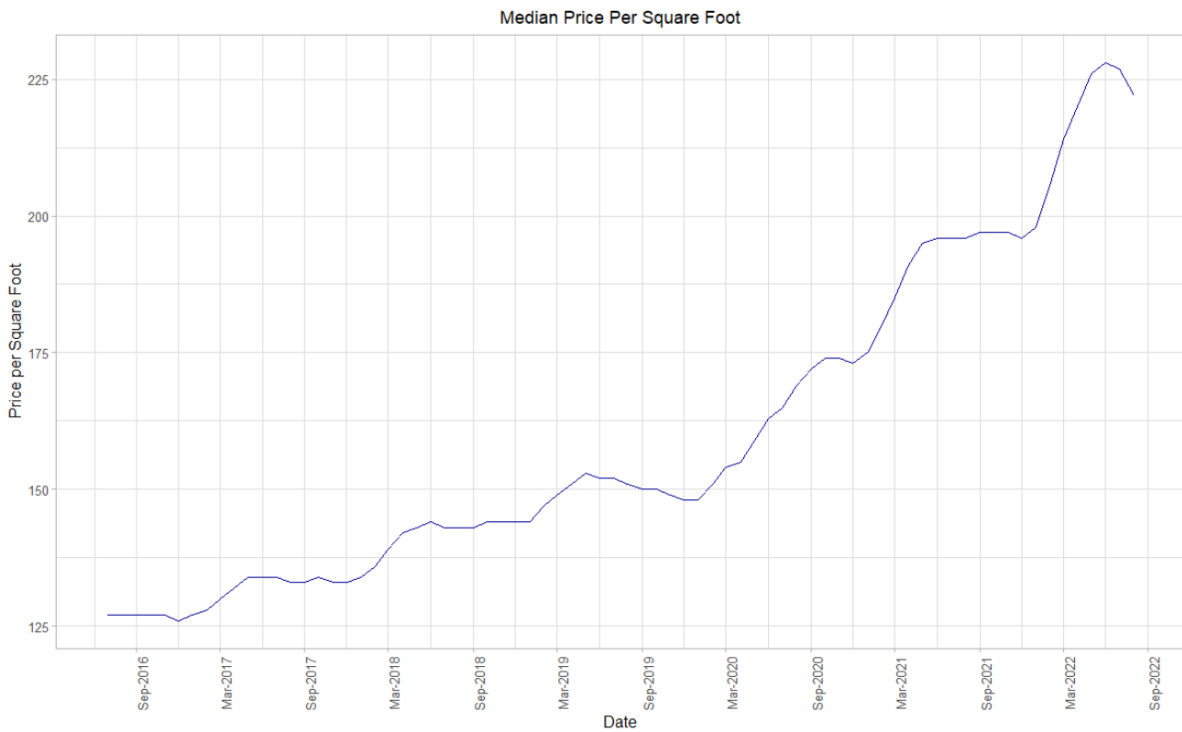
Figure 11: US National Residential Rental Prices, 2008-Present

Source: Federal Reserve Economic Database (https://fred.stlouisfed.org/)
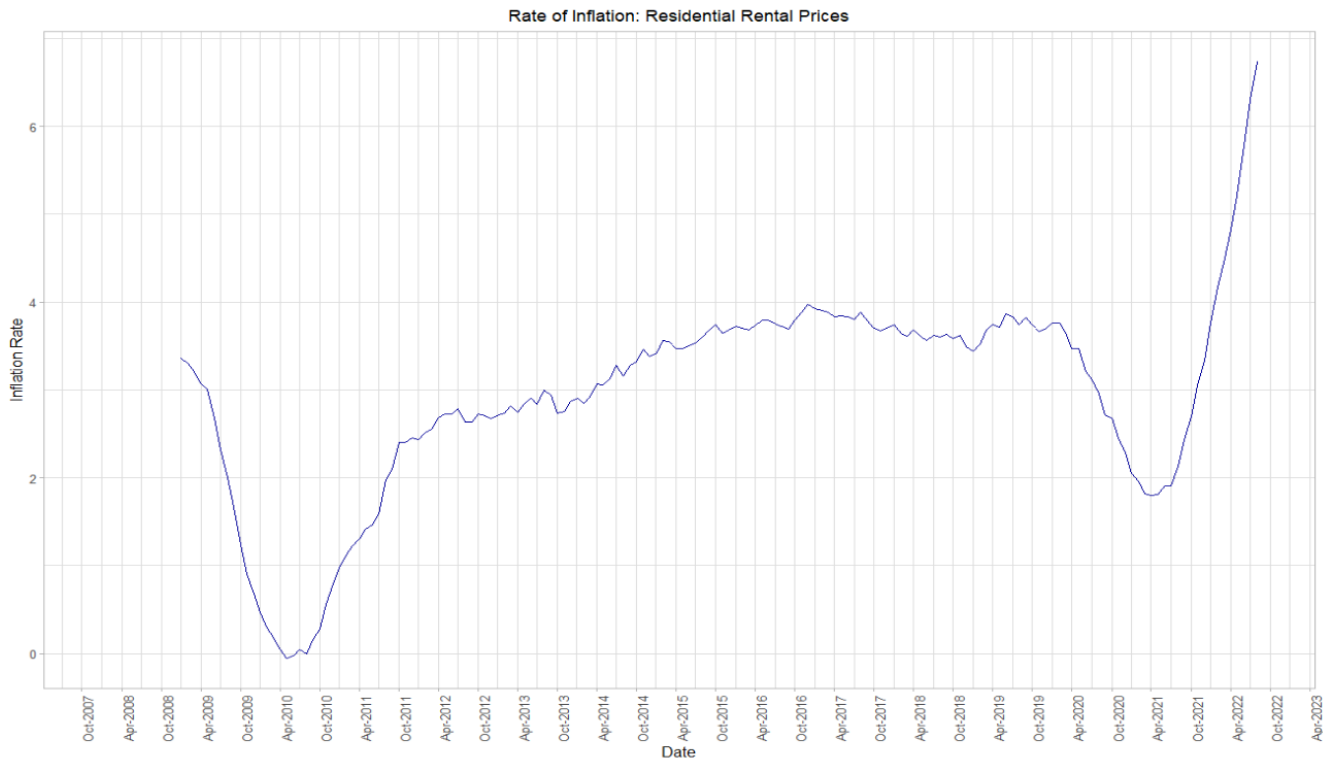
Figure 12: Median Price for Single Family Residences for the US & Selected MSAs
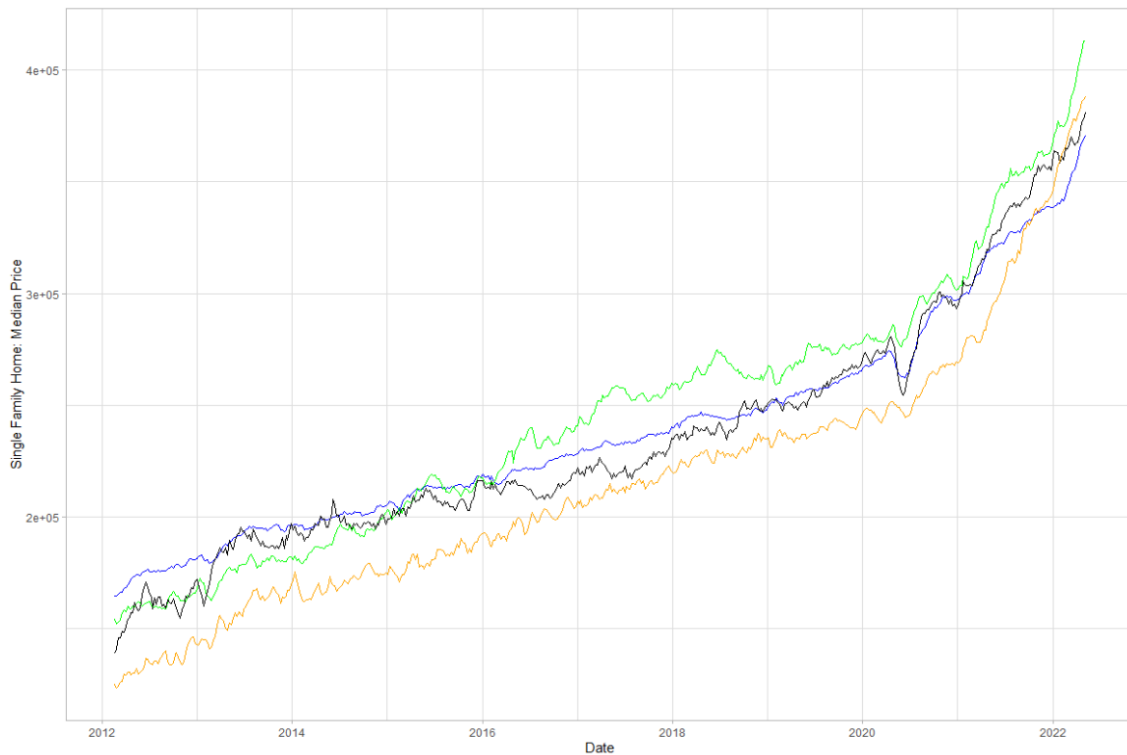
Source: Zillow.com

Figure 12 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 of 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.

Inflation: Summary

Consumers are extremely aware of the inflationary trends of the US. The inflationary expectations (as shown in Figure 13, Figure 14, and Figure 15, from the University of Michigan) suggest that consumers have anticipated that inflation will start to fall by small amounts. 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" control inflationary trends. The Fed's policy has been broadly covered, by media sources on the left and right sides of the aisle (i.e., CNN[15], Fox[16], and Newsmax[17]); consumers have been alerted to these policies and range of outcomes stemming from these policies (e.g., a recession[18]). Perhaps because of these revelations (or because consumers are having difficulties with their budgets) consumer confidence in the economy has continued to decline. 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.

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[15] https://www.cnn.com/2022/06/15/economy/fed-rate-hike-decision-june/index.html
[16] https://www.foxbusiness.com/economy/fed-could-break-economy-aggressive-rate-hike-campaign-analyst-says
[17] https://www.newsmax.com/finance/streettalk/federal-reserve-75-basis-point-rate-hike-inflation-jerome-powell-recession/2022/06/15/id/1074589/
[18] Supra 16, 17, and 18

Figure 13: US Consumer Inflation Expectations

Source: Federal Reserve Economic Database (https://fred.stlouisfed.org/)
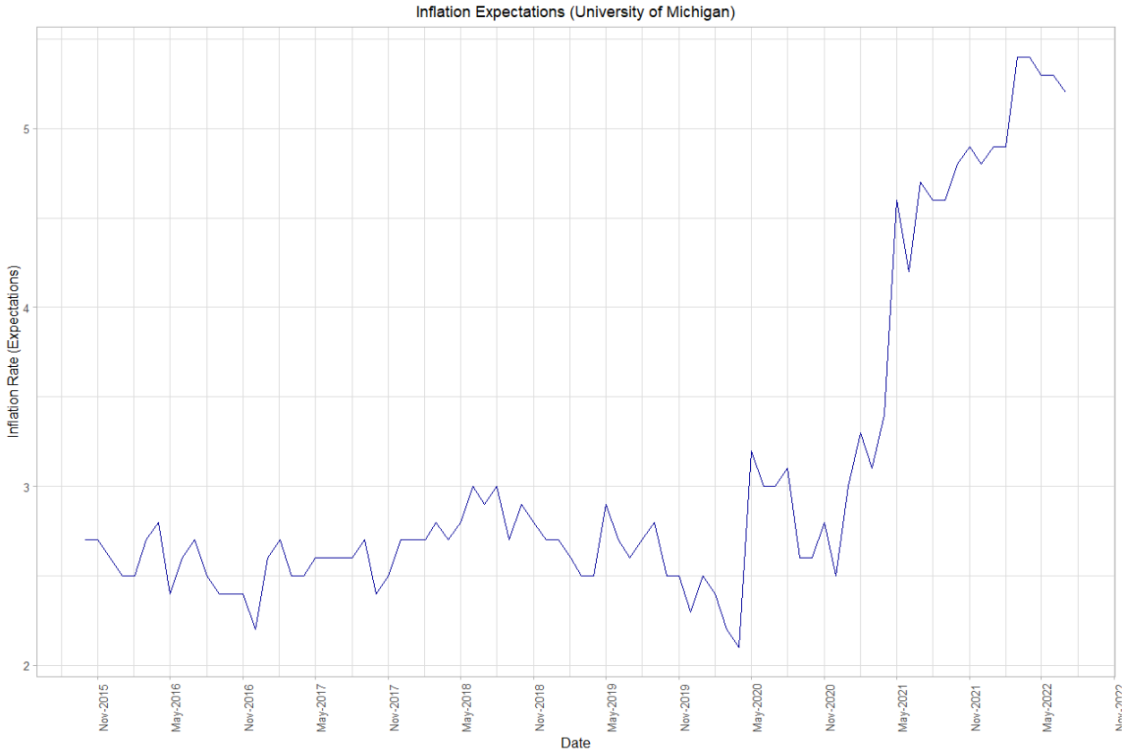
Figure 14: Consumer Inflationary Expectations

Source: https://www.newyorkfed.org/microeconomics/sce#/inflexp-1
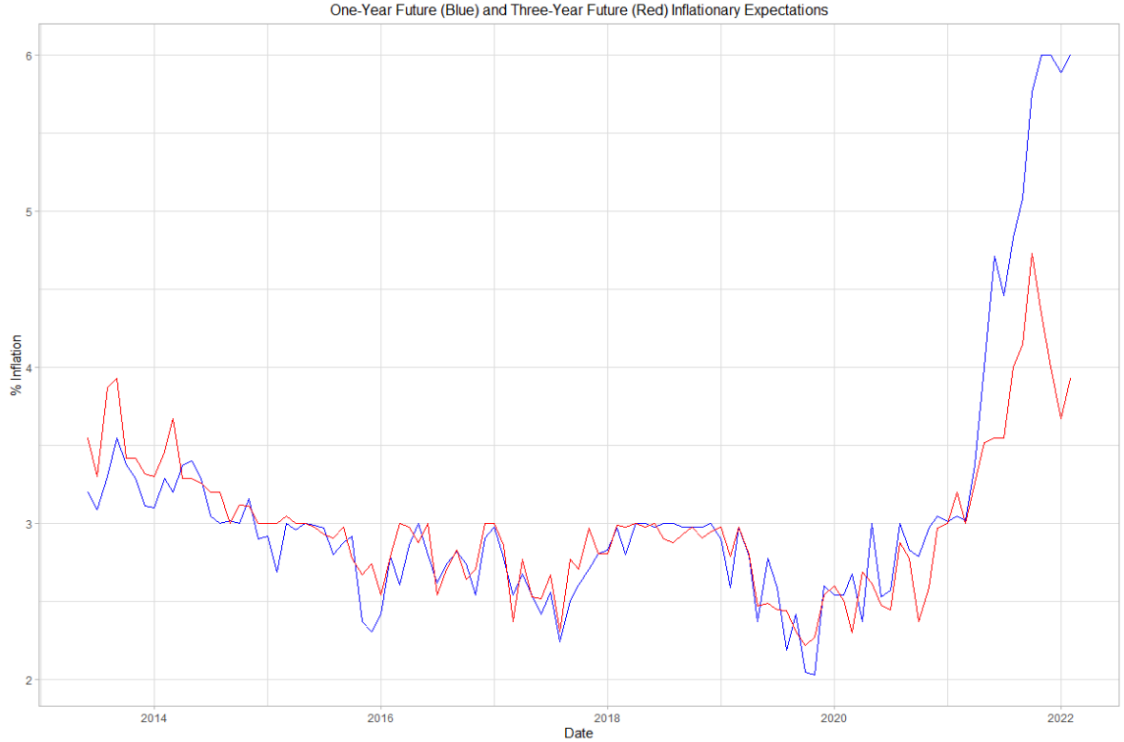
Figure 15: US National Consumer Confidence
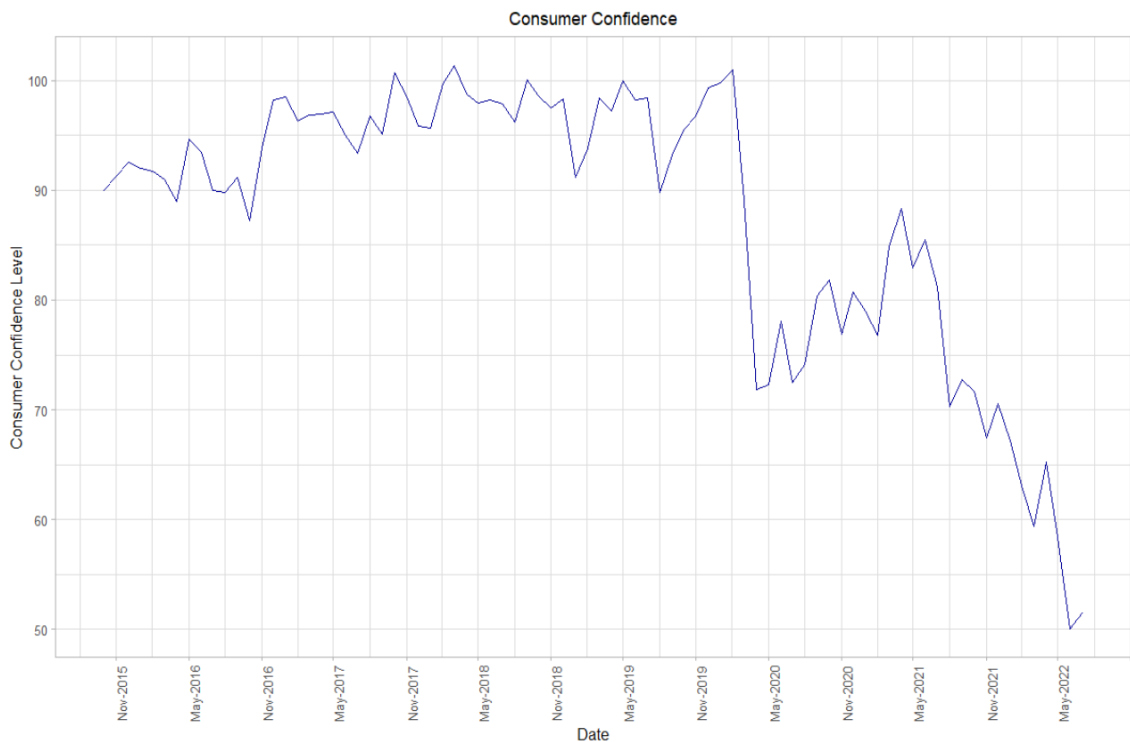
Our models (both the 24-month and 36-month horizon) for forecasting inflation are suggesting downward movement for inflation (See Figure 16 and Figure 17.) The Fed's movements (Figure 18) have been hawkish for the last 6 months, and we believe that these policy moves are starting to eat away at inflationary pressures. The US economy is going to continue to have inflation but at levels closer to between 7.25% and 8.25% into the 4Q2022. These movements, however, have changed the Fed's outlook from a "possible" soft landing to a "less likely" soft landing[19]. We are under the impression that the economy is currently under a growth recession and that the economy's "best chance" is to limit the damage to high inflation for the next 16 -18 months (perhaps falling to between 5.5% and 6.5% by Fall of 2023) and slowing job growth.

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[19] https://www.reuters.com/markets/us/fed-forecasts-may-show-fraying-faith-soft-landing-2022-09-21/

Figure 16: 24-month ARIMA Model for US Inflation
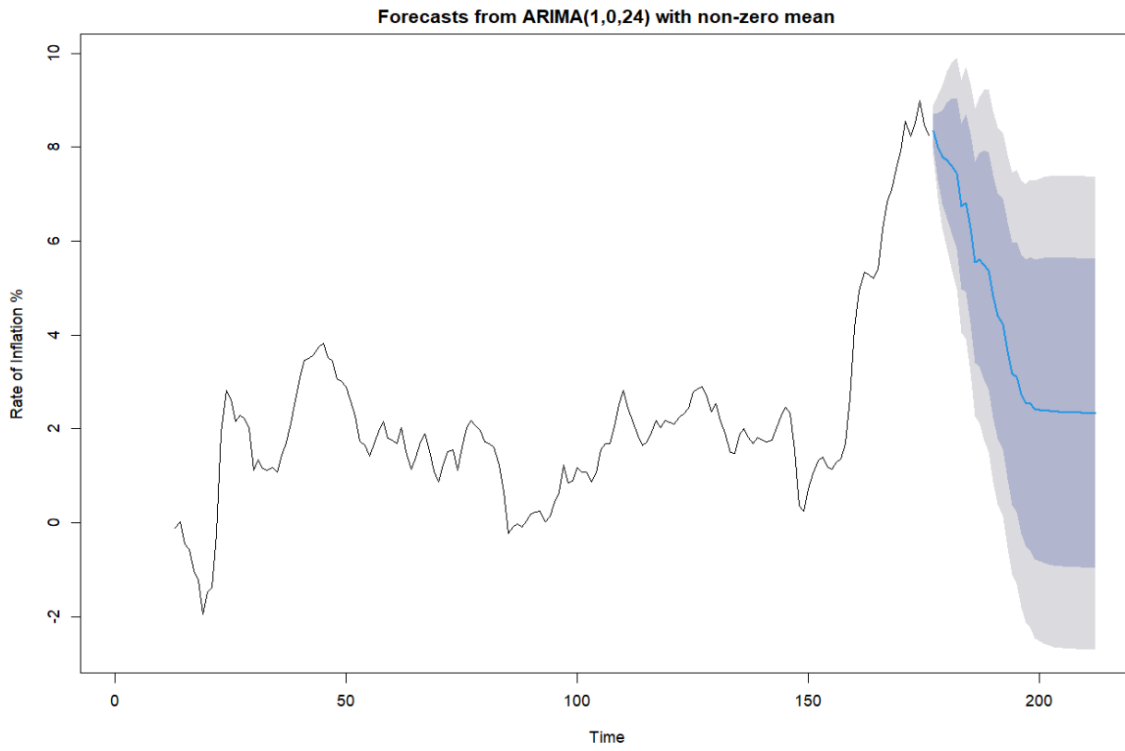
Source: Authors' calculations based on CPI

Figure 17: 36-month ARIMA Model for US Inflation
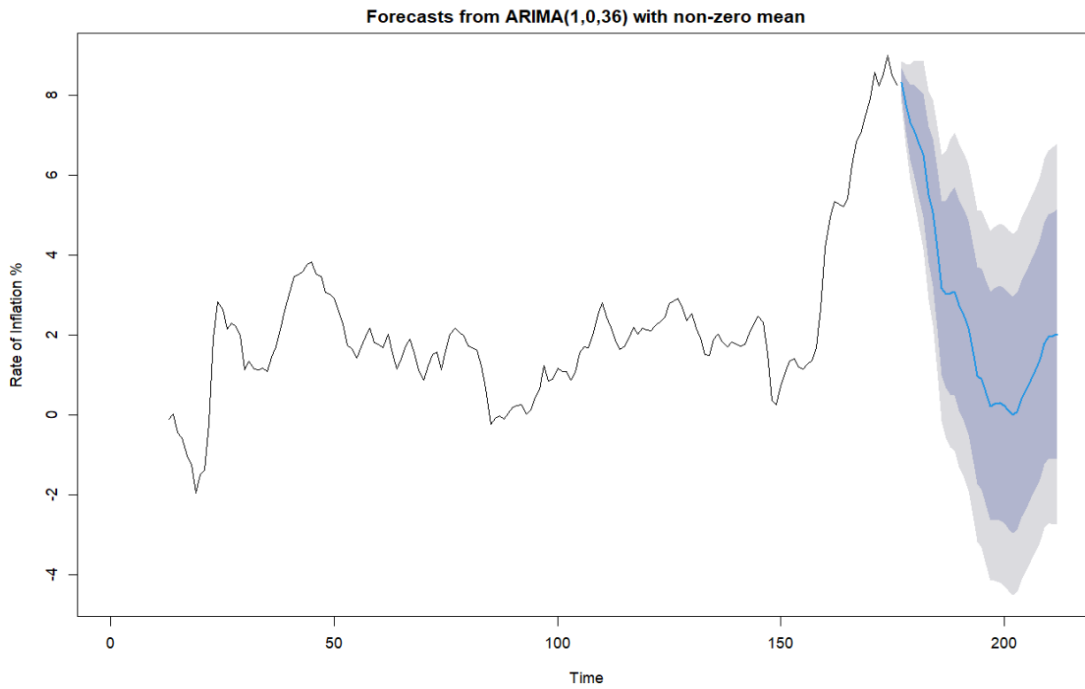
Source: Authors' calculations based on CPI

Figure 18: Effective Federal Funds Rate, 2010-Present

<div align="right">Source: Federal Reserve Economic Database (https://fred.stlouisfed.org/)</div>
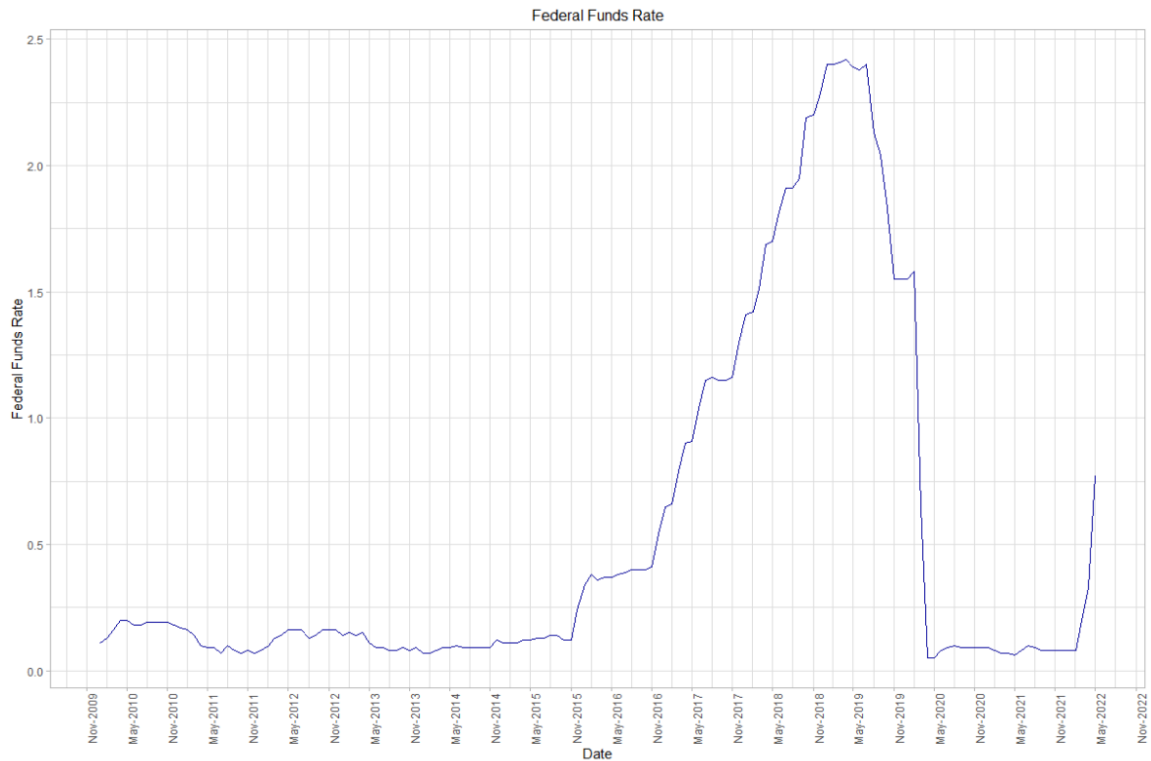
Macroeconomic Indicators: Other

The Real GDP of the United States is still growing, although we did experience a negative quarter-over-quarter growth for the real GDP between 4Q2021 and 1Q2022. 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 19: US National Nominal Average Hourly Wages for Selected Industries

Source: Federal Reserve Economic Database (https://fred.stlouisfed.org/)
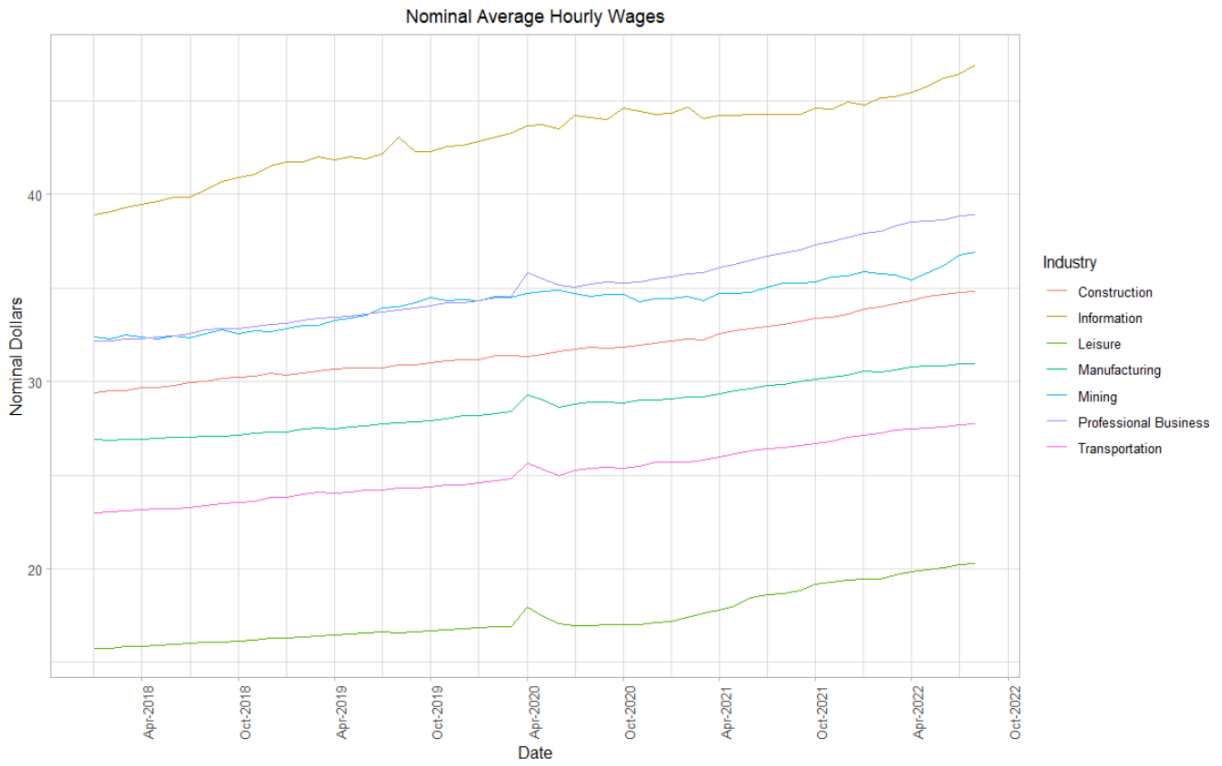
Figure 20: US Real Nominal Average Hourly Wages for Selected Industries

Source: Federal Reserve Economic Database (https://fred.stlouisfed.org/)
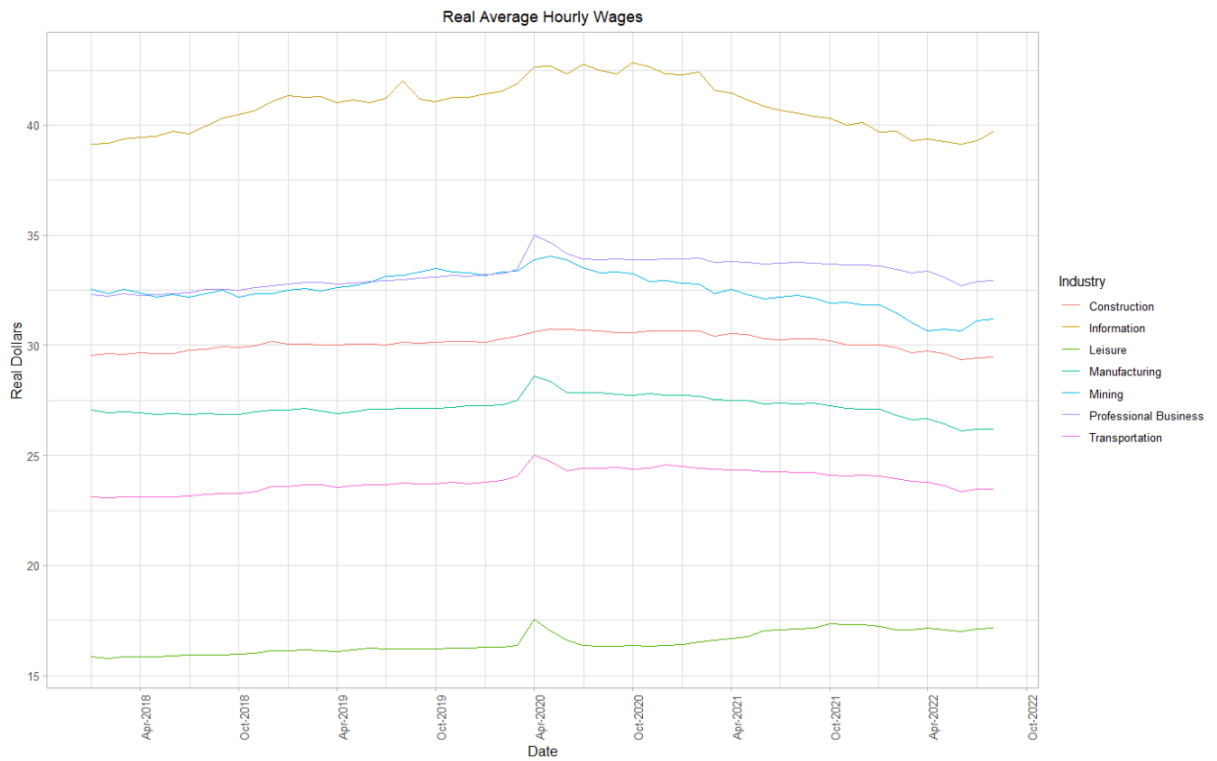
Figure 21: Y/Y Change in Real GDP

Source: Federal Reserve Economic Database (https://fred.stlouisfed.org/)
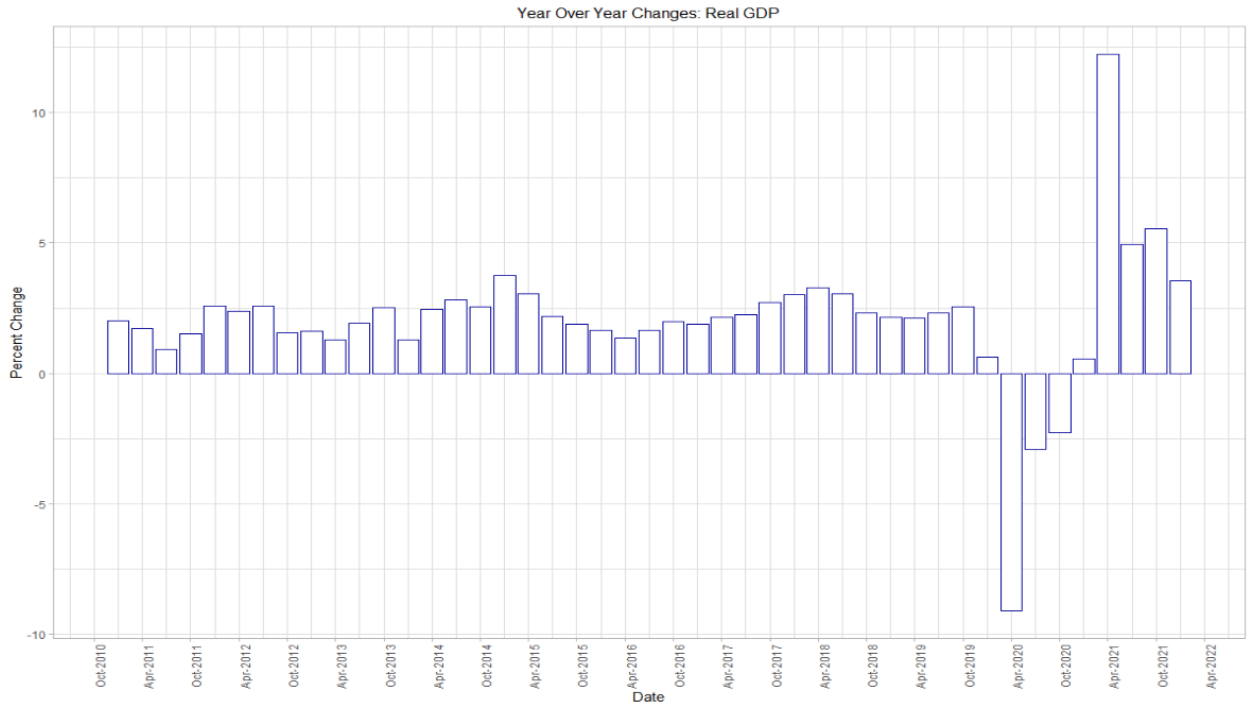
Figure 22: Q/Q Change in Real GDP

Source: Federal Reserve Economic Database (https://fred.stlouisfed.org)
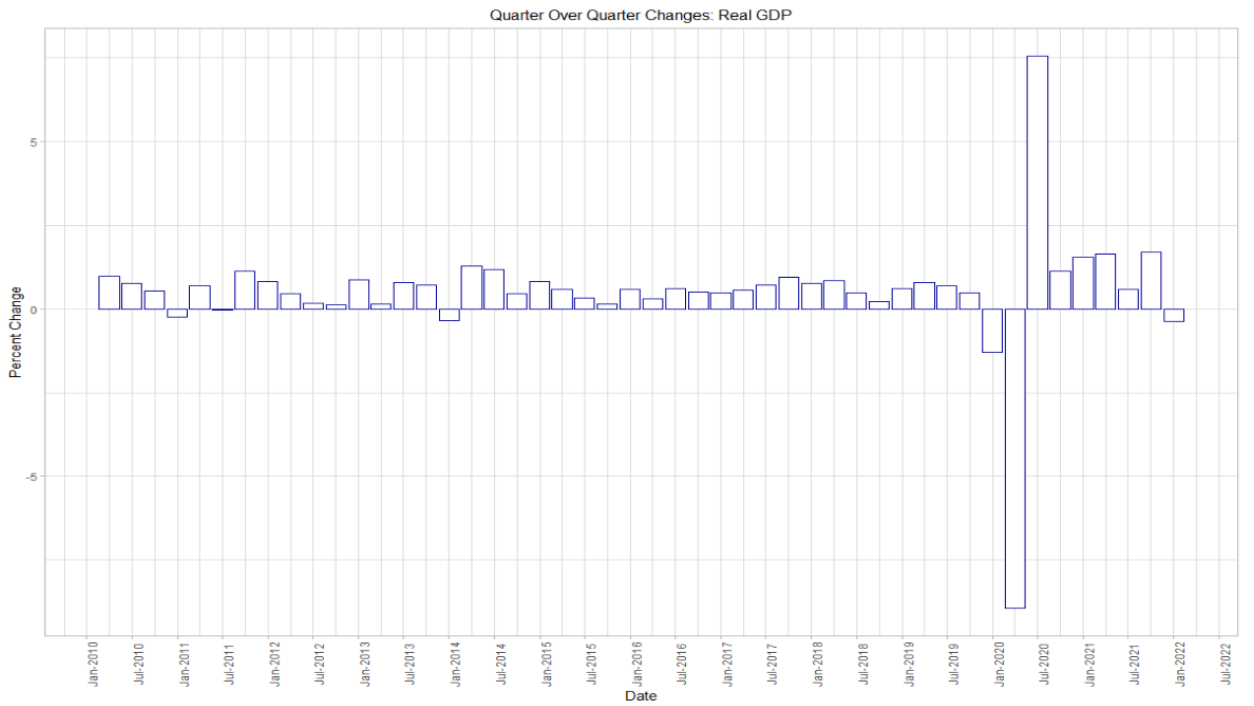
Figure 23 and Figure 24identify capacity utilization and industrial production. Both of these trends show a slight 'leveling' of the previous upward trend. Again, it is not clear at this point if these are showing a real plateau or just micro-corrections in the overall trend. We will need to keep a closer eye on these trends; historically, downward trends in these indicators are consistent with economic recessions.

Figure 23: Capacity Utilization

Source: Federal Reserve Economic Database (https://fred.stlouisfed.org)
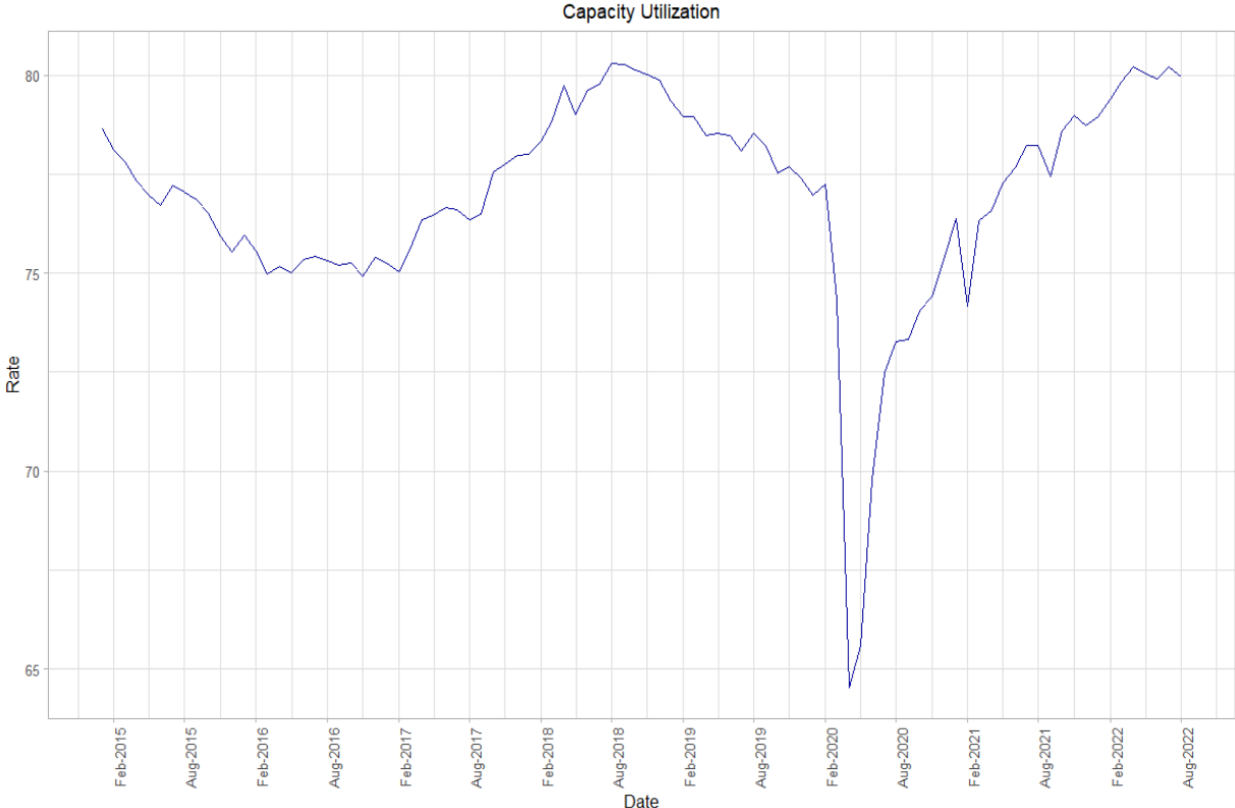
Figure 24: Industrial Production Index
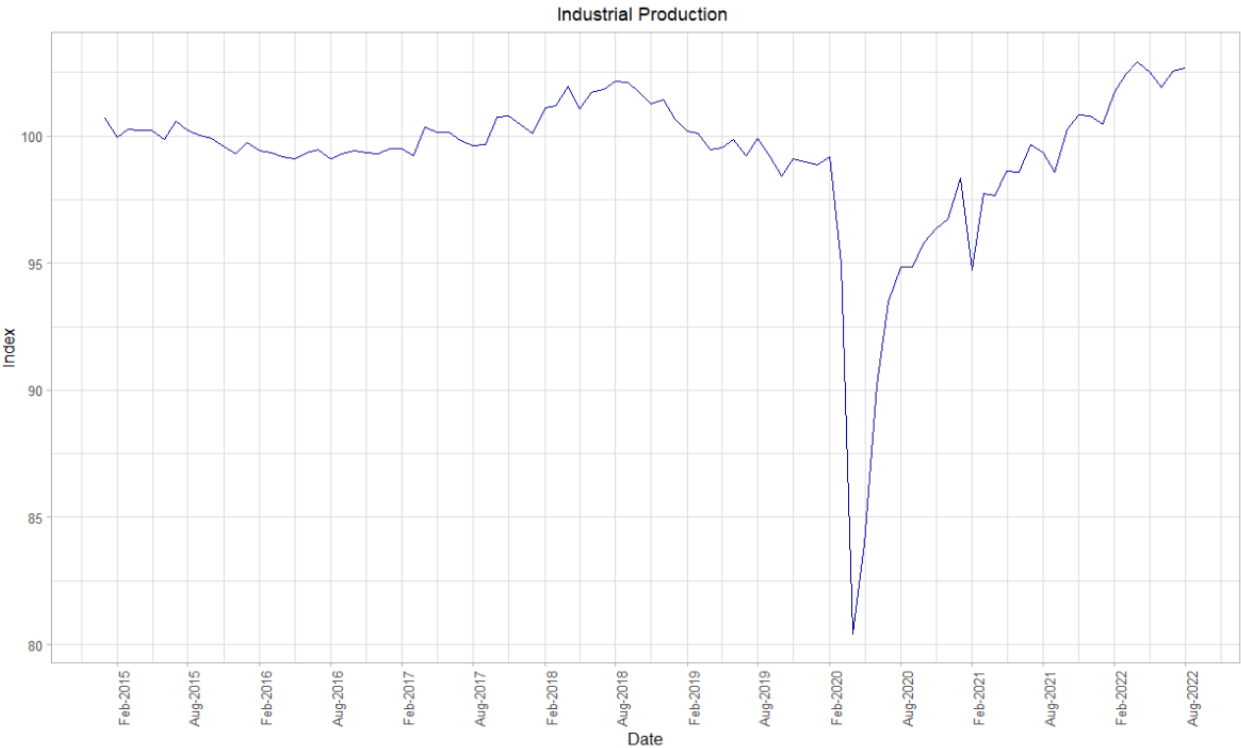
Inflations & Real Wages

Figure 25 and Figure 26 show national overall average real wages, and national average real wages by industry. The real wages for the US have shown a continued downward trend. Although nominal wages are increasing slightly, the buying power of those wages have decreased significantly as the result of the near double-digit inflation. The construction sector and the manufacturing sector are showing slight upward trends in real wages. There is some concern that the US might be heading caught in an inflation-wage spiral – where overall inflation has upward pressure on wages, which, in turn, puts upward pressure on prices, which leads to more wage inflation. There is little evidence that the entire economy is caught in a wage-inflation web. Rather, there seems to be some wage inflation in a select number of industries. Most sectors are experiencing a decline in real wages.

Figure 25: Real Hourly Wages (Nationwide)

Source: Federal Reserve Economic Database (https://fred.stlouisfed.org)
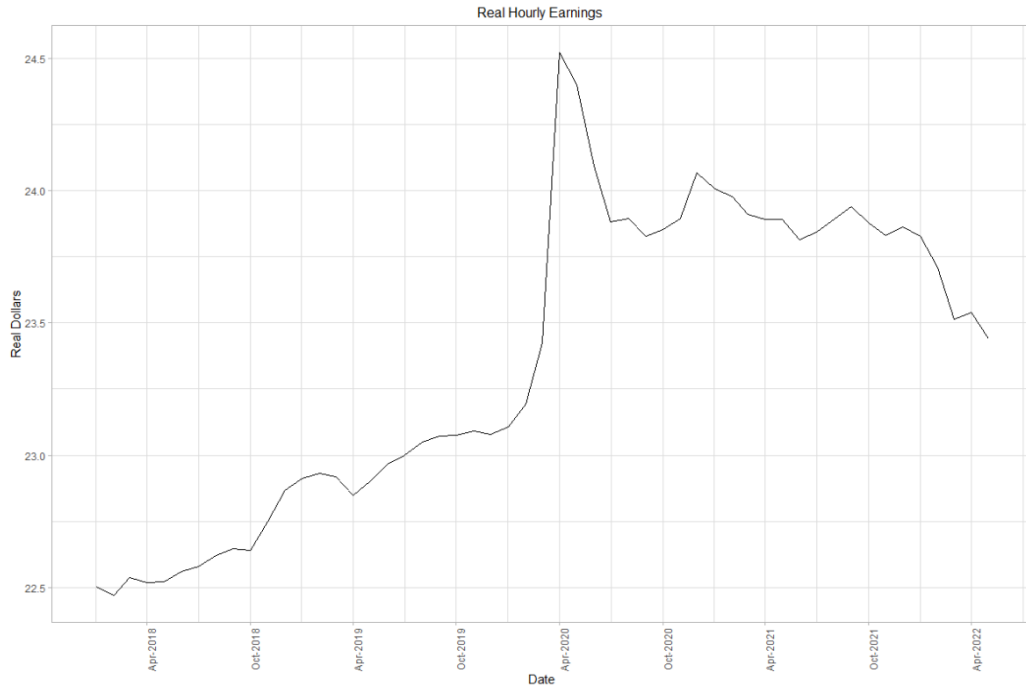
Figure 26: Real Hourly Wages for Select Industries (Nationwide)

Source: Federal Reserve Economic Database (https://fred.stlouisfed.org)
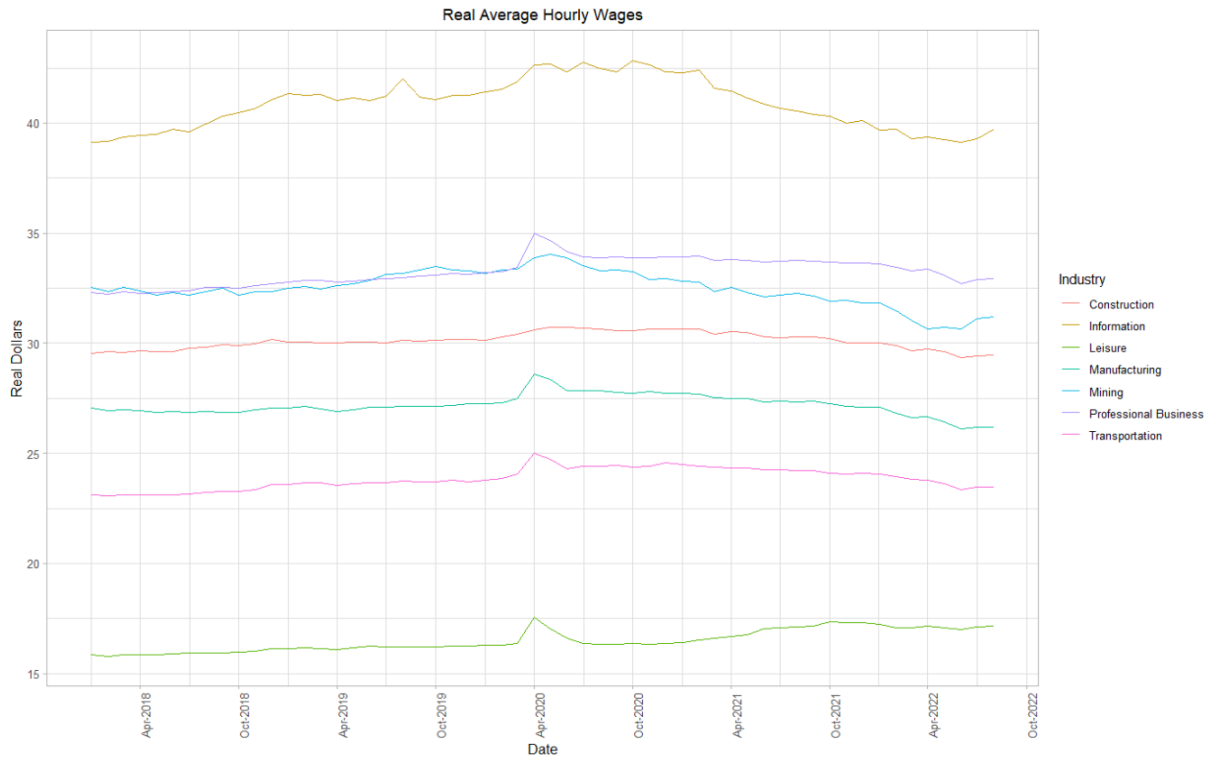
Exchange Rates, Dollar-Euro Parity and Dollar-Pound Sterling Parity

Figure 27 and Figure 28 show the exchange rate between the dollar and the Euro and the dollar and the British Pound, respectively; the dollar is appreciating against both of those currencies. The political costs of changing prime ministers (following the turmoil of Prime Minster Boris Johnson), and the impact of the Russian-Ukraine conflict in Europe, has weakened the economies of the UK and of Europe, driving down the demand for Euros and Pounds relative to the dollar. Although the economic outlook of the US is not certain (and looks as if the US is either in a recession or headed towards one), the economic trends in the UK and Europe are no better. Although the appreciation of the dollar against these currencies may create opportunities for US foreign travel, the most likely impact will be in decreasing US exports to the UK and Europe.

Farmers are currently concerned about possible export bans of GMO corn to Mexico[20] and additional soft demand for US agricultural products that could create a depressed situation in the Midwest farming communities. We believe that as the Midwest goes, so goes the rest of the United States. A decrease in farming exports will result in a decrease in the prices of corn and other US crops, placing downward pressure on farm revenues and increasing the likelihood of farm loan default. This scenario plays into the prediction that the US is either in or headed towards an economic slowdown.

Figure 27: Euro / Dollar Spot Rate (Euros Per USD)

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

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[20] https://www.kcur.org/news/2021-10-20/the-u-s-agriculture-secretary-says-mexicos-gmo-ban-wont-hurt-corn-exports
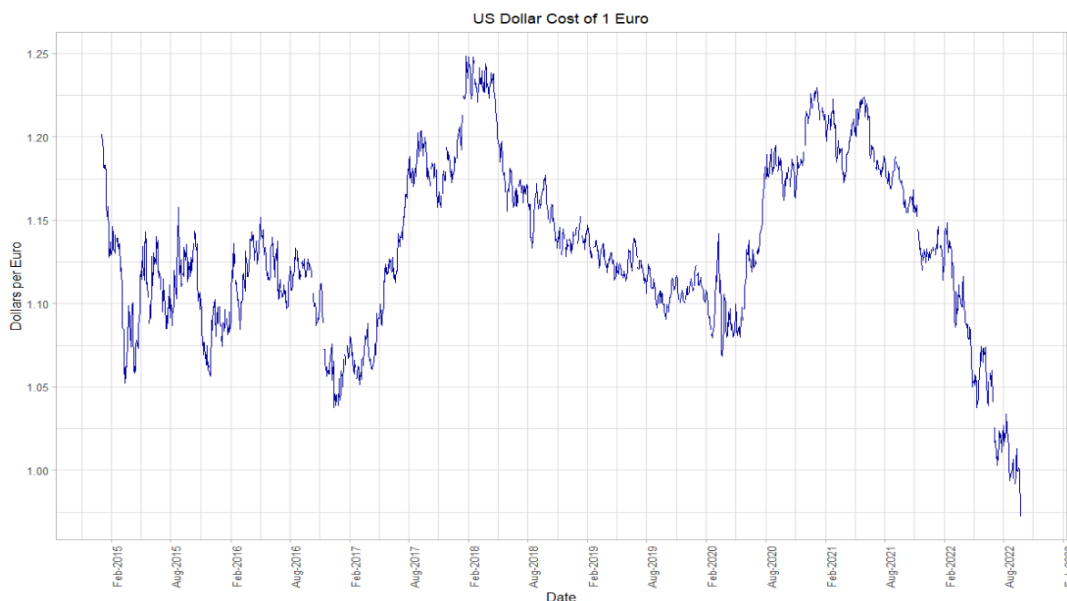
Figure 28: British Pound Sterling / US Dollar Spot Rate (BPS per USD)

Source: Federal Reserve Economic Database (https://fred.stlouisfed.org)
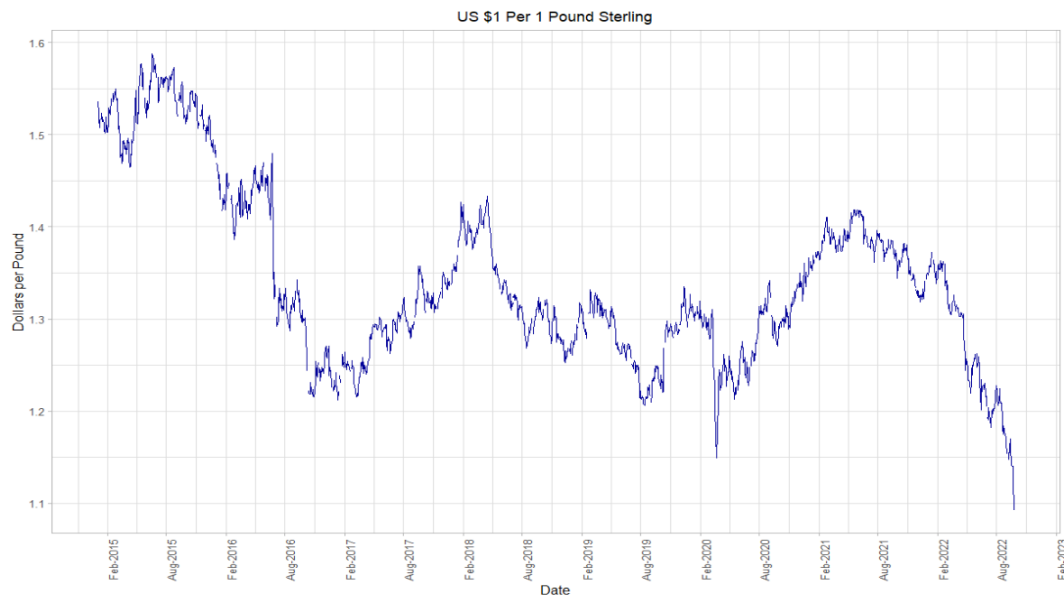
Unemployment and Labor Force Participation

Although the current unemployment rate (3.6%) is nearly as low as the month before the start of the pandemic (3.5%, March 2020 per **Error! Not a valid bookmark self-reference.**), the employment situation is still unstable and is a continued cause for concern. The labor force participation rate (Figure 30) 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 31) 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 offers[21] and layoffs by Ford[22], Stanley Black & Decker[23], Peloton[24], and Goldman Sachs[25] is 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 would not be a surprise given how asynchronous and out-of-step the labor market seems to be. (See Figure 32 and Figure 33.)

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[21] https://www.efinancialcareers.com/news/2022/09/revolut-graduates, https://www.wsj.com/articles/the-surprise-in-a-faltering-economy-laid-off-workers-quickly-find-jobs-11661333405, and https://www.nytimes.com/2022/09/07/technology/recruiters-tech-layoffs.html
[22] https://www.wsj.com/articles/ford-confirms-layoffs-says-it-is-cutting-about-3-000-jobs-primarily-in-u-s-and-canada-11661180161
[23] https://www.wsj.com/articles/stanley-black-decker-cuts-about-1-000-finance-jobs-as-part-of-cost-savings-drive-11664568393
[24] https://www.wsj.com/articles/peloton-to-cut-another-500-jobs-in-last-bid-for-turnaround-11665011471
[25] https://www.wsj.com/articles/goldman-sachs-plans-to-cut-hundreds-of-jobs-11663002265

Figure 29: US National Unemployment Rate

Source: Federal Reserve Economic Database (https://fred.stlouisfed.org)
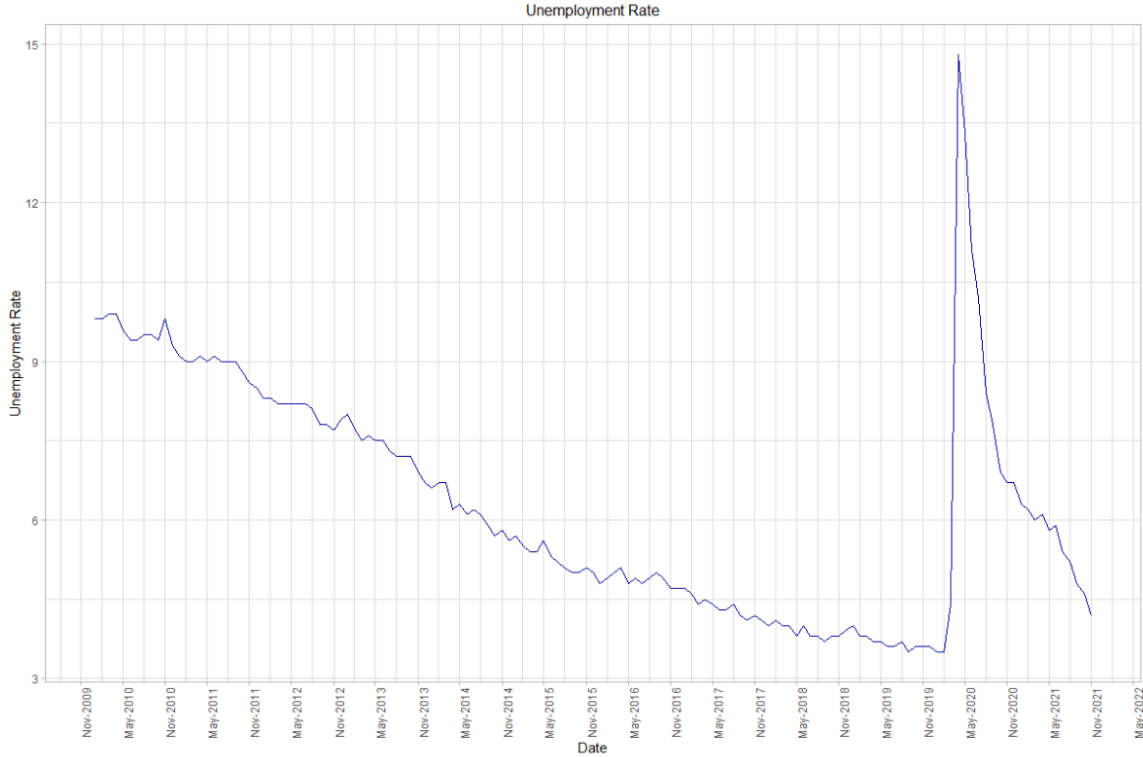
Figure 30: US National Labor Force Participation Rate

Source: Federal Reserve Economic Database (https://fred.stlouisfed.org)
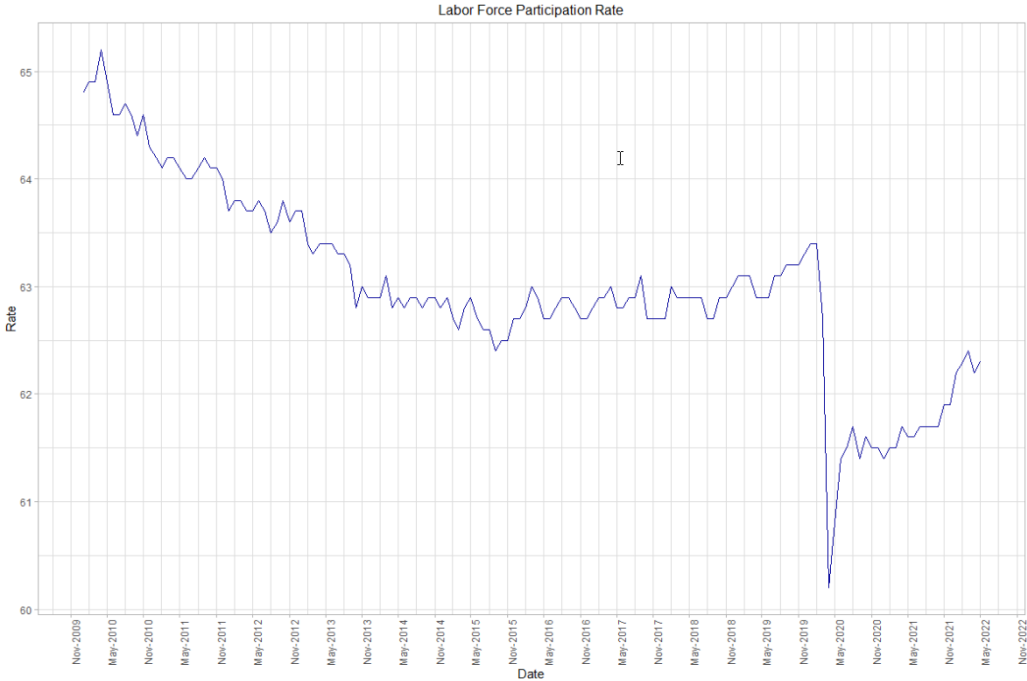
Figure 31: US National Labor Force Participation Rate per Race & Gender

Source: Federal Reserve Economic Database (https://fred.stlouisfed.org)
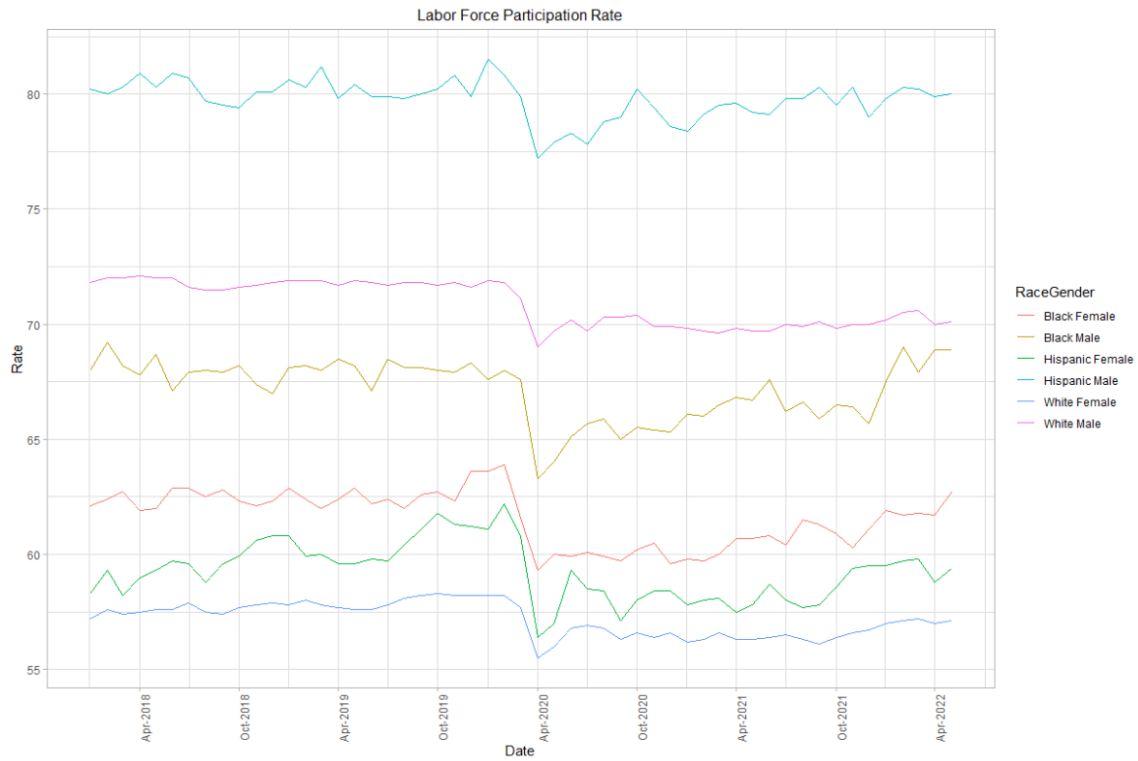
Figure 32: Employment to Population Ratio (Nationwide)

Source: Federal Reserve Economic Database (https://fred.stlouisfed.org)
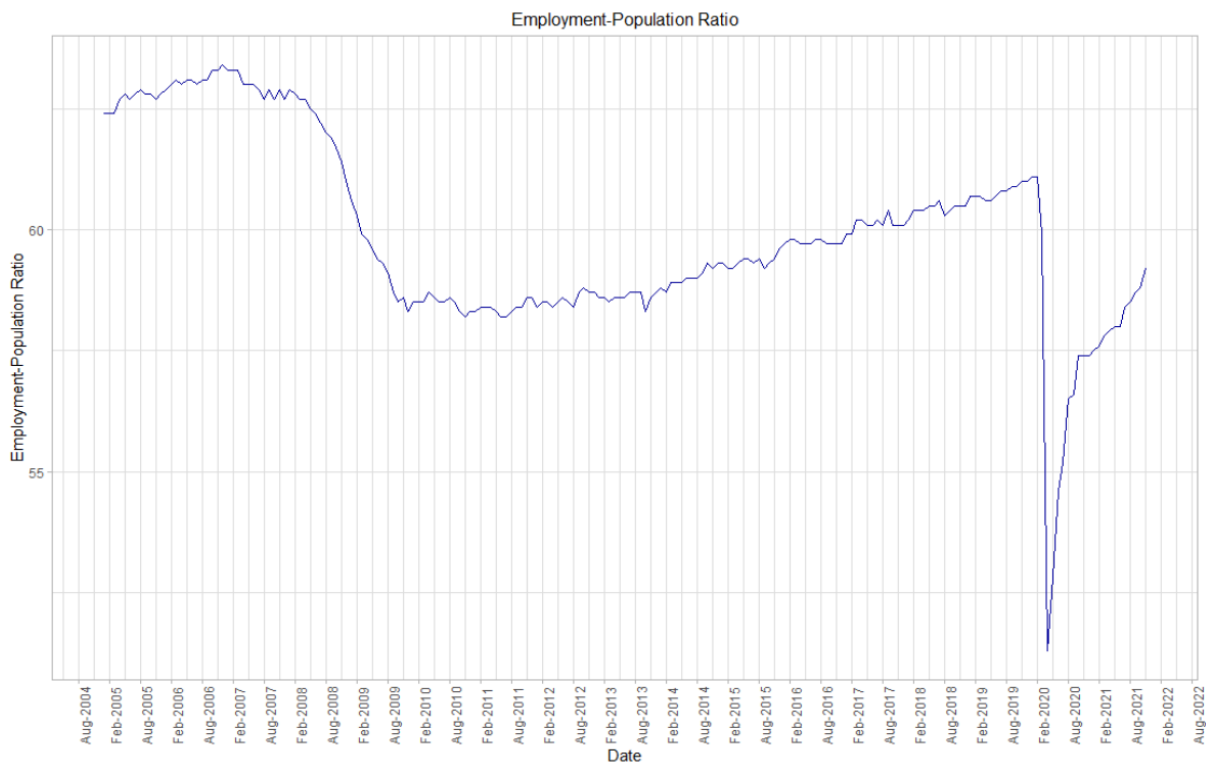
Figure 33: Employment Level (Nationwide)

Source: Federal Reserve Economic Database (https://fred.stlouisfed.org)
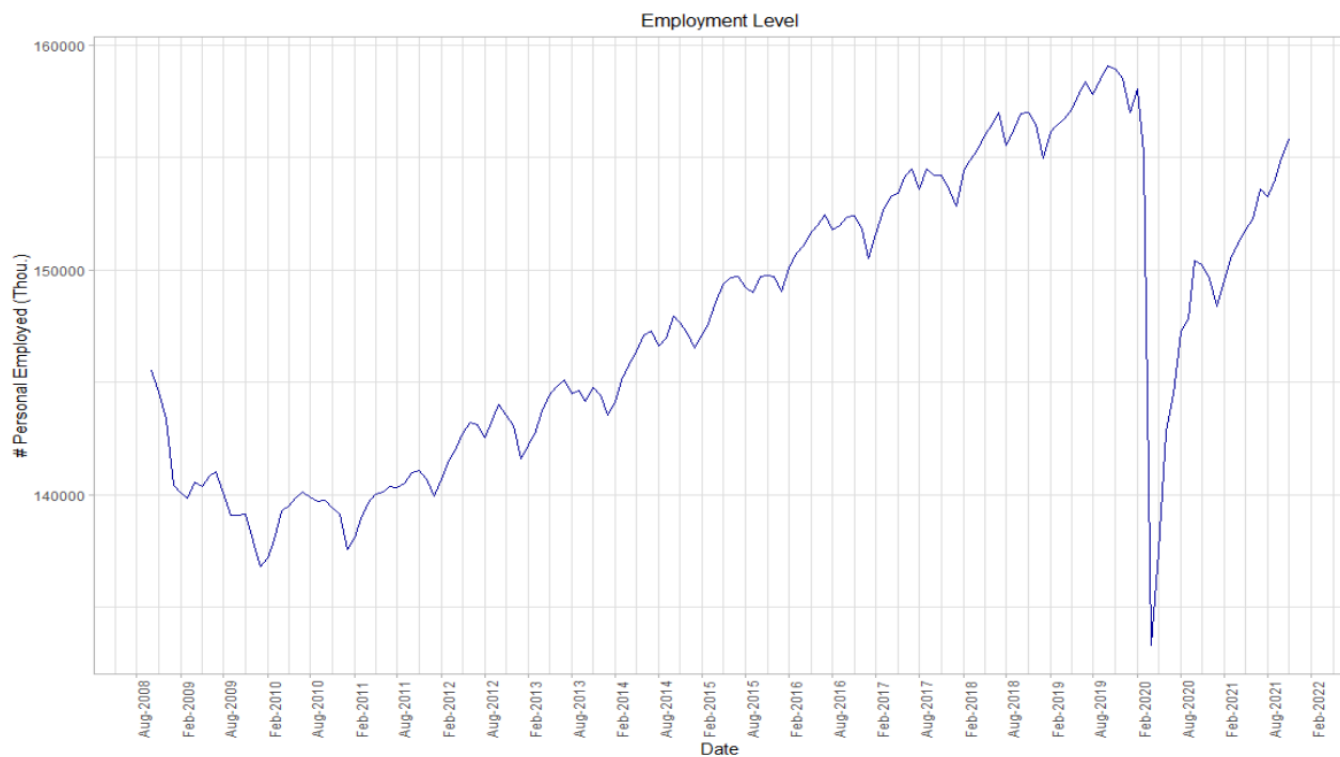
"So, What's the Score?"

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 (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. In Figure 34[26], we hypothesize what could occur if firms do not act aggressively, and signal to the Fed' that adjustments (e.g., inventory changes, spending trends, etc.) are occurring and held; a counter-example is shown in Figure 35.

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[26] The vertical blue region in Figure 34 reflects the latest information known by the FOMC when interest rate changes are being considered (for the example point indicated).

Figure 34: Optimistic Forecasts for Fed. Funds Rate, Unemployment, and Inflation
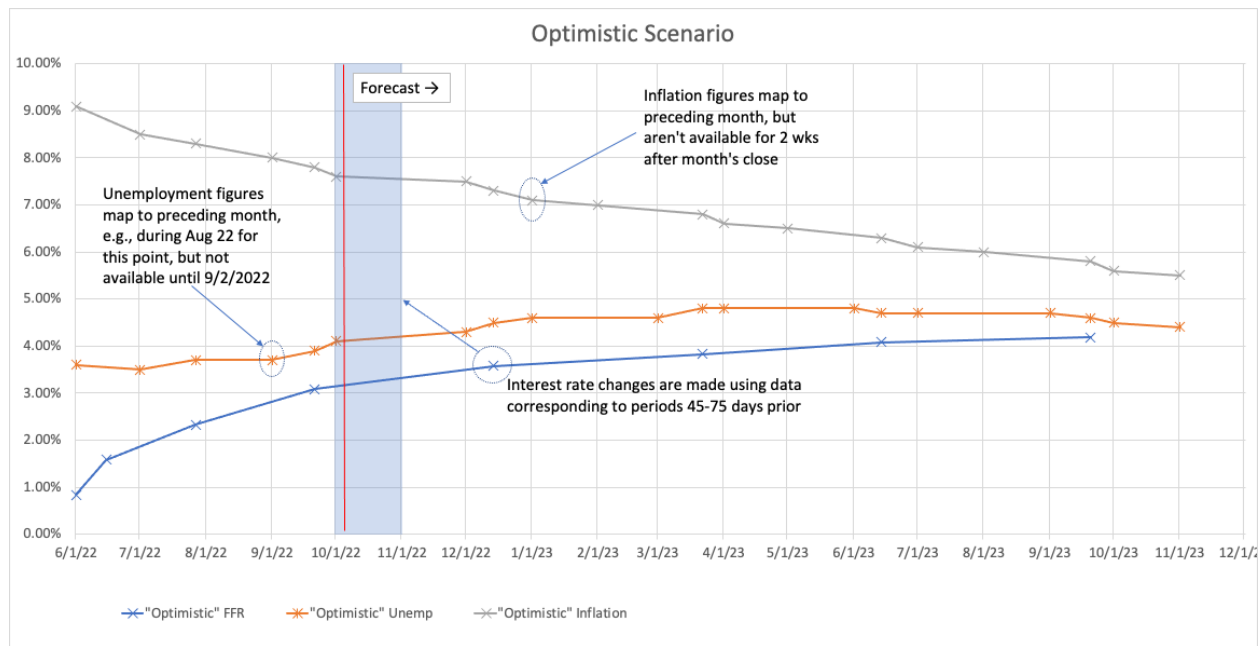
Figure 35: Pessimistic Forecasts for Fed. Funds Rate, Unemployment, and Inflation
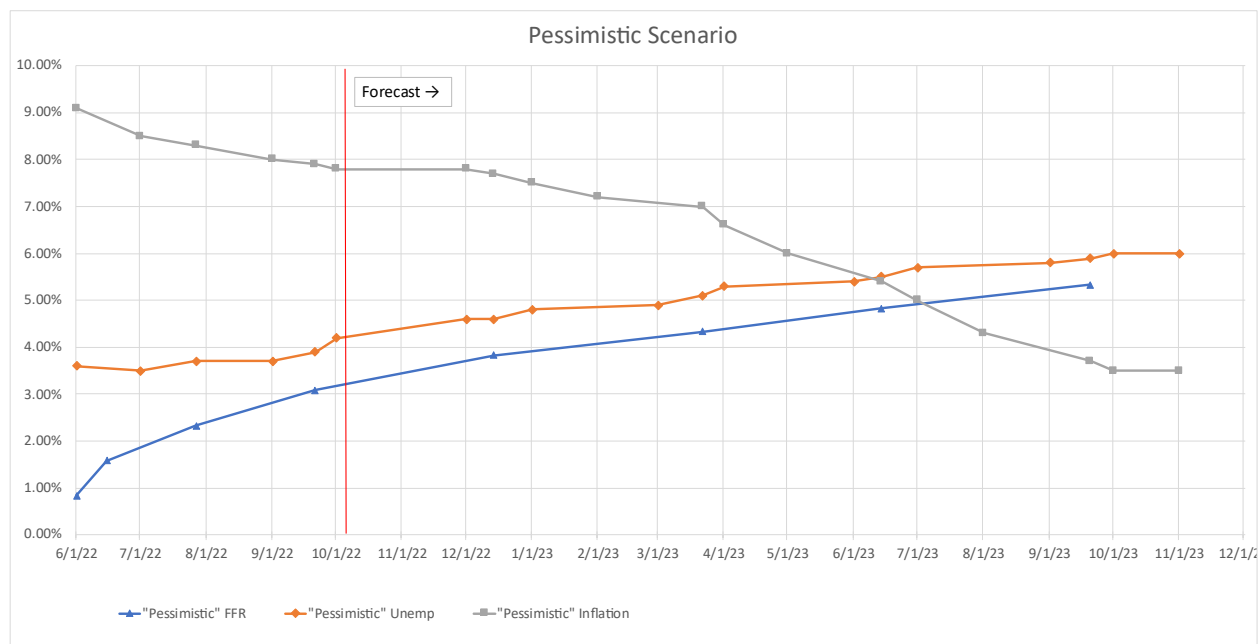
If the Federal Reserve Bank is able to adjust target interest rates to secure a "soft landing" rather than a full-blown recession, the labor market adjustments made by firms will be a smaller magnitude and we might see more temporary layoffs than full blown fires. On the other hand, if the Federal Reserve 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 a job (Amazon warehouse or some fulfillment center). At that point, we will see a sharp spike in the unemployment rate, which would cause additional panic.

In thinking about the current labor-market disequilibrium, we fear that an uptick in unemployment could have one of two possible outcomes. First, the increase in the unemployment rate could create an incentive for persons sitting on the labor-market sidelines to re-engage with the labor market. The labor force participation is still very low and isn't showing much of a resurgence. However, if the unemployment rate creates panic for persons not yet re-engaged, there could be a movement back to the labor market. A second possible outcome would be additional transactions costs within the labor market, creating more disequilibria. For example, Delta[27], United, and American Airlines[28] have recently canceled thousands of flights because of a lack of pilots and flight attendants. If unemployment spikes occur across the country and hit industries that are already suffering from shortages, the result could be additional disruptions to services and supply chains. It is certainly possible that the US cannot withstand additional stresses on the labor market; a soft-landing might not be attainable.

We are skeptical that the US can avoid a recession.

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[27] https://www.reuters.com/business/aerospace-defense/delta-can-temporarily-cut-some-new-york-washington-flights-faa-2022-08-12/
[28] https://www.reuters.com/business/aerospace-defense/airlines-cancel-nearly-700-us-flights-labor-crunch-weighs-2022-06-27/

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 (2019-2022), 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.

   While President Biden has declared that the "pandemic is over"[29], many are questioning that statement[30,31]. The World Health Organization (WHO) states that it is having increasing difficulty identifying new variations of the coronavirus as intelligence gathering and monitoring decreases[32].

2. Disinformation Campaigns: A staple of international conflicts (both military and otherwise), organized campaigns based on disinformation or propaganda have been around for hundreds of years. Most recently, the US has made allegations against foreign governments that there has been interference in federal elections (and caused social unrest) by using freely available social networks[33]. It is expected that the same types of propaganda that was made noteworthy in 2016 will continue to be seen in future elections at all levels of government, and as part of other key events.

3. Disruptive Malware and Ransomware: Malware has been an issue for computers for decades, dating back to the initial hypothesized versions of "worms" in US universities of the 1960s and 1970s (as "thought exercises"). More recently, however, sophisticated attacks on businesses has (literally) become a business for some entities, foreign and domestic. "Ransomware" is the latest version of malware that "… [locks and encrypts] a victim's computer or device data, then demand a ransom to restore access."[34] There is currently 1 attack every 11 seconds (during 2020, according to the FBI), with an average cost of about $4M per breach globally (as of YE 2019)[35]. And, just to add an interesting twist, ransomware is now even offered as a *service* in

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[29] https://www.cnn.com/2022/09/18/politics/biden-pandemic-60-minutes/index.html

[30] https://www.politico.com/news/2022/09/19/biden-pandemic-over-covid-team-response-00057649

[31] https://www.politico.com/news/2022/09/19/anthony-fauci-we-are-not-where-we-need-to-be-00057580

[32] https://www.cnbc.com/2022/09/22/who-warns-ability-to-identify-new-covid-variants-is-diminishing-as-testing-declines-.html

[33] See https://www.nytimes.com/2020/09/01/technology/facebook-russia-disinformation-election.html

[34] See https://us.norton.com/internetsecurity-malware-ransomware-5-dos-and-donts.html

[35] See https://security.berkeley.edu/faq/ransomware/ and https://securityintelligence.com/articles/6-ransomware-trends-2020/

which a criminal may sell a *license* to a (software) ransomware variant to another criminal, who will then infect a system and demand a fee for the decryption key. As our society becomes more dependent on automated systems, disruptions to those systems will have an increasing impact on us.

State-sponsored ransomware, originating in North Korea and other countries, and is increasingly becoming a significant threat to US businesses[36,37,38].

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.[39]

Recent hearings regarding the events of January 6, 2021 have led to an increase in acts of civil unrest in the US, and to dogged defensiveness by some politicians that have "doubled down" on statements indicating their mistrust in various states' voting processes[40].

5. Unanticipated Changes in Leadership: President Biden is currently 78 years old, and it is entirely possible that a transition of leadership from him to (assumedly) Vice President Harris may be necessary before the next inauguration in 2024. It is not clear at this time what differences in policy may come to light between Mr. Biden and Ms. Harris if such a transition were to occur, or how effective Ms. Harris may be at leading domestically or internationally. It has been reported that Ms. Harris is a strong advocate of diversity[41] and wage protection[42], 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, President Biden's personal physician says that he is generally healthy[43]. It is not clear if Biden will run for President in 2024 as an octogenarian[44]; if he does not run in 2024, it is similarly unclear if Vice President Harris will run in his stead, or if another candidate will emerge, e.g., Pete Buttigieg, Gretchen Whitmer[45], or Hillary Clinton[46].

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

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[36] See, e.g., https://news.bloomberglaw.com/privacy-and-data-security/nation-backed-cyberattacks-escalate-push-to-bolster-data-shields
[37] https://www.insurancebusinessmag.com/us/news/cyber/statesponsored-hackers-exploit-vulnerability-to-hit-energy-providers-420096.aspx
[38] https://www.govtech.com/sponsored/the-increasing-concern-of-public-sector-cybersecurity-in-state-and-local-government
[39] 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/
[40] https://www.nytimes.com/2022/09/23/us/politics/election-deniers-trump-midterms.html
[41] See, e.g., https://www.huffpost.com/entry/kamala-harris-vice-president-nominee-dnc_n_5f36f56bc5b69fa9e2fb7862
[42] See, e.g., https://www.shrm.org/resourcesandtools/hr-topics/benefits/pages/where-kamala-harris-stands-on-workers-pay-and-benefits.aspx
[43] https://www.whitehouse.gov/wp-content/uploads/2021/11/President-Biden-Current-Health-Summary-November-2021.pdf
[44] See https://www.cnn.com/2022/09/25/politics/joe-biden-2024-run-democrats/index.html
[45] https://thehill.com/homenews/campaign/3658507-the-seven-democrats-most-likely-to-run-for-president-if-biden-bows-out/
[46] https://nypost.com/2022/09/25/ex-clinton-adviser-dick-morris-predicts-dems-will-dump-biden-in-favor-of-hillary-in-2024/

10-15% of all goods[47]. Notice that the Suez, the Panama Canal, the Strait of Hormuz, and the Malacca Strait are the four most noteworthy trade chokepoints. If closed, the Panama Canal would impact 5% of global trade (and 60% of US imports and exports); closing the Strait of Hormuz would affect 25% of seaborne oil and a third of global liquified natural gas; and the Malacca Strait carries 40% of all global trade (including 16M barrels of oil per day globally).[48]

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 & Nevis[49]. Ecuador, Senegal, and China have canceled or withdrawn their currencies[50].

Cryptocurrencies have become a new "hot button" topic given the recent hit that the value of various coins have taken[51]. 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. However, Ethereum (one of the most successful cryptocurrencies in use domestically) recently addressed one of its biggest issues by "switching" their mechanism for allowing integration of new transactions into their infrastructure, thereby decreasing the average power requirement for maintaining the currency to approximately 0.05% of its previous power consumption levels[52].

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.

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[47] See https://www.businessinsider.com/toilet-paper-coffee-products-delayed-suez-canal-blockage-impact-2021-3
[48] See https://www.dw.com/en/suez-canal-blockage-4-of-the-biggest-trade-chokepoints/a-57020755
[49] https://www.atlanticcouncil.org/cbdctracker/
[50] Ibid.
[51] https://www.reuters.com/markets/europe/cryptos-latest-meltdown-leaves-punters-bruised-bewildered-2022-06-21/
[52] https://ethereum.org/en/upgrades/merge/

Data Analysis

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

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

Capitalytics provides the results of a rigorous analysis of every variable that is included in our quarterly macroeconomic study. These variables include the following[53]:

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

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[53] 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, to establish the existence and level of interdependence of variables. In Appendix C of this document, we document the 169 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[54]
Real GDP Growth		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	… depends on …	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.

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[54] 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 1.6% during 1Q2022, followed by another drop by 0.6% during 2Q2022[55]. As mentioned, rising prices are the key issues facing the economy through 1H2022, and into 2H2022. There are several causes of the increasing prices, for instance:

1. Recovery of lost revenue during the COVID pandemic;
2. Increased wages demanded by workers;
3. Increased costs of raw materials; and
4. Increased prices of goods and services.

We continue to believe that the effects of significant inflation are going to continue through most of 2023. Employee retention and churn cannot help but impact sales, as personnel changes affect productivity, and relationships between businesses and customers.

Personal income rose by 1.67% during 2Q2022, and has increased by roughly 0.23% per quarter over the past year (from 0.74% to 1.67% since 3Q2021). The growth rate of disposable personal income has gone from 0.25% during 3Q2021 to 0.4% (4Q2021) to -0.32% (1Q2022) to 1.58% during 2Q2022. Finally, the growth rate for personal consumption expenditures has remained within a tight band of between 1.8% and 2.2% for the past four quarters, coming in at about 2.1% during 2Q2022. Notice that none of these figures have accounted for inflation adjustments, as all are derived based on actual dollars. [56]

As a results, while personal income is growing super-linearly, and consumption appears to be growing approximately linearly, we should see some pressure on individuals' accounts decreasing as the two lines approach each other; we expect that the difference between these two rates have been accommodated by the $2T+ savings that were built up during the COVID period (i.e., during the brief recession of 2020, and the late-2020 and early-2021 months during which income was seen to have dramatically increased). It is not a surprise that we are currently seeing a decrease in the percentage of income that is considered "disposable", given the rapidly rising costs of "core" goods. (See Figure 36.)[57]

Looking at the rate of growth of the CPI for all urban areas (i.e., the quarterly inflation rate) in Figure 37, we see that the Q/Q increase in basket prices have been ticking up consistently from 1.64% in 3Q2021 to 1.92% to 2.22% to 2.53% in 2Q2022, showing that the rate of growth has been increasing almost

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[55] https://www.bea.gov/data/gdp/gross-domestic-product
[56] See https://fred.stlouisfed.org/series/PI, https://fred.stlouisfed.org/series/DSPI, and https://fred.stlouisfed.org/series/PCE
[57] Ibid.

perfectly by +0.3% per quarter. (The annualized rate for 2Q2022 is calculated to be 8.58%.[58]) The reason for highlighting this point is to emphasize how much of the previously described growth is due to sheer price increases, and to show that, in real dollars, spending and income has actually been generally receding. As energy prices seem to be receding at the moment (merely up 25% Y/Y, having piqued at +40% Y/Y per Figure 40), we see that inflation still is driven substantially by food prices and other "core" expenses in Figure 39, Figure 40, and Figure 41.

Figure 36: Personal Income, Disposable Personal Income, and Personal Consumption Levels per Quarter

Source: Federal Reserve Economic Database (https://fred.stlouisfed.org/)
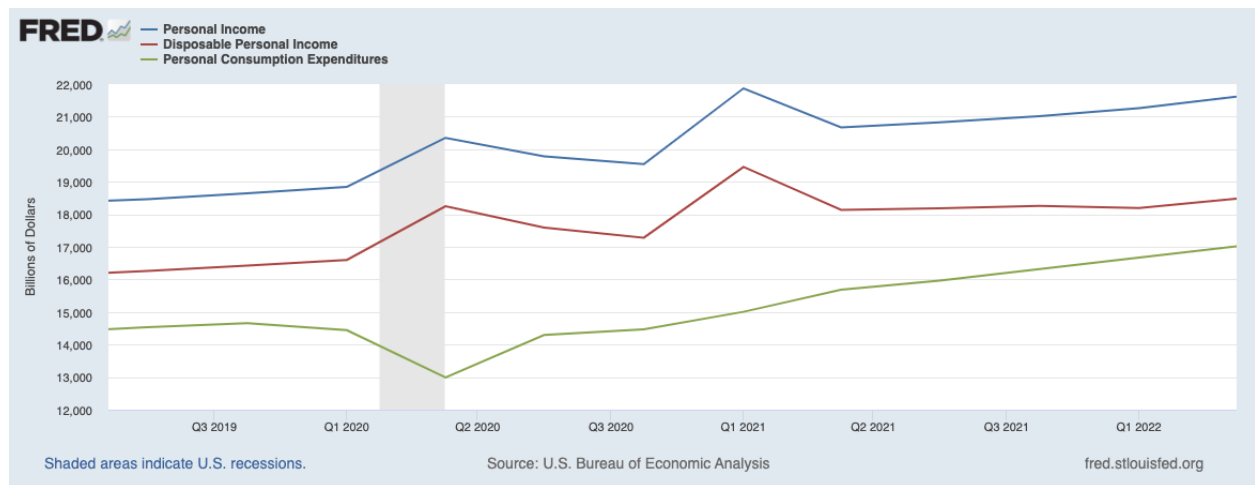
Figure 37: Average Quarterly Inflation Rate, Q/Q (blue) and Y/Y (red)

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

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[58] https://fred.stlouisfed.org/series/CPIAUCSL
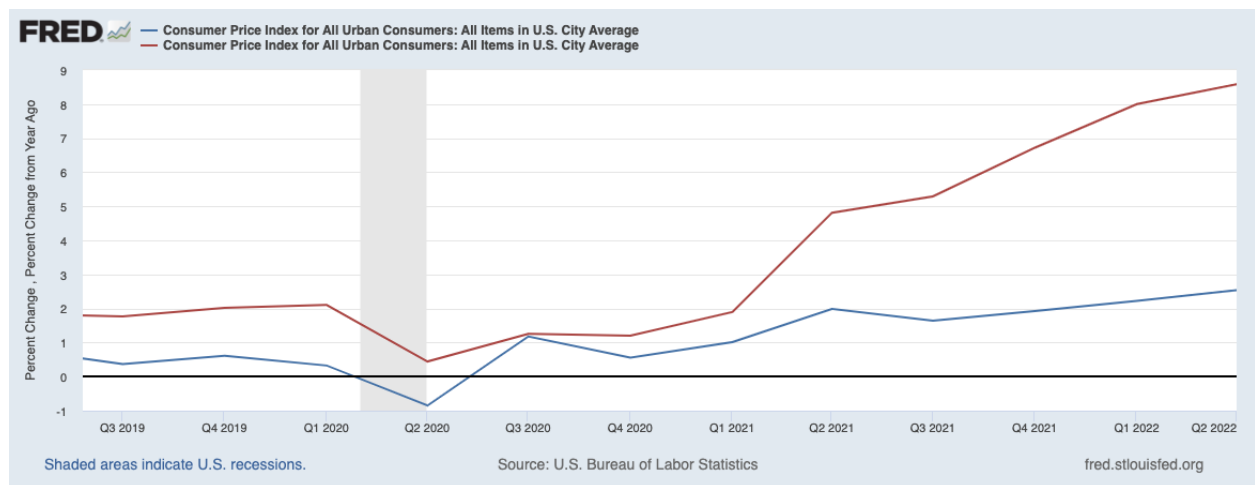
Figure 38: Real Personal Income, Real Disposable Personal Income, and Real Personal Consumption Percent Change per Quarter

Source: Federal Reserve Economic Database (https://fred.stlouisfed.org/)
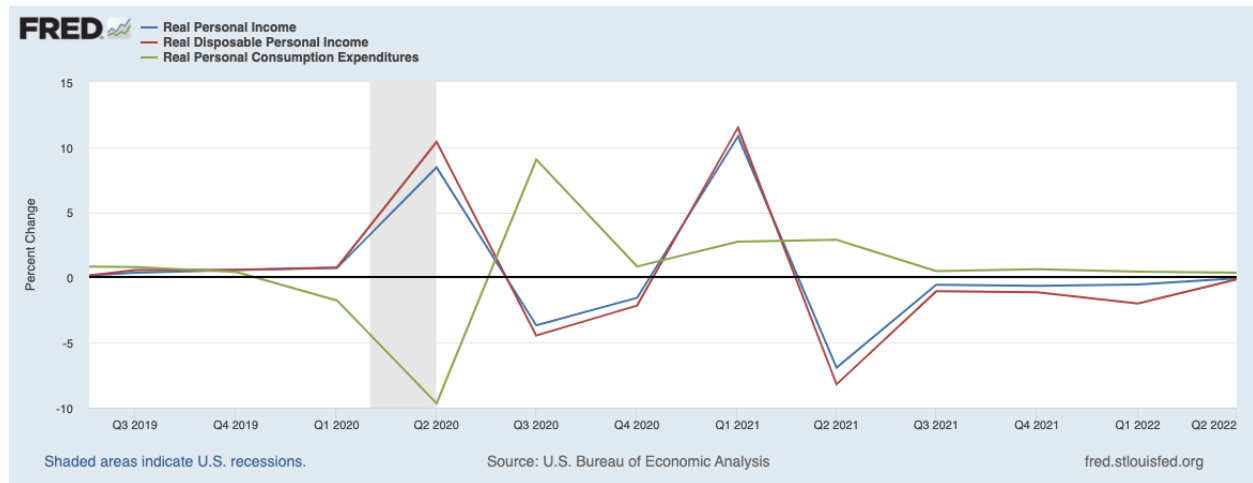
We previously stated that we "[expected] for nominal personal spending to rapidly start to drop as the 'post-COVID, pent-up demand' is either exhausted or squelched..."; while consumers *have* cut back on spending *slightly* per Figure 38, we have not yet seen the anticipated adjustment. With annual inflation for 2022 likely reaching close to 7% for the year, we are very concerned about the country's monetary position during the next 24 months. The US has experienced almost two years of "easy money" and goods that are not always easily accessible, and the FOMC is raising overnight lending rates in order to curtail demand in the aggregate.[59] Unfortunately, the best indicator of slowed spending that the FOMC can count on is unemployment, currently at its lowest rate since the 1960s; with the backlog of savings that resulted from the COVID stimulus programs of 2020 and 2021, it will likely be over a year before rates are eased.

The US' net trade deficit dropped to an average of almost $84B during 2Q2022, a decrease of almost 10% Q/Q[60]. Generally, the most significant cause of the US maintaining a consistent trade deficit is the low rate of U.S. domestic savings as compared to its investment needs (i.e., the high fraction of debt that is built for consumptive reasons rather than investment). Borrowing for consuming luxuries is less desirable than borrowing for building goods and services that can be sold abroad; the latter allows Americans to enjoy a higher rate of economic growth than would be obtained by relying only on domestic savings. A decreasing trade deficit reflects a slowing (domestic) demand for imported goods and/or increasing overseas demand for U.S.-made goods and services; in recent months, the US has seen increased exports of energy commodities, automobile, industrial, and telecom' related goods, and decreased imports of similar products, along with consumer goods[61]. Trade deficits are largest – on a recurring basis – with China, the EU, and Vietnam[62].

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[59] https://fortune.com/2022/09/23/larry-summers-inflation-economy-housing-stock-market-outlook/
[60] https://fred.stlouisfed.org/series/BOPGSTB and https://www.census.gov/foreign-trade/Press-Release/current_press_release/ft900.pdf
[61] https://www.census.gov/foreign-trade/Press-Release/current_press_release/ft900.pdf, https://www.census.gov/foreign-trade/Press-Release/ft900/ft900_2206.pdf,
[62] Ibid.

Figure 39: 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
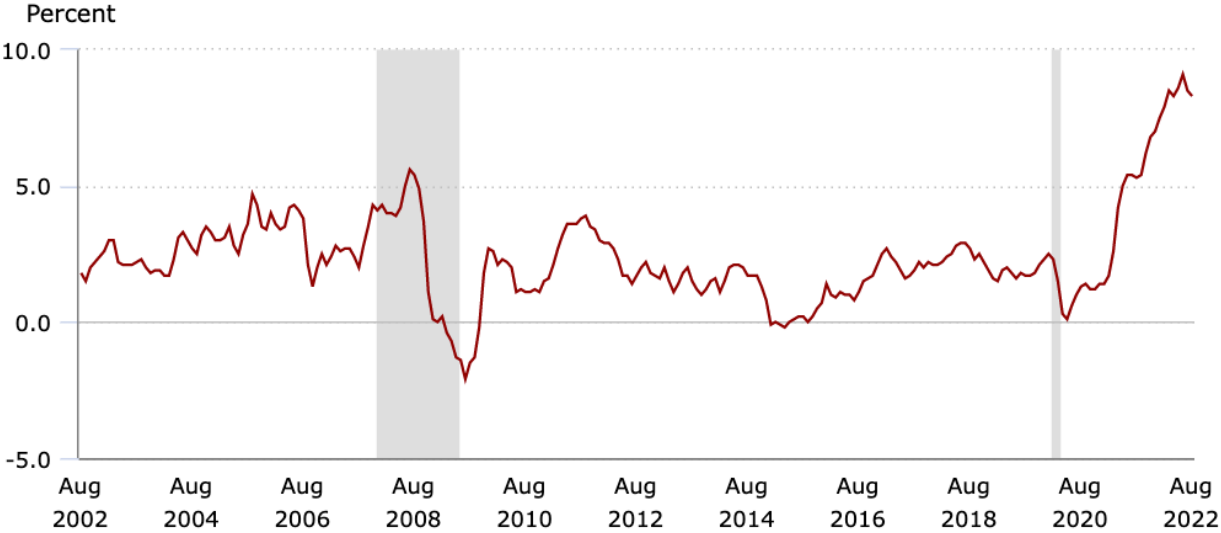
Figure 40: 12-month Percent Change in CPI (nationwide), Energy
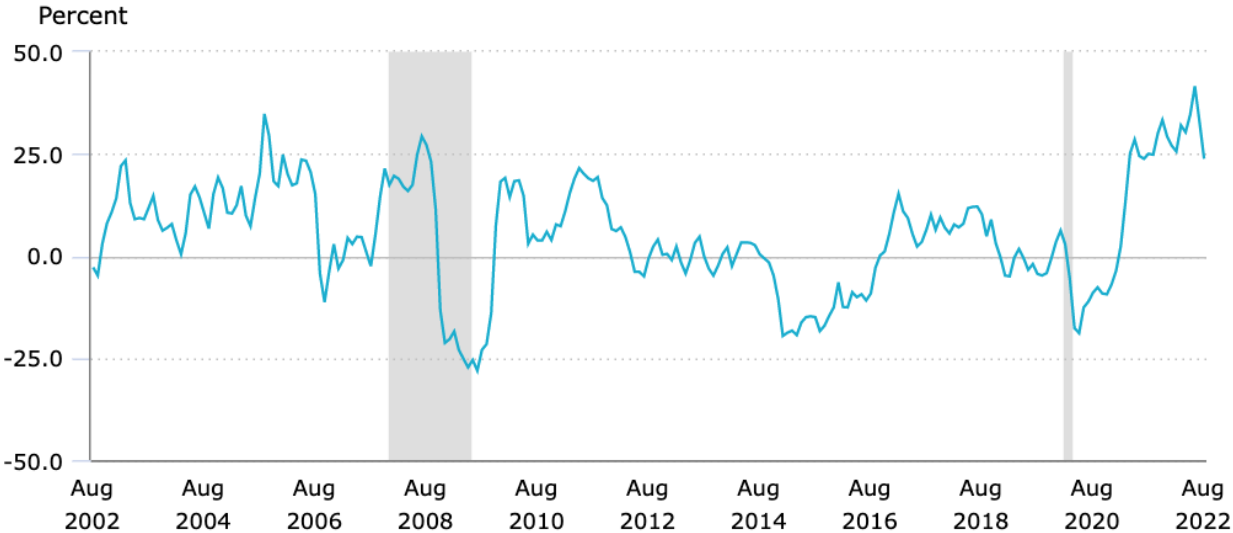
Figure 41: 12-month Percent Change in CPI (nationwide), Food at Home (black) and Food Away from Home (green)

Source: https://www.bls.gov/charts/consumer-price-index/consumer-price-index-by-category-line-chart.htm
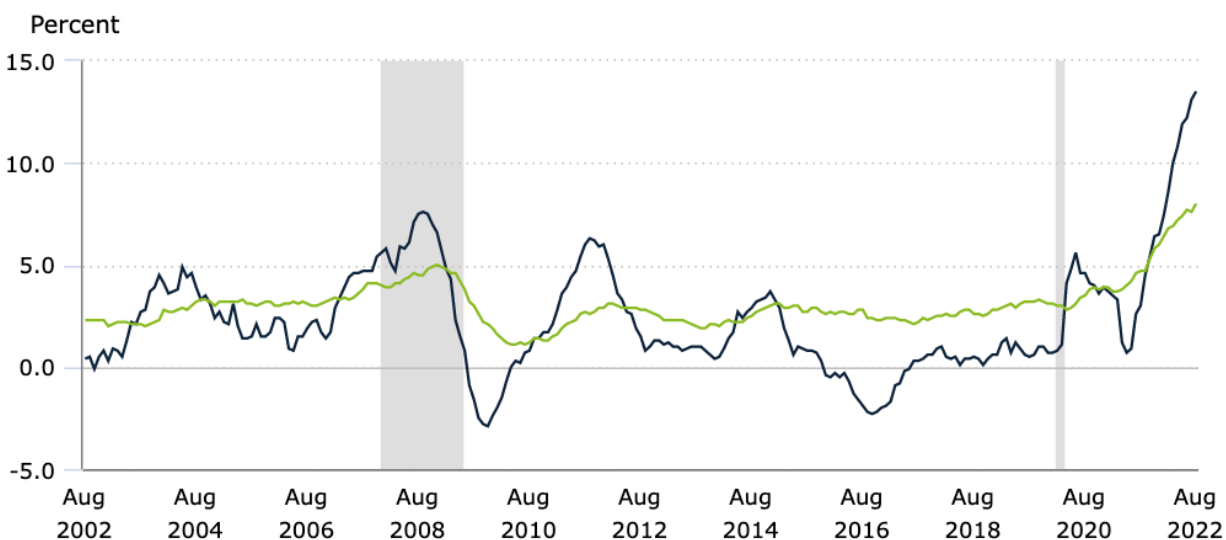
At this point, we continue to believe that ***the global economy will remain in a state of flux (at least) through 2024***. ***We expect that annualized US inflation will average at least 7% through 2022, and over 5.5% through 2023,*** and ***real GDP growth rates during 2022 & 2023 will most likely come in at no more than 0.5% (Q/Q).***

Other Commentary

- "Total exports rose 0.2% due to stronger overseas demand for U.S.-made goods, with capital goods and automotive parts leading the monthly gain. Service exports rose on stronger inbound tourism and demand for transport. After a slow rebound from the slump in the early stages of the pandemic, real goods exports are now 7% above the prepandemic peak. On the imports side, the 2.9% decrease was broad-based, as food and beverage purchases dropped considerably, along with imports of industrial supplies and consumer goods. Services imports fell as domestic demand for both business services and travel declined." (https://www.kiplinger.com/economic-forecasts/trade-deficit; Sept. 19, 2022)
- "'Today's CPI reading is a stark reminder of the long road we have until inflation is back down to earth,' said Mike Loewengart, head of model portfolio construction for Morgan Stanley's Global Investment Office. 'Wishful expectations that we are on a downward trajectory and the Fed will lay off the gas may have been a bit premature.'" (see https://www.cnbc.com/2022/09/13/inflation-rose-0point1percent-in-august-even-with-sharp-drop-in-gas-prices.html; Sept. 13, 2022)
- "The U.S. consumer and energy exports are supporting the economy right now. And consumers are being helped both by low unemployment and $2.1 trillion in extra savings built up during the pandemic. Inflation has caused a pullback in purchases of food and gasoline, though recent pump price declines have helped, and have also boosted consumer sentiment a bit. Also, initial unemployment claims have been trending upward (though slowly), and may be pointing toward a general slowing of the economy." (https://www.kiplinger.com/economic-forecasts/gdp; Aug. 25, 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 42.) Businesses that experienced a "net loss" of employees were compelled to increase compensation to attract and/or retain talent. The more lucrative compensation packages resulted in talent becoming less loyal and more willing to continuously re-evaluate their options in order to keep pace with inflation.

Now, though, we are starting to see changes from previous periods. The M/M job openings growth rate has started to drop, peaking between 7.0% and 7.3% from Dec 2021 to April 2022, and now sitting between 6.8% and 6.9% monthly growth for three months[63]. The monthly new hire rate it at its lowest point in 18 months.[64] Turnover and resignation rates are at their lowest respective rates in a year.[65] And, while it is muted in the press, many businesses seem to have received Chairman Powell's message that rate increases will continue until spending decreases.[66]

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	60.2%	164.4M	3.6%
Aug. 2022	264.2M	60.1%	165.0M	3.7%

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

Looking at Table 2, which shows employment metrics for February, May, and August of 2022, we see a continued stagnancy in the US. As has been the refrain for several months, the US adult population and labor force are growing very slightly (see Figure 44). However, while employment-to-population ratio was only growing more slowly than was expected, the metric now appears to have stalled completely at a level below that which was seen pre-pandemic (per Figure 45). ***We expect a rout of people who had exited the labor force to return by 1Q2023*** as personal savings diminish, and interest rate increases force efficiency from businesses and signal the end of the "free money" days.

Looking at geographic trends (Figure 46), we see that Memphis' unemployment rate is momentarily exceeding that of New Orleans and Houston; Memphis' industries are dominated by Healthcare, Transportation, Retail, Education, Manufacturing, and Hospitality,[67] including headquarters for Fedex, ServiceMaster, International Paper, and AutoZone. New Orleans' dominant industries are Government, Hospitality, Education, Healthcare, and Business Services, while Houston is dominated by Energy, Healthcare, Chemical Manufacturing, and other Technology-oriented spaces. Birmingham and Atlanta,

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[63] https://data.bls.gov/timeseries/JTS000000000000000JOR
[64] https://data.bls.gov/timeseries/JTS000000000000000HIR
[65] https://data.bls.gov/timeseries/JTS000000000000000TSR and https://data.bls.gov/timeseries/JTS000000000000000QUR
[66] See, e.g., https://www.businessinsider.com/layoffs-sweeping-the-us-these-are-the-companies-making-cuts-2022-5 and https://www.forbes.com/sites/brianbushard/2022/09/21/meta-and-google-reportedly-plan-staff-reductions-here-are-the-major-us-layoffs-this-year/
[67] See https://statisticalatlas.com/place/Tennessee/Memphis/Industries

which are focused on Banking, Retail, Trade, and Business Services, are at the lower end of the spectrum.

Figure 42: US Job Openings, Hires, and Turnover Rates

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

Figure 43: US Unemployment Rate per County
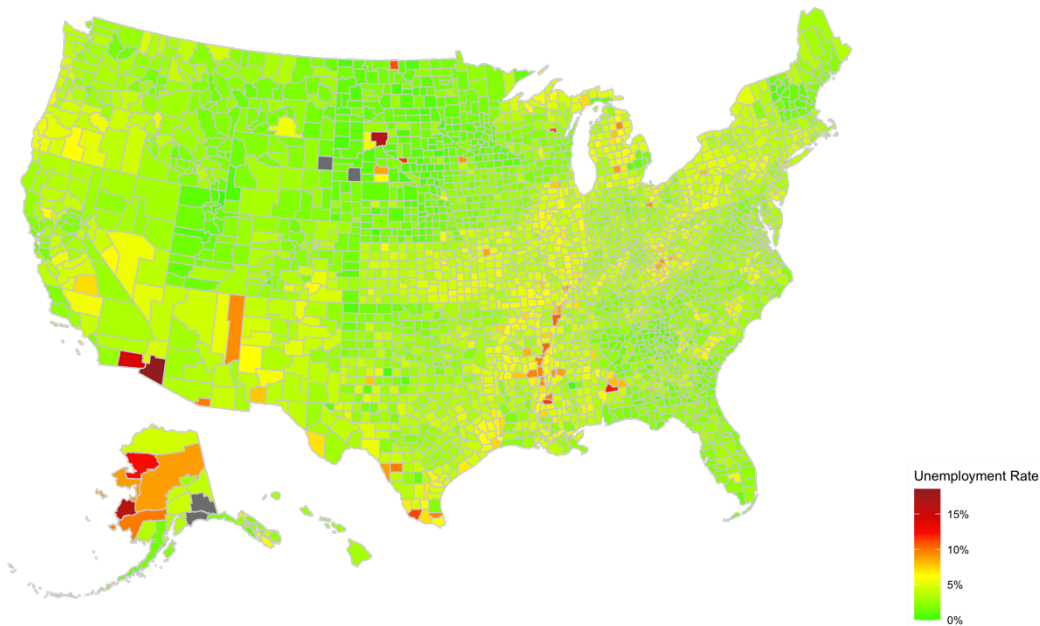
Source(s): Bureau of Labor Statistics (https://www.bls.gov)

Figure 44: US Employment and Unemployment
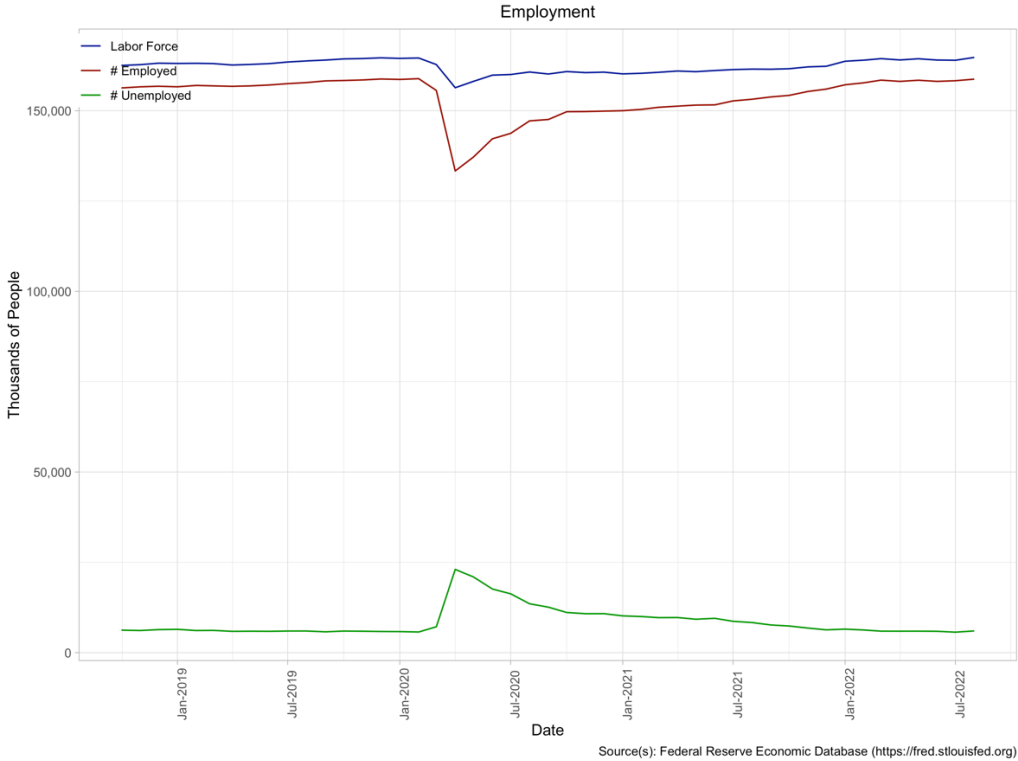
Figure 45: Employment/Population Ratio (%)
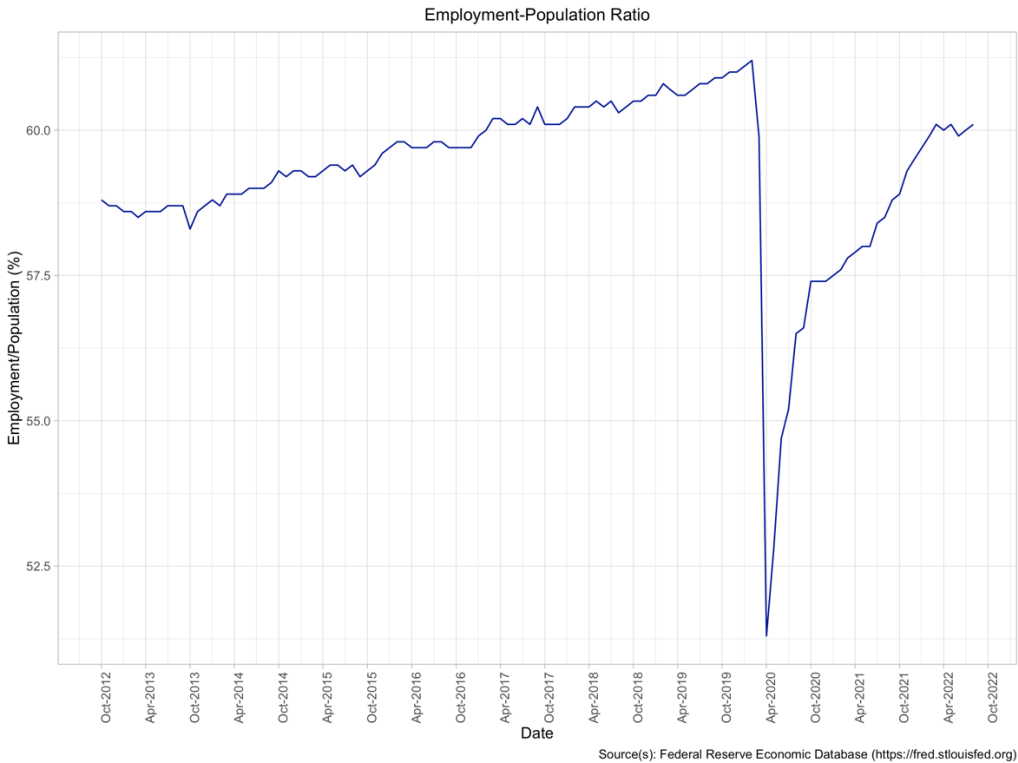
Figure 46: Unemployment Rate per US SE MSA
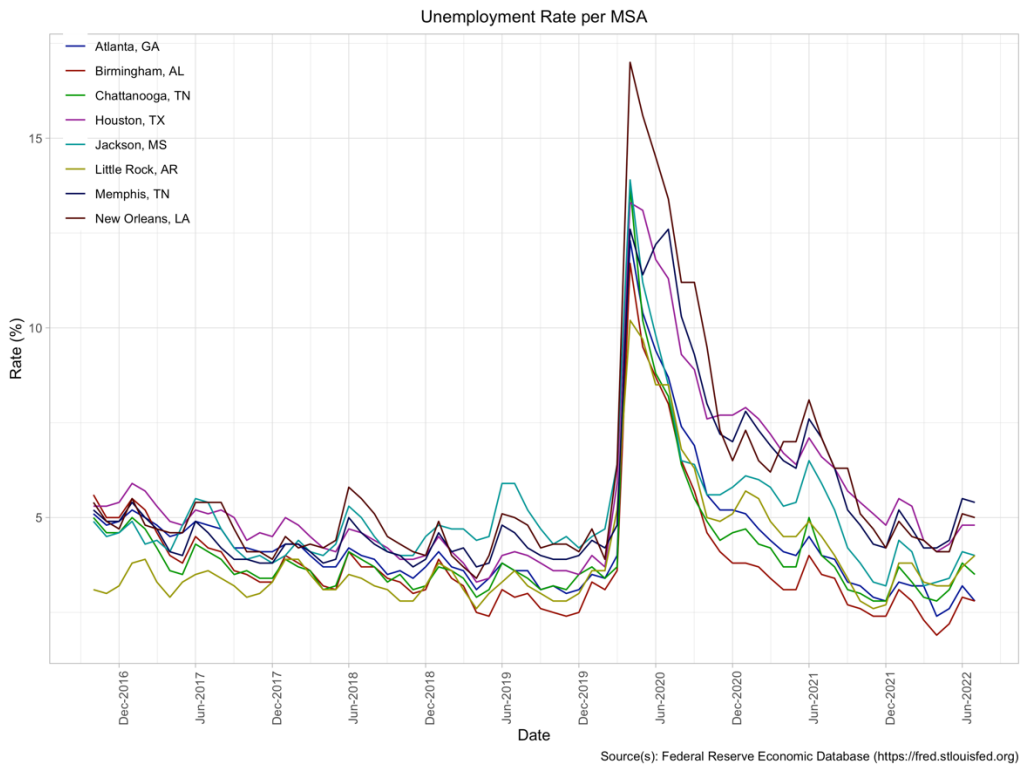
Figure 47: US Employment Level by Industry
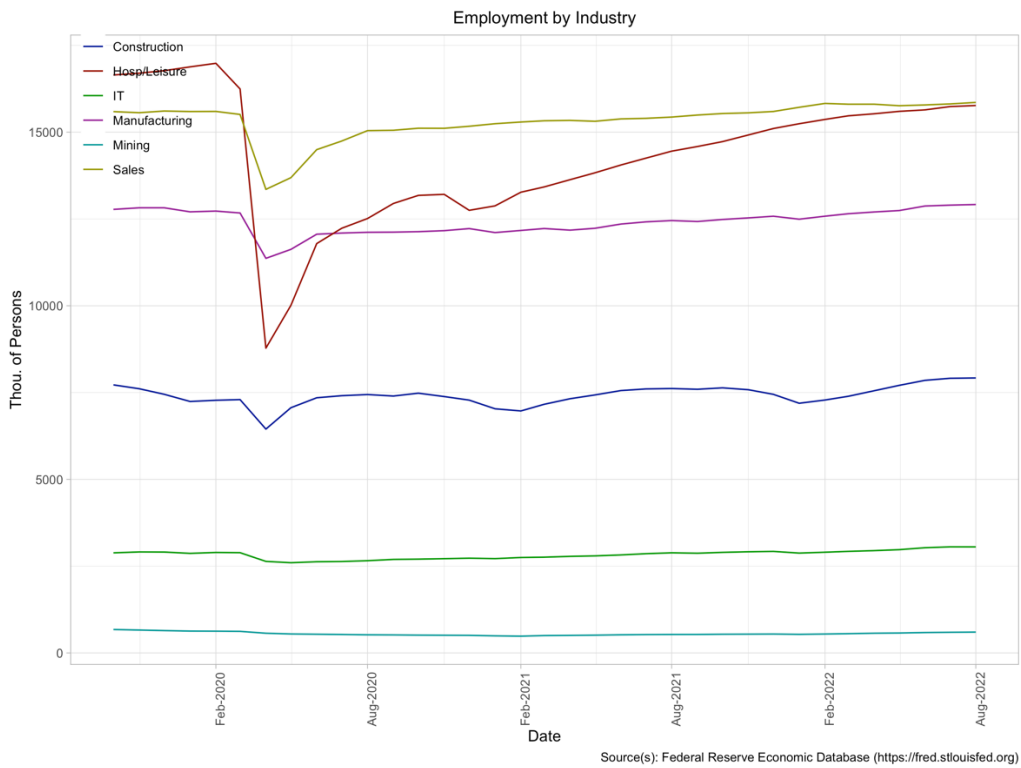
Figure 48: US Unemployment Rate by Education
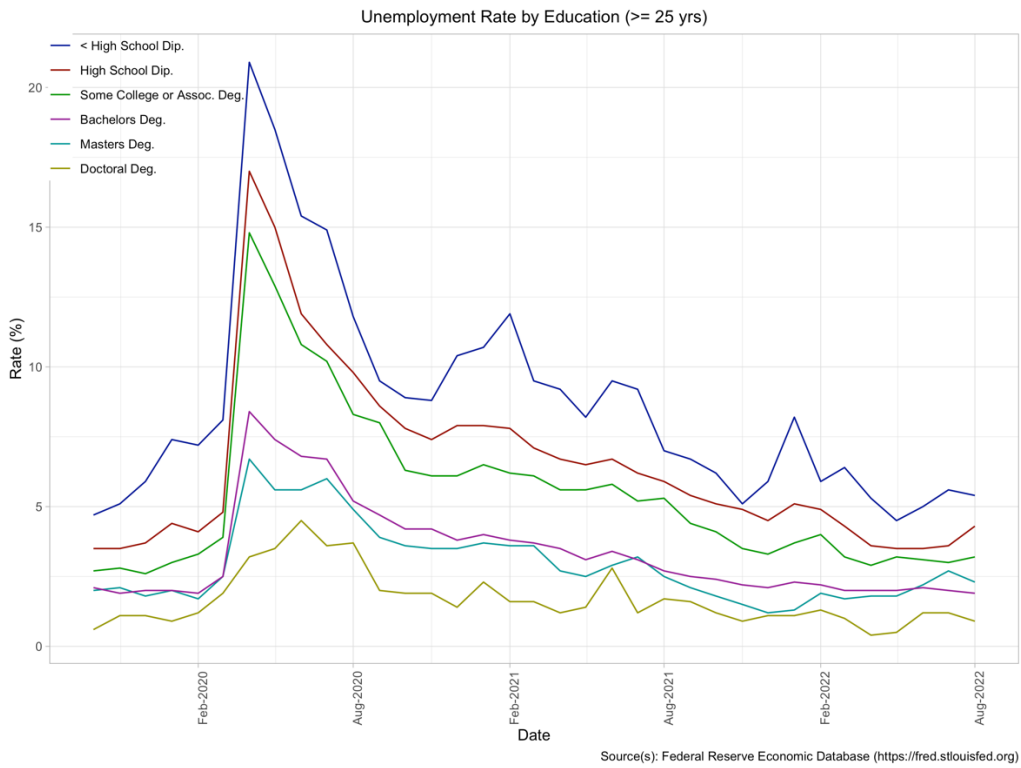
Figure 49: Hourly Wages per Industry
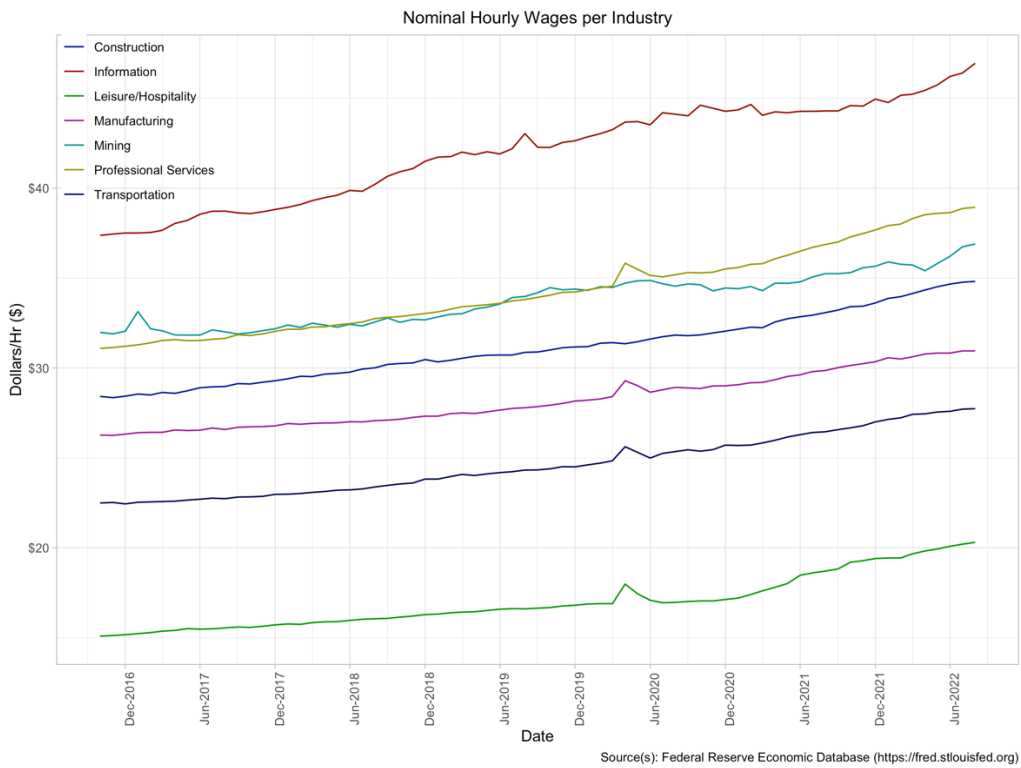
Overall, we see that the Hospitality industry has still not recovered to its pre-pandemic levels (per Figure 47), still lacking approximately 10% of its headcount from late-2019. Other spaces appear to have recovered to their employment levels as of late-2019. Unemployment rates by education level, though, all appear to be slightly higher than pre-pandemic levels (see Figure 48).[68]

Figure 50: Real Hourly Wages per Industry
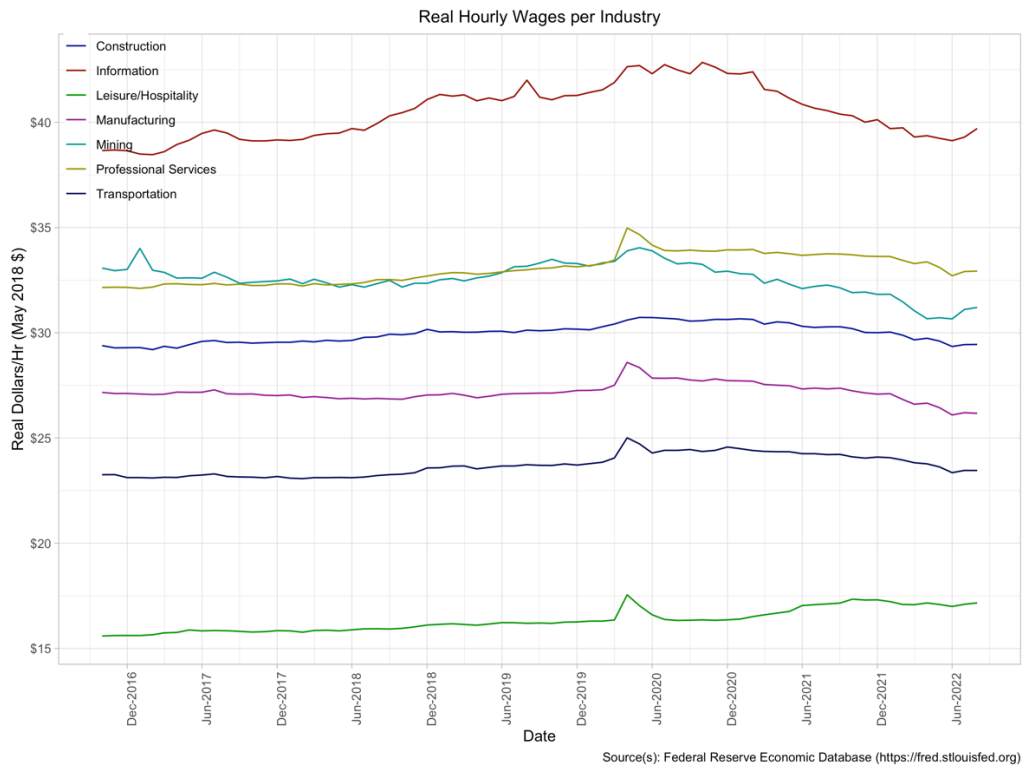
Finally, while nominal wages appear to have been dramatically increasing since YE2020, this is approximately the same time at which real wages are seen to have started decreasing, with the real decrease in wages contributing to the pressure felt by job-hoppers as they try to keep ends together (see Figure 49 and Figure 50).

Other Commentary

- "51%. That's the share of corporate executives that have implemented or plan to implement job cuts, according to a PricewaterhouseCoopers survey of 722 executives released Thursday. In addition to laying off employees, 52% of respondents said they've made hiring freezes or plan to." (https://www.forbes.com/sites/brianbushard/2022/09/21/meta-and-google-reportedly-plan-staff-reductions-here-are-the-major-us-layoffs-this-year; Sept. 21, 2022)
- "'There are going to be more layoffs. So, you need to be wary of that,' Mark Zandi, chief economist at Moody's Analytics, told CNBC. … 'The Federal Reserve is raising interest rates at this point in an effort to slow down the job market, and that's going to mean more layoffs,' Zandi said." (https://www.cnbc.com/video/2022/09/20/why-layoffs-may-be-on-the-horizon-in-the-us.html; Sept. 20, 2022)

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[68] https://abcnews.go.com/Business/fed-unemployment-rise-economists-lose-jobs/story?id=90375709

- "So far this year, more than 41,000 workers in the tech sector have been laid off, according to data compiled by Crunchbase." (Per https://www.vox.com/policy-and-politics/2022/9/12/23345276/tech-layoffs-labor-market; Sept. 12, 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, June, and September 2022, putting target overnight lending rates above 3%[69]. Per Figure 51 and Figure 52, the FOMC has recently adjusted their belief that they will need to raise rates to approach 5% by the end of 2023. ***We believe that the target overnight lending rate will rise to 5% by the end of 1H2023*** due primarily to the current level of savings stymieing the Fed's efforts slow spending (through increased unemployment)***.***

Figure 51: FOMC "Dot Plot" from June 2022 Board of Governors' Meeting

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

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[69] See https://fred.stlouisfed.org/series/DFF
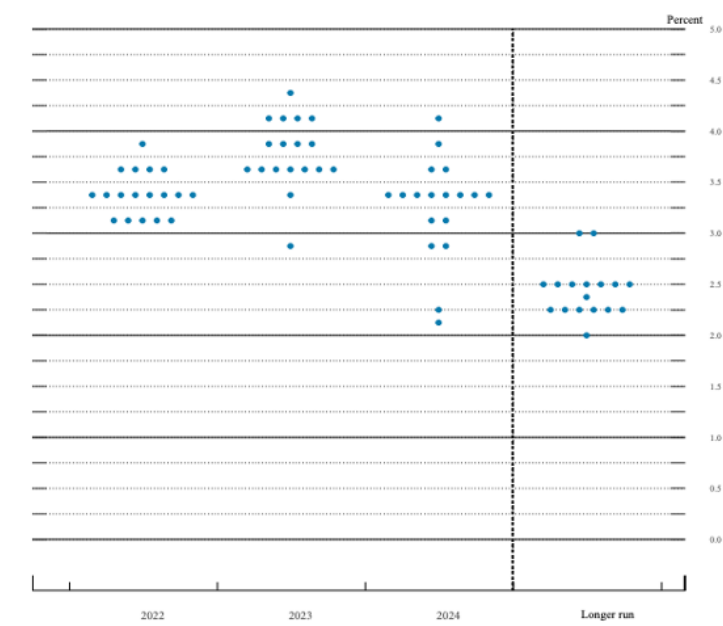
Figure 52: FOMC "Dot Plot" from September 2022 Board of Governors' Meeting

Source: https://www.federalreserve.gov/monetarypolicy/files/fomcprojtabl20220921.pdf
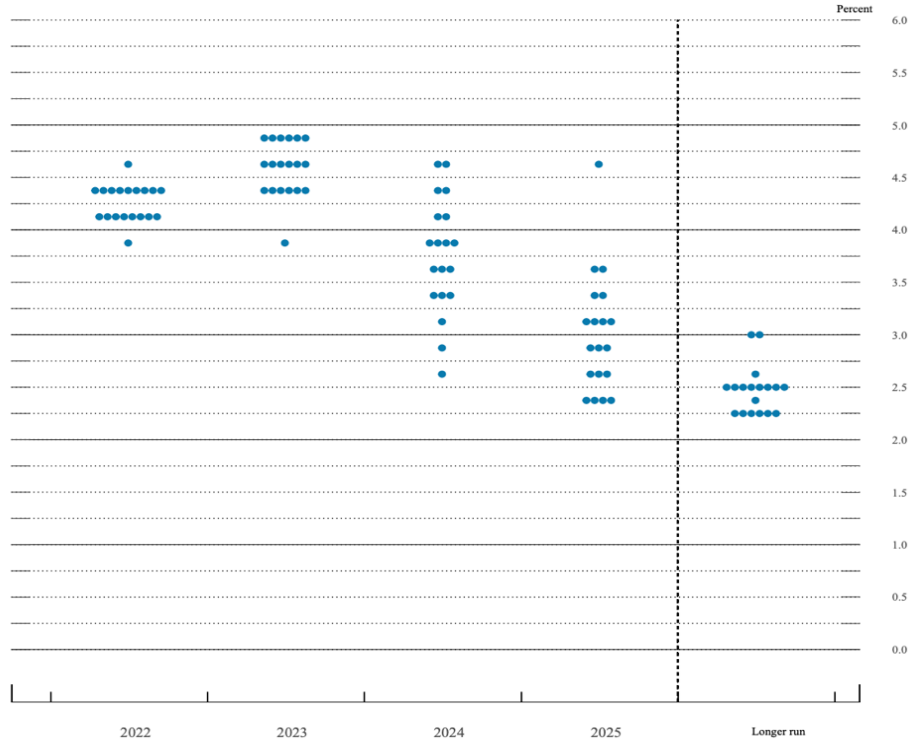
Figure 53: US Consumer Inflation Expectations
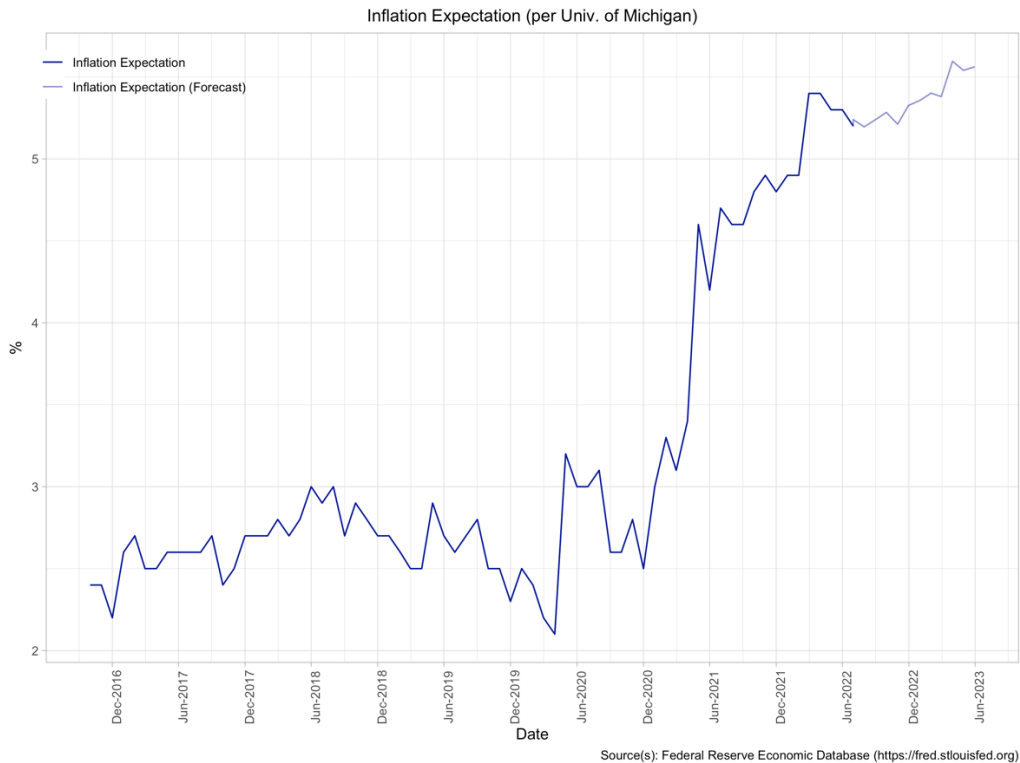
Source(s): Federal Reserve Economic Database (https://fred.stlouisfed.org)

We are holding to a belief based on a few points: First, while we are seeing slight movements from industry to curb spending, the movement is not enough to convince the FOMC that the economy is no longer running "hotter" than they desire. We previously listed and referenced several businesses that had offered plans to the market for reductions in workers, but the numbers do not appear to be large enough to move the unemployment rate by the full point (or more) that many expect to be necessary.[70]

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

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

$y = 1.0547x - 0.8293$
$R^2 = 0.9419$

Primary Credit

3 mo Treasury yield
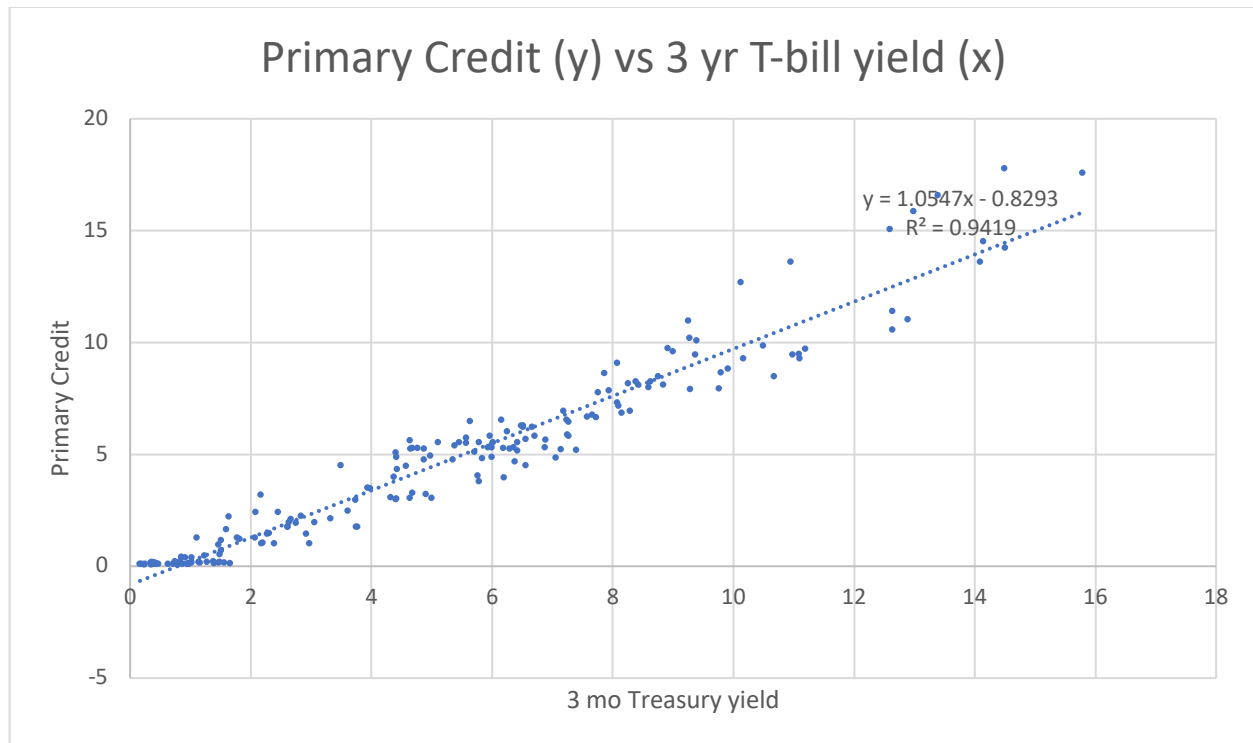
Source: Authors' calculation

Other Commentary

- " 'We need five years of unemployment above 5% to contain inflation—in other words, we need two years of 7.5% unemployment or five years of 6% unemployment or one year of 10% unemployment,' [Harvard economics professor and former Treasury secretary Larry Summers] said …" (https://finance.yahoo.com/news/larry-summers-along-inflation-ominous-193034057.html; Sept. 23, 2022)
- "Housing costs continue to rise at a strong pace, though rent increases tend to lag the broader housing market. Food prices slackened only a little. Restaurant prices maintain strong momentum. Used car prices have declined at auctions. It is hoped that this will carry over into their retail prices in the near future. But businesses are raising prices to try to stay ahead of cost increases for materials and labor. Shortages of medical personnel are likely to keep pressure on medical care costs. Expect price inflation at the end of the year to be around 8.0%, down a bit

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[70] See, e.g., https://www.reuters.com/markets/us/fed-forecasts-show-fraying-faith-soft-landing-2022-09-21/ and https://finance.yahoo.com/news/larry-summers-along-inflation-ominous-193034057.html

from the peak of 9.1% in June, but still high." (https://www.kiplinger.com/economic-forecasts/inflation; Sept. 13, 2021)

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

Analysis

Figure 54 shows how the yield curve for T-bill's has evolved over the past 18 months. 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. Rates then retreated until now, in mid-2022, we are seeing returns spiking due to the aforementioned inflation rates. As interest rates have increased over the past months, yields on T-bills have also risen, and we see points of the yield curve that are inverted; the fact that (relatively) short term yields like the 5-year T-bill yield is actually lower (for the moment) than the 3-year yield is a point of some concern.

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 54: Treasury Yield Curves based on maturity duration
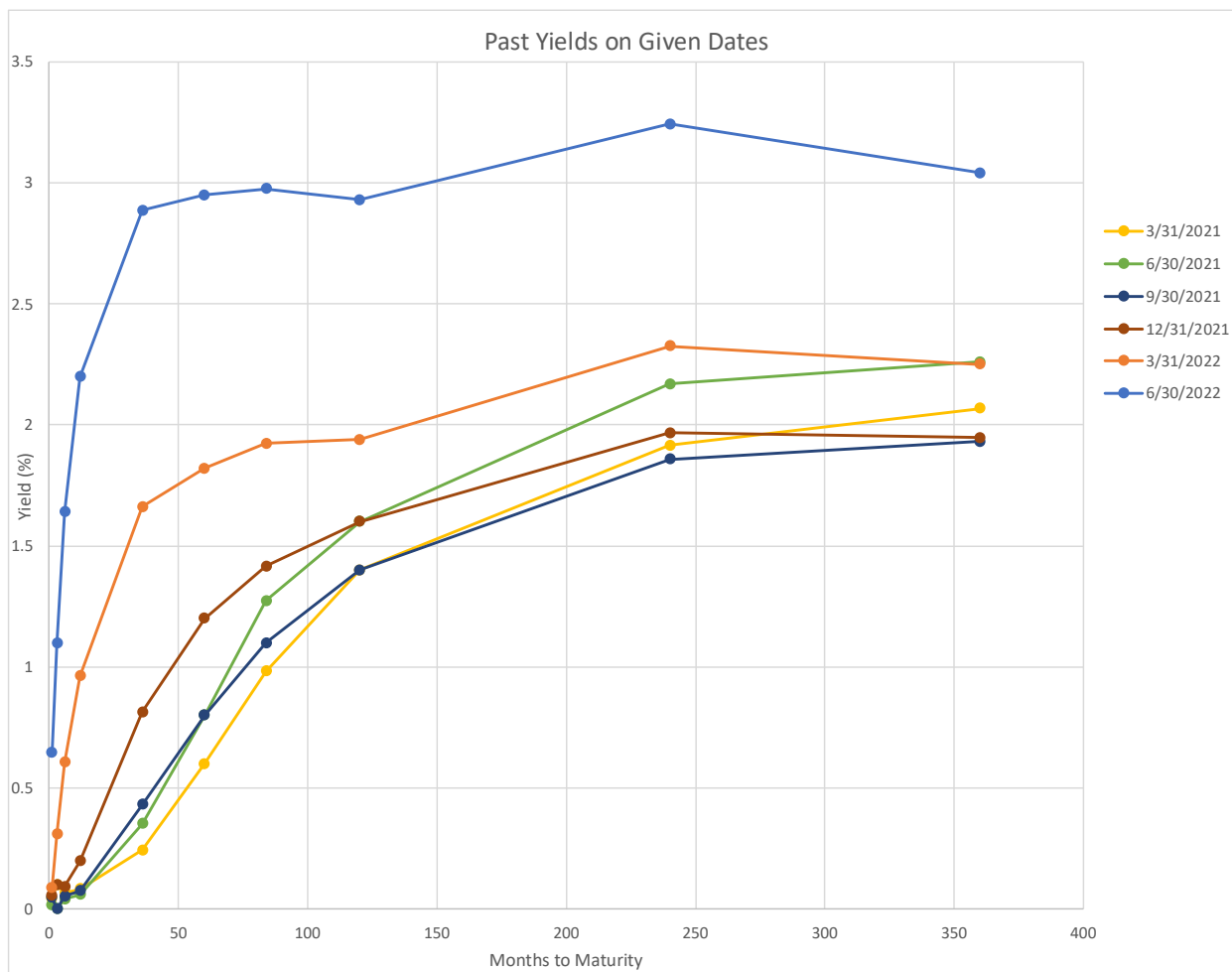
Source: US Treasury

Other Commentary

- "The United States Government Bond 10Y is expected to trade at 3.98 percent by the end of this quarter, according to Trading Economics global macro models and analysts expectations. Looking forward, we estimate it to trade at 4.46 in 12 months time." (https://tradingeconomics.com/united-states/government-bond-yield; Oct. 2, 2022)
- "The United States 10 Years Government Bond Yield is expected to be 5.076% by the end of March 2023. It would mean an increase of 123.9 bp, if compared to last quotation (3.837%, last update 2 Oct 2022 17:15 GMT+0). The expected yield, by June 2023, is 5.554% (+171.7 bp vs last quotation). A farther forecast of the yield, for December 2023, is 6.286% (+244.9 bp vs last quotation)" (http://www.worldgovernmentbonds.com/bond-forecast/united-states/10-years/; Oct. 2, 2022)
- "Expect the 10-year Treasury yield to stay around 3.5% until evidence of slowing inflation occurs. Eventually, rates should fall as indications of the economy's slowing growth become evident." (see https://www.kiplinger.com/economic-forecasts/interest-rates; Sept. 21, 2022)

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

$y = 0.9624x - 0.2254$
$R^2 = 0.9686$

Source: Authors' calculation

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

y = 0.9402x - 0.6548
R² = 0.9583

y-axis: 3 mo Treasury yield
x-axis: 3 yr Treasury yield

Source: Authors' calculation

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

y = 0.9619x - 0.5271
R² = 0.9748

y-axis: 6 mo Treasury yield
x-axis: 3 yr Treasury yield

Source: Authors' calculation

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

$y = 0.9674x + 0.5933$
$R^2 = 0.9812$

Source: Authors' calculation

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

$y = 0.9073x + 1.257$
$R^2 = 0.9558$

Source: Authors' calculation

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

$y = 0.9291x + 0.9004$
$R^2 = 0.9841$

3 yr Treasury yield

7 yr Treasury yield

Source: Authors' calculation

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

$y = 0.8876x + 1.3403$
$R^2 = 0.9612$

3 yr Treasury yield

10 yr Treasury yield

Source: Authors' calculation

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

$y = 0.8693x + 1.3274$
$R^2 = 0.9826$

30 yr Treasury yield (y-axis)

7 yr Treasury yield (x-axis)

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. As the FOMC has raised overnight lending rates, so have banks raised mortgage rates. Daily 30-year fixed mortgage rates are 6.7% as of this writing, having increased a full 1.0% since our last report.

If Chairman Powell and the FOMC is willing to increase overnight lending rates to the 5.0% mark that we have previously suggested, ***we still 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.

30 yr Mortgage Rate (y) vs 3 yr T-bill yield (x)

$y = 0.9193x + 2.8511$
$R^2 = 0.9584$

Source: Authors' calculation
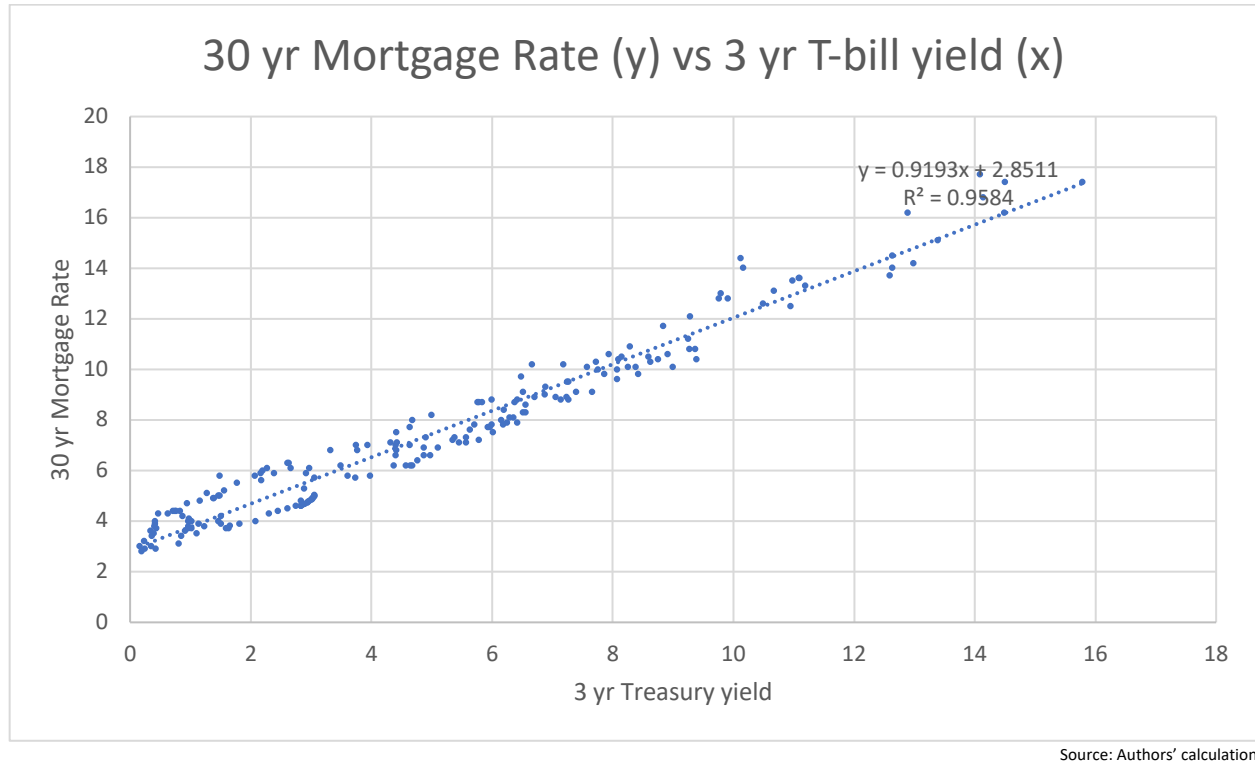
Other Commentary

- "'While rates in the 7% range were [nearly unthinkable in August], with the 10-year Treasury touching 4% this week, we can expect rates to move in the [6.5% to 8% range] through the remainder of the year,' [George Ratiu, Realtor.com's director of economic research] says." (https://www.forbes.com/advisor/mortgages/mortgage-interest-rates-forecast/; Sept. 30, 2022)

- "Economists at the MBA expect a volatile market over the next three months, with the 30-year, fixed-rate mortgage averaging 5.5% during that time. But Ruben Gonzalez, the chief economist at Keller Williams, says that rates could keep rising from here, particularly as the Federal Reserve keeps hiking the federal funds rate throughout 2022 in an attempt to control rising inflation. … 'The Federal Reserve will continue to ratchet up the federal funds rate to slow inflation, and if the Reserve's approach becomes more aggressive, we will see mortgage rates increase even further' Gonzalez said in an email. 'We expect existing home sales to finish the year down nearly 20 percent.' " (https://www.nasdaq.com/articles/mortgage-rates-hit-15-year-high-at-6.7-as-some-economists-raise-forecast; Sept. 29, 2022)

- "Mortgage rates are rising again, but should be close to a peak. 30-year fixed-rate loans are at 6.0%, and around 5.3% for 15-year fixed loans. When inflation is high, mortgage rates tend to stay higher longer, while Treasury rates tend to be more sensitive to signs of economic slowing. It is possible that mortgage rates could ease a bit later this year if the bond market thinks that progress is being made against inflation, or if the economy slows more than anticipated." (https://www.kiplinger.com/economic-forecasts/interest-rates; Sept. 21, 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. BAA yields have historically tracked with AAA yields, with approximately 25 to 35 bp additional return to compensate for the risk associated with the BAA instruments. We would not be surprised to see that spread increase if the FOMC cannot manage the current inflation levels very quickly.

Capitalytics' quantitative models see AAA yields increasing over the next several years from 4.1% in 3Q2022 to 5.0% by mid-2026. ***We anticipate that AAA & BAA debt yields will need to appreciate more quickly than that (possibly crossing 6.0% briefly by YE2023), and will then rebound to current levels by YE2025 before stabilizing, if inflation is checked with 5.0% rates***. If inflation cannot be controlled by YE2023, AAA & BAA yields will increase beyond that target to remain competitive.

Moody's BAA yield (y) vs 30 yr Mortgage Rate (x)

$y = 0.9071x + 1.2243$
$R^2 = 0.9747$
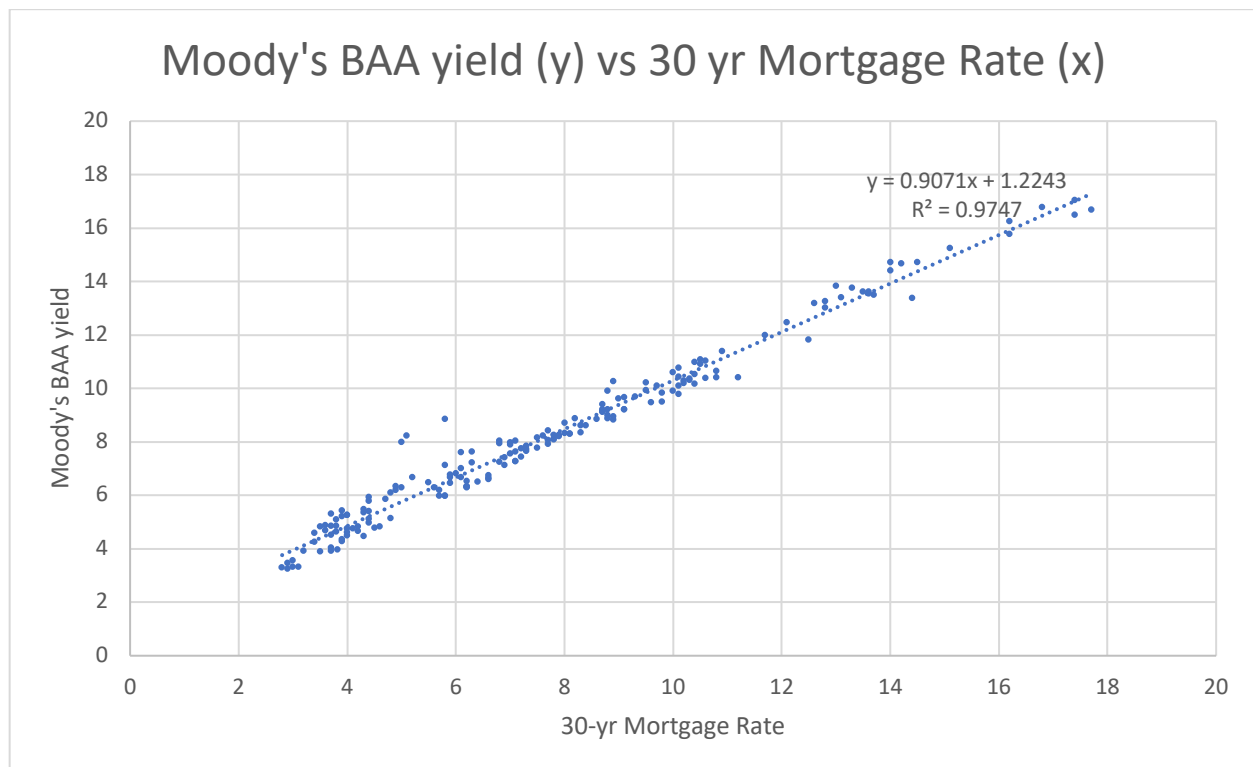
Source: Authors' calculation

Other Commentary

- "While clearly increasing from late 2021 levels, trailing 12-month high-yield default rates are still low for normal times, let alone recessions, and it could take several quarters for the defaults to start materializing in significant numbers."
(https://www.washingtonpost.com/business/corporate-bond-doomsayers-are-a-little-premature/2022/09/30/0b3d6334-40b4-11ed-8c6e-9386bd7cd826_story.html; Sept. 30, 2022)

- "Long-term rates are rising, again to levels that would have been considered normal in the past. But if the corporate bond rate goes above 5%, as implied by our baseline forecast for a 5% 10-year Treasury, holders of past corporate bonds issued at the low rates of the past 10 years will have to eventually take a loss. Exactly how depends on the accounting and regulatory environment of the investor." (https://www2.deloitte.com/us/en/insights/economy/us-economic-forecast/united-states-outlook-analysis.html; Sept. 15, 2022)
- "Move up in credit quality as corporate fundamentals should continue to deteriorate through the end of the year. We prefer investment grade corporate bonds and preferred securities for those with a more aggressive risk tolerance. With financial conditions tightening and the yield curve flattening, we suggest a more cautious approach with high-yield bonds and bank loans." (https://www.schwabassetmanagement.com/content/bond-market-update; Sept. 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 6.25%[71] with the Federal Funds Effective Rate being 3.08%. **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 YE2023**, given our previous speculation about the Federal Funds Rate.

US Average Retail Gasoline Price

Analysis

Changing gasoline prices have been the most obvious sign to consumers about the recent changes to inflation rates (see Figure 55). The US average retail gasoline price for regular unleaded gasoline is $3.75/gallon[72] per Table 1 and Figure 3, a dramatic decline from the $5+/gallon rates less than a year ago. As we discussed earlier in this paper, we anticipate that average gas prices will remain between $3.50/gallon and $3.95/gallon throughout the next quarter, which would be consistent with lower inflationary pressures.

OPEC+ recently announced a production cut of 2M+ barrels/day, a move that was perceived as helping Russia (since all of its exports have been shunned by many Western countries since the invasion of Ukraine)[73]. West Texas Intermediate crude is selling well below $90/barrel after peaking over $100/barrel early in 2022[74]. The move is also viewed as a defense to global inflation forces as the WTO announced that they expect global trade to slow substantially in 2023[75].

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[71] See https://fred.stlouisfed.org/series/DPRIME

[72] https://gasprices.aaa.com/

[73] https://www.wsj.com/articles/opec-agrees-to-biggest-oil-production-cut-since-start-of-pandemic-11664978144

[74] https://oilprice.com/

[75] https://www.wsj.com/articles/sharp-slowdown-in-global-trade-points-to-possible-recession-lower-inflation-11664964002?mod=article_inline

Figure 55: Crude Oil vs Retail Gasoline Prices
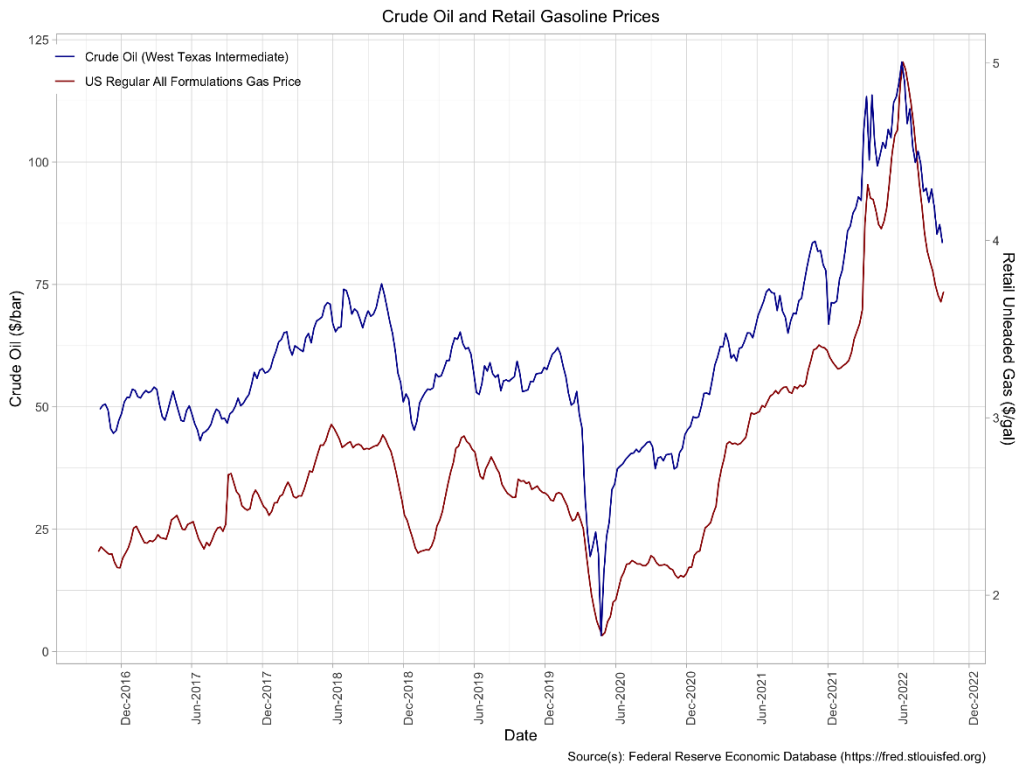
Figure 56: Regular-grade Gasoline Prices (US$/gal) by region

Source: https://www.eia.gov/petroleum/gasdiesel/
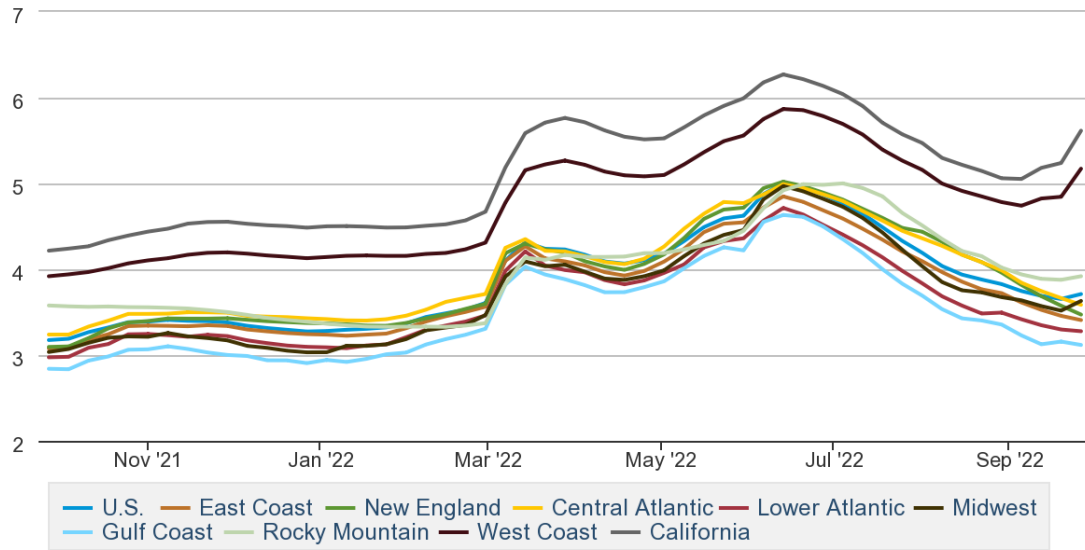
The National Oceanic and Atmospheric Administration has forecasted above average activity for the 2022 season (from June to November), implying an increased risk for impacting oil production in the Gulf of Mexico[76]. The agency is predicting between three and six major storms in the Atlantic Ocean, Caribbean, and Gulf of Mexico[77]. While Hurricane Ian was one major storm that briefly entered the Gulf of Mexico[78], we are hopeful that the impact of weather on the oil industry will be minimized for the rest of the 2022 season.

Other Commentary

- "Some 190,000 barrels per day of oil production, or 11% of the Gulf's total were shut-in, according to offshore regulator the Bureau of Safety and Environmental Enforcement (BSEE). Producers lost 184 million cubic feet of natural gas or nearly 9% of daily output." (https://www.reuters.com/business/energy/us-offshore-oil-producers-keep-eye-hurricane-ians-track-output-already-hit-2022-09-27/; Sept. 27, 2021)
- "We expect retail gasoline prices will average $3.60 per gallon (gal) in 4Q22 and $3.61/gal in 2023. Retail diesel prices in our forecast average $4.90/gal in 4Q22 and $4.28/gal in 2023." (https://www.eia.gov/outlooks/steo; Sept. 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-home. In many markets, inventory has been all but exhausted. Rates for 30-year, fixed rate mortgages, however, have already gone from 2.65% to 6.70%[79] (or higher) during 2022, and we have already projected that we expect that gap to increase further 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. With home sales and mortgage applications faltering, *we believe that housing sales will continue to slow through the fall and winter months, and purchase prices will significantly drop during the same period*. We have already started to see this behavior as home listings seem to have stalled, as they reconsider what prices the market will bear[80]. The big question now is how much different the home sales market will look when it re-emerges in Spring of 2023.

Regarding commercial real estate, holders seem to be developing a sense of the businesses that will demand workers return to the office[81], and what real estate needs will be for the next twelve to twenty-

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[76] https://www.noaa.gov/news-release/noaa-predicts-above-normal-2022-atlantic-hurricane-season

[77] https://www.usgs.gov/news/featured-story/2022-atlantic-hurricane-season-here

[78] https://www.reuters.com/business/energy/us-offshore-oil-producers-keep-eye-hurricane-ians-track-output-already-hit-2022-09-27/

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

[80] See https://www.realtor.com/research/september-2022-data/

[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.

four months (provided that a new COVID variant does not develop traction). While some projects are being converted to innovative purposes, office real estate appears to be stabilizing. Some office portfolios are contracting by as much as 25%, but landlords are "toeing-the-line" with regards to rent rates, knowing that they determine the value of assets. Amenities are being provided where they are required in order to secure long-term solid tenants[82]. As leverage shifts from workers to management (per our previous discussion), more employees are being pulled back into the office in order to take advantage of rented office space. However, the "work from home" opportunity is one that will likely benefit both the worker and the financial officer in the long term as an equilibrium point is sought.

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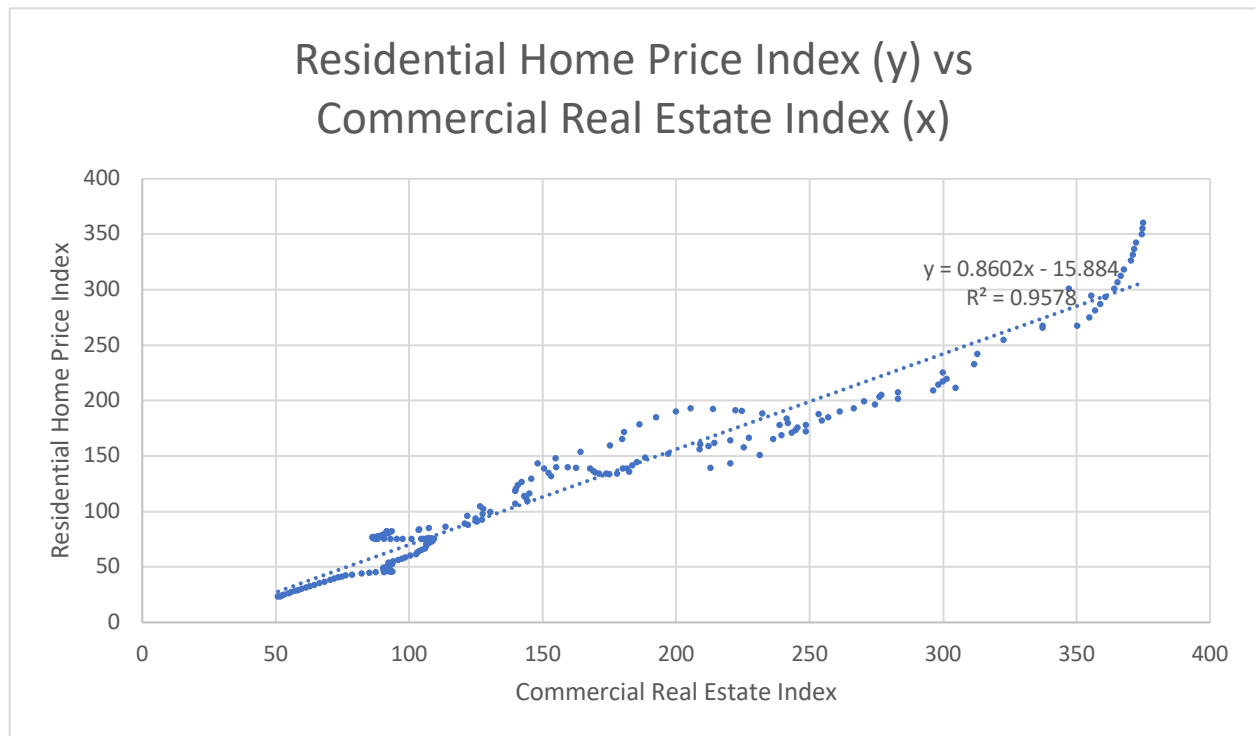
Source: Authors' calculation

Other Commentary

- Still, CBRE's survey found just last month that 58 percent of companies reported employees were working in the office less often than executives expected. That's in comparison to 39 percent that said attendance was ideal and 3 percent that said it was more than anticipated." (https://www.cbre.com/press-releases/new-survey-finds-wide-gap-between-office-attendance-levels-and-managers-expectations; Sept. 8, 2022)

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[82] See https://www.realtor.com/research/september-2022-data/ and https://www.globest.com/2022/09/19/commercial-real-estate-remains-a-critical-investment-asset-even-as-cap-rates-rise/

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, 3Q2022 has not quite been as much of a disappointment for the DWCF as 2Q, but 2022 appears to be expected to generally be rolling the clock back on gains made for the past few years.

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

Period	Index Range[83]	Trading Days	Avg points/day
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
3Q2022 (7/1/2022-9/30/2022)	37976.52→ 36097.99	64	-29.4

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 3Q2022, we have seen a decrease of another 200 points (between 5% and 6%). As the FOMC has increased interest rates over the past quarter, equities have appeared to be weakening in terms of investment interest; when government issued T-bills (even "inflation adjusted T-bills") are garnering guaranteed 2.5% to 3.5% yields, the returns of companies that are struggling to maintain their headcount are not nearly as appealing.

Table 4: Approximate Quarterly Milestones for the Standard and Poor's 500 ("SP500") Index

Period	Index Range[84]	Trading Days	Avg points/day
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
3Q2022 (7/1/2022-9/30/2022)	3785.38 → 3585.62	64	-3.12

Unfortunately, this pattern is part of the system: as overnight lending rates increase, along with bond yields, companies are undercut by investors liquidating their equity positions. This liquidation, along with increasing prices, causes companies to need to cut costs and personnel. Spending costs, on both the corporate and personal level, are the indicators sought by the FOMC to indicate that "less money will chase the (limited) goods" in the market, causing price growth (i.e., inflation) to slow. As that occurs, and the populous becomes comfortable with levels of income and a new "steady state" set of prices of goods, rates may be gradually reduced as called for.

We expect to see levels continue to decline gradually over the next several quarters until the FOMC gets control over the economy. As long as bond yields are as high as they are, and at least until the unemployment rate starts to significantly increase (current expectations are at least 4.5%), then the trading markets will likely continue to be volatile day-to-day, and present general malaise over the longer term.

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

The bigger question is how the Fed's current push for "Quantitative Tightening" will compound issues for the markets. The Fed' is still holding over $8T of equities which were purchased during 2020 & 2021, and has publicized that they plan to sell $50B to over $100B per month. As inflation hits the markets, we expect that their investment will garner a minimal return or, more likely, a notable loss on the order of 5% to 10%. Considering those losses to turn into minor devaluation of the US dollar, and given the position of many countries' currencies compared to that of the US dollar, we don't think that the impact will be notable.

The VIX has dropped from 27.4 in 2Q2022, to 24.8 as of this writing. This decrease is likely due to the American people becoming increasingly expectant of the world situation: the Russian invasion of Ukraine, its impact on grain and petroleum supplies, the US' level of inflation, etc. COVID seems to be diminishing as a factor of instability in the markets, and there isn't a perception of a significant risk of dramatic insecurity in daily life.

Other Commentary

- "The sell-off in the U.S. stock market intensified in September, completely wiping out all of the S&P 500's 2021 gains. … The S&P 500 was firmly in bear market territory at the end of September, down nearly 24% on the year, the lowest level since November 2020. … By this point, investors have become accustomed to temporary bear market rallies that are followed by even more severe losses. Nearly half of the trading days have seen the S&P 500 move higher or lower in excess of 1%, indicating a heightened level of volatility." (See https://www.forbes.com/advisor/investing/stock-market-outlook-and-forecast/; Sept. 30, 2022)
- "The 'inflation shock ain't over' and an earnings recession will likely drive stocks to new lows, strategist Michael Hartnett said in a note. Although the bank said US equity funds posted their biggest inflows in more than a month in the week to Sept. 14, stock markets have been under pressure again since Tuesday after a hotter-than-expected consumer price report fueled the S&P 500's biggest one-day drop since June 2020." (https://www.bloomberg.com/news/articles/2022-09-16/bofa-sees-new-lows-for-us-stocks-as-inflation-shock-ain-t-over; Sept. 16, 2022)

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	***	**	***
Nominal Disposable Income Growth	***	**	***
Inflation	***	***	***
Unemployment Rate	20.86%	-437.11%	752.85%
1-month Treasury Yield	***	**	***
3-month Treasury Yield	0.00%	343.61%	***
6-month Treasury Yield	1.76%	630.36%	***
1-year Treasury Yield	0.17%	513.52%	***
3-year Treasury Yield	0.57%	-50.73%	696.48%
5-year Treasury Yield	1.39%	9.87%	422.68%
7-year Treasury Yield	0.03%	16.55%	315.65%
10-year Treasury Yield	0.31%	161.23%	***
20-year Treasury Yield	0.62%	-1.55%	112.91%
30-year Treasury Yield	3.26%	-46.40%	121.74%
30-year Mortgage Rate	3.00%	-25.49%	101.48%
Moody's AAA Curve	3.01%	-30.84%	75.88%
Moody's BAA Curve	2.21%	-15.78%	51.85%
BBB Corporate Yield	2.87%	-23.40%	98.37%
Prime Rate	28.84%	-416.71%	713.41%
US Average Retail Gasoline Price	387.68%	**	***
Cost of Federal Funds	0.78%	573.51%	***
Dow Jones Total Stock Market Index	43.80%	-752.66%	***
S&P 500 Stock Price Index	66.22%	536.67%	***
Commercial Real Estate Price Index	0.06%	1.50%	111.83%
Residential Home Price Index	1.18%	3.35%	89.22%
Market Volatility Index	542.87%	***	***

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

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

REGRESSION FOR REAL GDP GROWTH

	Dependent variable (+/- SE):
	Real GDP growth
Constant	-770.533 (+/- 13.490)
	$p = 0.00002$***
US Fed Reserve O-N Loan Rate	-254.511 (+/- 5.309)
	$p = 0.00002$***
Moody's AAA Curve	-12.739 (+/- 0.708)
	$p = 0.0004$***
Nominal disposable income growth	0.204 (+/- 0.002)
	$p = 0.00001$***
Unemployment Rate	-11.530 (+/- 0.051)
	$p = 0.00000$***
CPI Inflation Rate	3.469 (+/- 0.060)
	$p = 0.00002$***
BBB corporate yield	-9.220 (+/- 0.303)
	$p = 0.0001$***
30-year Mortgate Rate	13.566 (+/- 0.379)
	$p = 0.00005$***
Prime Rate	200.674 (+/- 3.020)
	$p = 0.00001$***
Dow Total Stock Market Index	0.003 (+/- 0.0001)
	$p = 0.00002$***
Home Price Index	-1.246 (+/- 0.019)
	$p = 0.00001$***
Commercial Real Estate Price Index	0.724 (+/- 0.014)
	$p = 0.00002$***
Market Volatility Index	1.494 (+/- 0.022)
	$p = 0.00001$***
LN_Market Volatility Index	-30.973 (+/- 0.560)
	$p = 0.00002$***
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	-19.413 (+/- 0.306)
	$p = 0.00001$***
30-year Treasury Yield	-650.637 (+/- 8.175)
	$p = 0.00001$***
LN_30-year Treasury Yield	1,983.187 (+/- 27.693)
	$p = 0.00001$***

20-year Treasury Yield	320.071 (+/- 5.652)
	p = 0.00002***
LN_20-year Treasury Yield	-418.967 (+/- 11.250)
	p = 0.00005***
10-year Treasury Yield	542.674 (+/- 5.592)
	p = 0.00001***
LN_10-year Treasury Yield	-1,289.880 (+/- 12.694)
	p = 0.00001***
1-month Treasury Yield	-46.454 (+/- 2.853)
	p = 0.001***
LN_1-month Treasury Yield	36.862 (+/- 0.409)
	p = 0.00001***
7-year Treasury Yield	-562.214 (+/- 6.188)
	p = 0.00001***
LN_7-year Treasury Yield	564.838 (+/- 5.429)
	p = 0.00001***
3-month Treasury Yield	-106.484 (+/- 1.776)
	p = 0.00002***
5-year Treasury Yield	133.025 (+/- 5.188)
	p = 0.0002***
6-month Treasury Yield	311.255 (+/- 6.183)
	p = 0.00002***
LN_6-month Treasury Yield	-145.874 (+/- 2.056)
	p = 0.00001***
3-year Treasury Yield	-46.820 (+/- 3.458)
	p = 0.001***
1-year Treasury Yield	-74.989 (+/- 4.772)
	p = 0.001***
LN_1-year Treasury Yield	111.190 (+/- 2.164)
	p = 0.00002***
1-year Treasury Yield_2	-57.144 (+/- 0.970)
	p = 0.00002***
3-year Treasury Yield_2	51.162 (+/- 1.291)
	p = 0.00004***
6-month Treasury Yield_2	18.455 (+/- 1.733)
	p = 0.002***
5-year Treasury Yield_2	-16.405 (+/- 1.057)
	p = 0.001***
3-month Treasury Yield_2	10.158 (+/- 1.372)

	p = 0.006***
Observations	40
R^2	1.000
Adjusted R^2	1.000
Residual Std. Error	0.083 (df = 3)
F Statistic	9,215.786*** (df = 36; 3)

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

REGRESSION FOR NOMINAL GDP GROWTH

	Dependent variable (+/- SE):
	Nominal GDP growth
Constant	-883.228 (+/- 64.391)
	p = 0.00004***
US Fed Reserve O-N Loan Rate	-322.264 (+/- 22.329)
	p = 0.00003***
Moody's AAA Curve	-21.400 (+/- 3.605)
	p = 0.002***
Real disposable income growth	0.207 (+/- 0.014)
	p = 0.00003***
Unemployment Rate	-11.965 (+/- 0.283)
	p = 0.00000***
CPI Inflation Rate	3.981 (+/- 0.269)
	p = 0.00003***
BBB corporate yield	-11.154 (+/- 1.535)
	p = 0.001***
30-year Mortgate Rate	15.618 (+/- 1.792)
	p = 0.0004***
Prime Rate	221.049 (+/- 15.809)
	p = 0.00004***
Dow Total Stock Market Index	0.002 (+/- 0.0002)
	p = 0.0002***
Home Price Index	-1.107 (+/- 0.074)
	p = 0.00003***
Commercial Real Estate Price Index	0.894 (+/- 0.072)
	p = 0.0001***
Market Volatility Index	1.642 (+/- 0.118)
	p = 0.00004***
LN_Market Volatility Index	-36.182 (+/- 2.759)
	p = 0.00005***
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	-19.018 (+/- 1.360)
	p = 0.00004***
30-year Treasury Yield	-673.064 (+/- 39.068)
	p = 0.00002***
LN_30-year Treasury Yield	2,180.169 (+/- 126.454)
	p = 0.00002***
20-year Treasury Yield	257.688 (+/- 28.569)

	$p = 0.0003^{***}$
LN_20-year Treasury Yield	-337.063 (+/- 56.172)
	$p = 0.002^{***}$
10-year Treasury Yield	619.130 (+/- 28.972)
	$p = 0.00001^{***}$
LN_10-year Treasury Yield	-1,465.983 (+/- 64.631)
	$p = 0.00001^{***}$
LN_1-month Treasury Yield	41.257 (+/- 2.186)
	$p = 0.00001^{***}$
7-year Treasury Yield	-595.162 (+/- 33.877)
	$p = 0.00002^{***}$
LN_7-year Treasury Yield	624.081 (+/- 31.064)
	$p = 0.00001^{***}$
3-month Treasury Yield	-94.782 (+/- 8.357)
	$p = 0.0001^{***}$
5-year Treasury Yield	158.936 (+/- 20.553)
	$p = 0.001^{***}$
6-month Treasury Yield	336.338 (+/- 29.287)
	$p = 0.0001^{***}$
LN_6-month Treasury Yield	-173.115 (+/- 9.680)
	$p = 0.0001^{***}$
3-year Treasury Yield	-101.478 (+/- 14.447)
	$p = 0.00002^{***}$
1-year Treasury Yield	-100.628 (+/- 21.177)
	$p = 0.001^{***}$
LN_1-year Treasury Yield	142.749 (+/- 9.269)
	$p = 0.006^{***}$
1-year Treasury Yield_2	-61.657 (+/- 4.114)
	$p = 0.00003^{***}$
3-year Treasury Yield_2	61.771 (+/- 6.134)
	$p = 0.00003^{***}$
6-month Treasury Yield_2	26.966 (+/- 2.681)
	$p = 0.0002^{***}$
5-year Treasury Yield_2	-19.025 (+/- 4.551)
	$p = 0.009^{***}$
Observations	40
R^2	1.000
Adjusted R^2	0.997
Residual Std. Error	0.470 (df = 5)

F Statistic	389.790*** (df = 34; 5)

REGRESSION FOR REAL DISPOSABLE INCOME GROWTH

	Dependent variable (+/- SE):
	Real disposable income growth
Constant	4,174.410 (+/- 374.506)
	$p = 0.0002^{***}$
US Fed Reserve O-N Loan Rate	1,483.781 (+/- 137.719)
	$p = 0.0002^{***}$
Moody's AAA Curve	88.346 (+/- 19.325)
	$p = 0.006^{***}$
Real GDP growth	4.513 (+/- 0.362)
	$p = 0.0001^{***}$
Unemployment Rate	53.527 (+/- 3.276)
	$p = 0.00002^{***}$
CPI Inflation Rate	-18.913 (+/- 1.290)
	$p = 0.00003^{***}$
BBB corporate yield	53.834 (+/- 7.886)
	$p = 0.002^{***}$
30-year Mortgate Rate	-78.714 (+/- 9.918)
	$p = 0.001^{***}$
Prime Rate	-1,024.940 (+/- 94.010)
	$p = 0.0002^{***}$
Dow Total Stock Market Index	-0.010 (+/- 0.001)
	$p = 0.0002^{***}$
Home Price Index	4.928 (+/- 0.371)
	$p = 0.00005^{***}$
Commercial Real Estate Price Index	-3.790 (+/- 0.396)
	$p = 0.0003^{***}$
Market Volatility Index	-7.678 (+/- 0.622)
	$p = 0.0001^{***}$
LN_Market Volatility Index	167.106 (+/- 15.531)
	$p = 0.0002^{***}$
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	100.474 (+/- 7.640)
	$p = 0.00005^{***}$
30-year Treasury Yield	3,282.540 (+/- 223.940)
	$p = 0.00003^{***}$
LN_30-year Treasury Yield	-10,446.400 (+/- 695.827)
	$p = 0.00003^{***}$
20-year Treasury Yield	-1,457.579 (+/- 140.172)

	$p = 0.0002^{***}$
LN_20-year Treasury Yield	2,077.619 (+/- 271.141)
	$p = 0.001^{***}$
10-year Treasury Yield	-2,755.006 (+/- 182.944)
	$p = 0.00003^{***}$
LN_10-year Treasury Yield	6,536.776 (+/- 409.788)
	$p = 0.00002^{***}$
LN_1-month Treasury Yield	-183.776 (+/- 12.756)
	$p = 0.00003^{***}$
7-year Treasury Yield	2,767.582 (+/- 186.769)
	$p = 0.00003^{***}$
LN_7-year Treasury Yield	-2,737.924 (+/- 170.849)
	$p = 0.00002^{***}$
3-month Treasury Yield	484.665 (+/- 35.884)
	$p = 0.00004^{***}$
5-year Treasury Yield	-852.195 (+/- 117.489)
	$p = 0.001^{***}$
6-month Treasury Yield	-1,709.597 (+/- 165.472)
	$p = 0.0002^{***}$
LN_6-month Treasury Yield	789.354 (+/- 54.465)
	$p = 0.00003^{***}$
3-year Treasury Yield	415.117 (+/- 85.812)
	$p = 0.005^{***}$
1-year Treasury Yield	611.818 (+/- 118.898)
	$p = 0.004^{***}$
LN_1-year Treasury Yield	-654.725 (+/- 52.145)
	$p = 0.0001^{***}$
1-year Treasury Yield_2	273.030 (+/- 23.796)
	$p = 0.0001^{***}$
3-year Treasury Yield_2	-297.066 (+/- 34.045)
	$p = 0.0004^{***}$
6-month Treasury Yield_2	-110.101 (+/- 15.296)
	$p = 0.001^{***}$
5-year Treasury Yield_2	119.691 (+/- 24.764)
	$p = 0.005^{***}$

Observations	40
R^2	0.995
Adjusted R^2	0.962
Residual Std. Error	2.609 (df = 5)

F Statistic	29.736*** (df = 34; 5)

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

REGRESSION FOR NOMINAL DISPOSABLE INCOME GROWTH

	Dependent variable (+/- SE):
	Nominal disposable income growth
Constant	1,355.447 (+/- 205.073)
	p = 0.0001***
Moody's BAA Curve	-45.085 (+/- 8.954)
	p = 0.001***
Real GDP growth	16.411 (+/- 2.163)
	p = 0.00002***
Nominal GDP growth	-13.850 (+/- 1.928)
	p = 0.00003***
Unemployment Rate	33.801 (+/- 4.000)
	p = 0.00001***
CPI Inflation Rate	-6.641 (+/- 1.000)
	p = 0.0001***
BBB corporate yield	35.610 (+/- 9.088)
	p = 0.003***
30-year Mortgate Rate	-66.298 (+/- 12.737)
	p = 0.0004***
Prime Rate	-369.307 (+/- 54.402)
	p = 0.00005***
Dow Total Stock Market Index	-0.017 (+/- 0.002)
	p = 0.00001***
Home Price Index	4.820 (+/- 0.514)
	p = 0.00001***
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	69.943 (+/- 8.804)
	p = 0.00002***
30-year Treasury Yield	2,130.168 (+/- 278.945)
	p = 0.00002***
LN_30-year Treasury Yield	-5,251.266 (+/- 673.441)
	p = 0.00002***
20-year Treasury Yield	-2,085.200 (+/- 274.843)
	p = 0.00002***
LN_20-year Treasury Yield	3,281.029 (+/- 520.815)
	p = 0.0001***
10-year Treasury Yield	-829.311 (+/- 115.226)
	p = 0.00003***
LN_10-year Treasury Yield	2,120.742 (+/- 232.810)

	p = 0.00001***
1-month Treasury Yield	398.791 (+/- 102.983)
	p = 0.004***
LN_1-month Treasury Yield	-58.031 (+/- 9.142)
	p = 0.0001***
7-year Treasury Yield	1,454.674 (+/- 154.805)
	p = 0.00001***
LN_7-year Treasury Yield	-1,197.216 (+/- 116.068)
	p = 0.00001***
3-month Treasury Yield	585.883 (+/- 82.915)
	p = 0.00004***
6-month Treasury Yield	-514.093 (+/- 78.467)
	p = 0.0001***
LN_6-month Treasury Yield	137.267 (+/- 17.389)
	p = 0.00002***
3-year Treasury Yield	-647.558 (+/- 76.405)
	p = 0.00001***
1-year Treasury Yield_2	112.848 (+/- 15.414)
	p = 0.00003***
3-month Treasury Yield_2	-226.149 (+/- 42.915)
	p = 0.0004***
1-month Treasury Yield_2	116.056 (+/- 33.712)
	p = 0.007***
Market Volatility Index_2	-0.025 (+/- 0.003)
	p = 0.00003***
Observations	40
R^2	0.969
Adjusted R^2	0.877
Residual Std. Error	4.608 (df = 10)
F Statistic	10.631*** (df = 29; 10)

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

REGRESSION FOR CPI INFLATION RATE

	Dependent variable (+/- SE):
	CPI Inflation Rate
Constant	15.041 (+/- 2.437)
	$p = 0.00001$***
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	3.100 (+/- 0.834)
	$p = 0.001$***
30-year Treasury Yield	110.099 (+/- 18.919)
	$p = 0.00001$***
LN_30-year Treasury Yield	-265.891 (+/- 42.640)
	$p = 0.00001$***
20-year Treasury Yield	-81.597 (+/- 16.357)
	$p = 0.00004$***
LN_20-year Treasury Yield	136.832 (+/- 33.147)
	$p = 0.0004$***
10-year Treasury Yield	-37.433 (+/- 12.699)
	$p = 0.007$***
LN_10-year Treasury Yield	88.383 (+/- 19.642)
	$p = 0.0002$***
LN_1-month Treasury Yield	-2.836 (+/- 0.762)
	$p = 0.001$***
7-year Treasury Yield	31.869 (+/- 8.409)
	$p = 0.001$***
LN_7-year Treasury Yield	-39.220 (+/- 9.864)
	$p = 0.0005$***
LN_6-month Treasury Yield	12.571 (+/- 2.605)
	$p = 0.00005$***
LN_1-year Treasury Yield	-11.951 (+/- 2.433)
	$p = 0.00004$***
Observations	40
R^2	0.813
Adjusted R^2	0.730
Residual Std. Error	1.184 (df = 27)
F Statistic	9.802*** (df = 12; 27)

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

Unemployment Rate

REGRESSION FOR UNEMPLOYMENT RATE

	Dependent variable (+/- SE):
	Unemployment Rate
Constant	-2.524 (+/- 0.616)
	p = 0.0003***
Real GDP growth	-0.088 (+/- 0.009)
	p = 0.000***
LN_30-year Treasury Yield	10.140 (+/- 0.899)
	p = 0.000***
10-year Treasury Yield	3.976 (+/- 0.480)
	p = 0.000***
LN_10-year Treasury Yield	-15.261 (+/- 0.909)
	p = 0.000***
LN_6-month Treasury Yield	-0.376 (+/- 0.066)
	p = 0.00001***
Observations	40
R^2	0.955
Adjusted R^2	0.949
Residual Std. Error	0.428 (df = 34)
F Statistic	145.633*** (df = 5; 34)
Note:	*p<0.1 **p<0.05 ***p<0.01

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

REGRESSION FOR 1-MONTH TREASURY YIELD

	Dependent variable (+/- SE):
	1-month Treasury Yield
Constant	-3.916 (+/- 4.023)
	p = 0.341
Moody's AAA Curve	-4.774 (+/- 0.707)
	p = 0.00000***
Moody's BAA Curve	1.619 (+/- 0.351)
	p = 0.0002***
Nominal GDP growth	-0.043 (+/- 0.011)
	p = 0.001***
Unemployment Rate	-0.578 (+/- 0.107)
	p = 0.00002***
BBB corporate yield	-1.208 (+/- 0.295)
	p = 0.0005***
30-year Mortgate Rate	1.277 (+/- 0.333)
	p = 0.001***
Home Price Index	-0.038 (+/- 0.007)
	p = 0.00002***
Commercial Real Estate Price Index	0.028 (+/- 0.008)
	p = 0.002***
30-year Treasury Yield	4.150 (+/- 0.874)
	p = 0.0001***
10-year Treasury Yield	41.898 (+/- 9.646)
	p = 0.0003***
LN_10-year Treasury Yield	-41.028 (+/- 8.202)
	p = 0.00005***
7-year Treasury Yield	-33.025 (+/- 6.614)
	p = 0.00005***
LN_7-year Treasury Yield	26.131 (+/- 5.089)
	p = 0.00003***
7-year Treasury Yield_2	4.688 (+/- 0.877)
	p = 0.00002***
10-year Treasury Yield_2	-5.130 (+/- 1.185)
	p = 0.0003***
Observations	40

R^2	0.936
Adjusted R^2	0.896
Residual Std. Error	0.253 (df = 24)
F Statistic	23.417*** (df = 15; 24)

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

REGRESSION FOR 3-MONTH TREASURY YIELD

	Dependent variable (+/- SE):
	3-month Treasury Yield
Constant	-1.988 (+/- 1.170)
	$p = 0.098^{*}$
SP500 Stock Price Index	-0.001 (+/- 0.0004)
	$p = 0.002^{***}$
Unemployment Rate	-0.185 (+/- 0.053)
	$p = 0.002^{***}$
Commercial Real Estate Price Index	0.026 (+/- 0.007)
	$p = 0.001^{***}$
Observations	40
R^2	0.529
Adjusted R^2	0.490
Residual Std. Error	0.563 (df = 36)
F Statistic	13.470^{***} (df = 3; 36)
Note:	$^{*}p<0.1$ $^{**}p<0.05$ $^{***}p<0.01$

REGRESSION FOR 6-MONTH TREASURY YIELD

	Dependent variable (+/- SE):
	6-month Treasury Yield
Constant	-2.111 (+/- 1.168)
	$p = 0.080^*$
SP500 Stock Price Index	-0.001 (+/- 0.0004)
	$p = 0.001^{***}$
Unemployment Rate	-0.203 (+/- 0.052)
	$p = 0.0005^{***}$
Commercial Real Estate Price Index	0.028 (+/- 0.007)
	$p = 0.0004^{***}$
Observations	40
R^2	0.573
Adjusted R^2	0.538
Residual Std. Error	0.562 (df = 36)
F Statistic	16.111^{***} (df = 3; 36)

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

REGRESSION FOR 1-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	1-year Treasury Yield
Constant	-1.961 (+/- 1.162)
	p = 0.101
SP500 Stock Price Index	-0.001 (+/- 0.0004)
	p = 0.001***
Unemployment Rate	-0.222 (+/- 0.052)
	p = 0.0002***
Commercial Real Estate Price Index	0.029 (+/- 0.007)
	p = 0.0003***
Observations	40
R^2	0.601
Adjusted R^2	0.568
Residual Std. Error	0.559 (df = 36)
F Statistic	18.062*** (df = 3; 36)
Note:	*p<0.1 **p<0.05 ***p<0.01

REGRESSION FOR 3-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	3-year Treasury Yield
Constant	-3.756 (+/- 1.434)
	p = 0.013**
SP500 Stock Price Index	-0.002 (+/- 0.0004)
	p = 0.00003***
Unemployment Rate	-0.229 (+/- 0.042)
	p = 0.00001***
Commercial Real Estate Price Index	0.035 (+/- 0.007)
	p = 0.00003***
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	0.521 (+/- 0.152)
	p = 0.002***
Observations	40
R^2	0.714
Adjusted R^2	0.681
Residual Std. Error	0.444 (df = 35)
F Statistic	21.805*** (df = 4; 35)

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

REGRESSION FOR 5-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	5-year Treasury Yield
Constant	3.340 (+/- 0.253)
	$p = 0.000^{***}$
Real disposable income growth	0.116 (+/- 0.039)
	$p = 0.005^{***}$
Nominal disposable income growth	-0.109 (+/- 0.039)
	$p = 0.008^{***}$
Unemployment Rate	-0.297 (+/- 0.041)
	$p = 0.00000^{***}$
Observations	40
R^2	0.606
Adjusted R^2	0.573
Residual Std. Error	0.455 (df = 36)
F Statistic	18.471^{***} (df = 3; 36)
Note:	$^{*}p<0.1$ $^{**}p<0.05$ $^{***}p<0.01$

REGRESSION FOR 7-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	7-year Treasury Yield
Constant	3.808 (+/- 0.372)
	$p = 0.000^{***}$
SP500 Stock Price Index	-0.0002 (+/- 0.0001)
	$p = 0.010^{***}$
Unemployment Rate	-0.248 (+/- 0.041)
	$p = 0.00000^{***}$
Observations	40
R^2	0.503
Adjusted R^2	0.476
Residual Std. Error	0.466 (df = 37)
F Statistic	18.718^{***} (df = 2; 37)
Note:	$^{*}p<0.1$ $^{**}p<0.05$ $^{***}p<0.01$

REGRESSION FOR 10-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	10-year Treasury Yield
Constant	14.173 (+/- 3.887)
	p = 0.001***
Unemployment Rate	-0.245 (+/- 0.037)
	p = 0.00000***
Dow Total Stock Market Index	-0.00004 (+/- 0.00001)
	p = 0.00003***
Market Volatility Index	0.371 (+/- 0.124)
	p = 0.006***
LN_Market Volatility Index	-5.854 (+/- 2.018)
	p = 0.007***
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	0.448 (+/- 0.111)
	p = 0.0004***
Market Volatility Index_2	-0.002 (+/- 0.001)
	p = 0.004***
Observations	40
R^2	0.704
Adjusted R^2	0.651
Residual Std. Error	0.362 (df = 33)
F Statistic	13.108*** (df = 6; 33)
Note:	*p<0.1 **p<0.05 ***p<0.01

REGRESSION FOR 20-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	20-year Treasury Yield
Constant	2.736 (+/- 0.390)
	$p = 0.00000^{***}$
Unemployment Rate	-0.134 (+/- 0.031)
	$p = 0.0002^{***}$
Dow Total Stock Market Index	-0.00004 (+/- 0.00001)
	$p = 0.00001^{***}$
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	0.506 (+/- 0.096)
	$p = 0.00001^{***}$
Observations	40
R^2	0.650
Adjusted R^2	0.621
Residual Std. Error	0.357 (df = 36)
F Statistic	22.335^{***} (df = 3; 36)
Note:	$^*p<0.1$ $^{**}p<0.05$ $^{***}p<0.01$

REGRESSION FOR 30-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	30-year Treasury Yield
Constant	3.422 (+/- 0.343)
	$p = 0.000^{***}$
SP500 Stock Price Index	-0.001 (+/- 0.0001)
	$p = 0.000^{***}$
Unemployment Rate	-0.132 (+/- 0.028)
	$p = 0.00004^{***}$
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	0.457 (+/- 0.084)
	$p = 0.00001^{***}$
Observations	40
R^2	0.742
Adjusted R^2	0.720
Residual Std. Error	0.314 (df = 36)
F Statistic	34.429^{***} (df = 3; 36)
Note:	$^{*}p<0.1$ $^{**}p<0.05$ $^{***}p<0.01$

30-year Mortgage Rate

REGRESSION FOR 30-YEAR MORTGATE RATE	
	Dependent variable (+/- SE):
	30-year Mortgate Rate
Constant	-2.483 (+/- 1.046)
	p = 0.024[**]
SP500 Stock Price Index	-0.003 (+/- 0.0004)
	p = 0.00000[***]
CPI Inflation Rate	0.113 (+/- 0.033)
	p = 0.002[***]
Home Price Index	0.056 (+/- 0.009)
	p = 0.00000[***]
1-month Treasury Yield	3.088 (+/- 0.707)
	p = 0.0002[***]
LN_1-month Treasury Yield	-0.597 (+/- 0.142)
	p = 0.0003[***]
1-month Treasury Yield_2	-0.837 (+/- 0.224)
	p = 0.001[***]
Market Volatility Index_2	-0.0002 (+/- 0.0001)
	p = 0.004[***]
Observations	40
R^2	0.675
Adjusted R^2	0.604
Residual Std. Error	0.380 (df = 32)
F Statistic	9.507[***] (df = 7; 32)
Note:	*p<0.1 **p<0.05 ***p<0.01

Moody's AAA & BAA Rates

REGRESSION FOR MOODY'S AAA CURVE

	Dependent variable (+/- SE):
	Moody's AAA Curve
Constant	4.722 (+/- 0.359)
	p = 0.000***
SP500 Stock Price Index	-0.001 (+/- 0.0001)
	p = 0.000***
Unemployment Rate	-0.141 (+/- 0.029)
	p = 0.00003***
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	0.363 (+/- 0.088)
	p = 0.0003***
Observations	40
R^2	0.729
Adjusted R^2	0.706
Residual Std. Error	0.330 (df = 36)
F Statistic	32.253*** (df = 3; 36)

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

REGRESSION FOR MOODY'S BAA CURVE

	Dependent variable (+/- SE):
	Moody's BAA Curve
Constant	7.018 (+/- 0.275)
	p = 0.000***
SP500 Stock Price Index	-0.001 (+/- 0.0001)
	p = 0.000***
US Fed Reserve O-N Loan Rate	-2.412 (+/- 0.341)
	p = 0.00000***
Unemployment Rate	-0.114 (+/- 0.030)
	p = 0.001***
6-month Treasury Yield	1.640 (+/- 0.235)
	p = 0.00000***
1-month Treasury Yield_2	0.335 (+/- 0.087)
	p = 0.001***
Observations	40
R^2	0.858
Adjusted R^2	0.838
Residual Std. Error	0.253 (df = 34)
F Statistic	41.237*** (df = 5; 34)

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

BBB Corporate Yield

REGRESSION FOR BBB CORPORATE YIELD

	Dependent variable (+/- SE):
	BBB corporate yield
Constant	4.235 (+/- 0.282)
	p = 0.000***
SP500 Stock Price Index	-0.001 (+/- 0.0001)
	p = 0.00000***
US Fed Reserve O-N Loan Rate	-1.141 (+/- 0.191)
	p = 0.00001***
Real GDP growth	0.241 (+/- 0.065)
	p = 0.001***
Nominal GDP growth	-0.229 (+/- 0.064)
	p = 0.002***
Real disposable income growth	-0.173 (+/- 0.054)
	p = 0.004***
Nominal disposable income growth	0.171 (+/- 0.053)
	p = 0.003***
CPI Inflation Rate	0.080 (+/- 0.025)
	p = 0.004***
Market Volatility Index	-0.043 (+/- 0.014)
	p = 0.005***
LN_1-month Treasury Yield	-0.394 (+/- 0.066)
	p = 0.00001***
1-year Treasury Yield	2.069 (+/- 0.186)
	p = 0.000***
Market Volatility Index_2	0.001 (+/- 0.0002)
	p = 0.004***
Observations	40
R^2	0.905
Adjusted R^2	0.868
Residual Std. Error	0.258 (df = 28)
F Statistic	24.245*** (df = 11; 28)

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

Prime Rate

REGRESSION FOR PRIME RATE

	Dependent variable (+/- SE):
	Prime Rate
Constant	-17.603 (+/- 6.216)
	p = 0.008***
Moody's AAA Curve	-3.135 (+/- 0.624)
	p = 0.00002***
Nominal GDP growth	-0.043 (+/- 0.009)
	p = 0.0001***
Unemployment Rate	-0.562 (+/- 0.067)
	p = 0.000***
LN_30-year Treasury Yield	14.153 (+/- 2.975)
	p = 0.00005***
20-year Treasury Yield	36.071 (+/- 7.846)
	p = 0.0001***
LN_20-year Treasury Yield	-52.624 (+/- 9.272)
	p = 0.00001***
20-year Treasury Yield_2	-3.265 (+/- 0.849)
	p = 0.001***
Observations	40
R^2	0.737
Adjusted R^2	0.679
Residual Std. Error	0.415 (df = 32)
F Statistic	12.795*** (df = 7; 32)
Note:	*p<0.1 **p<0.05 ***p<0.01

US Average Retail Gasoline Price

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

	Dependent variable (+/- SE):
	US Avg Retail Gasoline Price ($-gal; all grades, all formulations)
Constant	-9.179 (+/- 0.186)
	p = 0.00002***
SP500 Stock Price Index	-0.003 (+/- 0.00002)
	p = 0.00001***
US Fed Reserve O-N Loan Rate	4.863 (+/- 0.074)
	p = 0.00001***
Moody's AAA Curve	-1.853 (+/- 0.040)
	p = 0.00003***
Moody's BAA Curve	0.716 (+/- 0.015)
	p = 0.00002***
Real GDP growth	-0.206 (+/- 0.002)
	p = 0.00001***
Nominal GDP growth	0.138 (+/- 0.002)
	p = 0.00001***
Real disposable income growth	-0.187 (+/- 0.002)
	p = 0.00001***
Nominal disposable income growth	0.187 (+/- 0.002)
	p = 0.00001***
Unemployment Rate	-0.436 (+/- 0.005)
	p = 0.00001***
CPI Inflation Rate	0.107 (+/- 0.001)
	p = 0.00001***
BBB corporate yield	-0.412 (+/- 0.011)
	p = 0.00004***
30-year Mortgate Rate	0.898 (+/- 0.014)
	p = 0.00001***
Prime Rate	2.850 (+/- 0.039)
	p = 0.00001***
Dow Total Stock Market Index	0.0002 (+/- 0.00000)
	p = 0.00001***
LN_Market Volatility Index	0.271 (+/- 0.006)
	p = 0.00003***
30-year Treasury Yield	-5.729 (+/- 0.142)
	p = 0.00004***

LN_30-year Treasury Yield	15.852 (+/- 0.367)
	$p = 0.00003^{***}$
LN_20-year Treasury Yield	1.626 (+/- 0.194)
	$p = 0.004^{***}$
10-year Treasury Yield	15.735 (+/- 0.108)
	$p = 0.00000^{***}$
LN_10-year Treasury Yield	-35.518 (+/- 0.240)
	$p = 0.00000^{***}$
1-month Treasury Yield	-8.609 (+/- 0.065)
	$p = 0.00000^{***}$
LN_1-month Treasury Yield	0.308 (+/- 0.006)
	$p = 0.00002^{***}$
7-year Treasury Yield	-26.240 (+/- 0.303)
	$p = 0.00001^{***}$
LN_7-year Treasury Yield	29.355 (+/- 0.246)
	$p = 0.00001^{***}$
3-month Treasury Yield	-4.877 (+/- 0.041)
	$p = 0.00001^{***}$
5-year Treasury Yield	5.306 (+/- 0.150)
	$p = 0.00005^{***}$
6-month Treasury Yield	11.948 (+/- 0.068)
	$p = 0.00000^{***}$
LN_6-month Treasury Yield	-1.760 (+/- 0.012)
	$p = 0.00000^{***}$
3-year Treasury Yield	18.305 (+/- 0.121)
	$p = 0.00000^{***}$
LN_3-year Treasury Yield	-7.202 (+/- 0.080)
	$p = 0.00001^{***}$
1-year Treasury Yield	-8.788 (+/- 0.060)
	$p = 0.00000^{***}$
6-month Treasury Yield_2	-0.378 (+/- 0.005)
	$p = 0.00001^{***}$
5-year Treasury Yield_2	-2.092 (+/- 0.038)
	$p = 0.00002^{***}$
7-year Treasury Yield_2	0.494 (+/- 0.045)
	$p = 0.002^{***}$
20-year Treasury Yield_2	0.892 (+/- 0.011)
	$p = 0.00001^{***}$
Market Volatility Index_2	0.0001 (+/- 0.00000)

	$p = 0.00002^{***}$
Observations	40
R^2	1.000
Adjusted R^2	1.000
Residual Std. Error	0.003 (df = 3)
F Statistic	41,105.610*** (df = 36; 3)

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

Cost of Federal Funds (Primary Credit Rate)

REGRESSION FOR US FED RESERVE O-N LOAN RATE

	Dependent variable (+/- SE):
	US Fed Reserve O-N Loan Rate
Constant	-1.818 (+/- 1.127)
	p = 0.116
SP500 Stock Price Index	-0.001 (+/- 0.0004)
	p = 0.001***
Unemployment Rate	-0.189 (+/- 0.051)
	p = 0.001***
Commercial Real Estate Price Index	0.026 (+/- 0.007)
	p = 0.001***
Observations	40
R^2	0.545
Adjusted R^2	0.507
Residual Std. Error	0.543 (df = 36)
F Statistic	14.346*** (df = 3; 36)

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

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

REGRESSION FOR DOW TOTAL STOCK MARKET INDEX

	Dependent variable (+/- SE):
	Dow Total Stock Market Index
Constant	-58,079.160 (+/- 16,840.580)
	$p = 0.005^{***}$
Real GDP growth	-619.466 (+/- 54.457)
	$p = 0.00000^{***}$
Real disposable income growth	-1,864.453 (+/- 158.377)
	$p = 0.00000^{***}$
Nominal disposable income growth	1,772.126 (+/- 151.138)
	$p = 0.00000^{***}$
Unemployment Rate	-1,732.183 (+/- 454.816)
	$p = 0.003^{***}$
CPI Inflation Rate	870.392 (+/- 100.864)
	$p = 0.00001^{***}$
Prime Rate	17,374.230 (+/- 4,544.532)
	$p = 0.003^{***}$
Market Volatility Index	316.712 (+/- 57.570)
	$p = 0.0002^{***}$
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	-6,672.996 (+/- 812.850)
	$p = 0.00001^{***}$
LN_20-year Treasury Yield	94,781.150 (+/- 20,458.020)
	$p = 0.001^{***}$
LN_10-year Treasury Yield	-208,110.500 (+/- 23,729.300)
	$p = 0.00001^{***}$
1-month Treasury Yield	-63,931.160 (+/- 6,702.567)
	$p = 0.00000^{***}$
LN_1-month Treasury Yield	5,679.275 (+/- 1,040.623)
	$p = 0.0002^{***}$
7-year Treasury Yield	-181,715.600 (+/- 17,212.360)
	$p = 0.00000^{***}$
LN_7-year Treasury Yield	232,816.600 (+/- 19,926.400)
	$p = 0.00000^{***}$
5-year Treasury Yield	88,892.440 (+/- 7,696.358)
	$p = 0.00000^{***}$
6-month Treasury Yield	126,583.800 (+/- 13,968.520)
	$p = 0.00001^{***}$

LN_6-month Treasury Yield	-34,632.530 (+/- 4,415.377)
	$p = 0.00001^{***}$
3-year Treasury Yield	129,620.200 (+/- 7,835.652)
	$p = 0.000^{***}$
LN_3-year Treasury Yield	-84,883.430 (+/- 5,223.808)
	$p = 0.000^{***}$
1-year Treasury Yield	-69,398.600 (+/- 9,997.113)
	$p = 0.00002^{***}$
LN_1-year Treasury Yield	19,915.030 (+/- 4,192.969)
	$p = 0.0005^{***}$
5-year Treasury Yield_2	-24,373.180 (+/- 1,249.595)
	$p = 0.000^{***}$
3-month Treasury Yield_2	-40,096.570 (+/- 4,196.456)
	$p = 0.00000^{***}$
1-month Treasury Yield_2	28,788.580 (+/- 3,280.947)
	$p = 0.00001^{***}$
10-year Treasury Yield_2	22,433.290 (+/- 2,607.010)
	$p = 0.00001^{***}$
20-year Treasury Yield_2	-3,724.019 (+/- 1,213.651)
	$p = 0.010^{***}$
Market Volatility Index_2	-4.280 (+/- 0.620)
	$p = 0.00002^{***}$
Observations	40
R^2	0.999
Adjusted R^2	0.995
Residual Std. Error	610.187 (df = 12)
F Statistic	314.334^{***} (df = 27; 12)

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

REGRESSION FOR SP500 STOCK PRICE INDEX

	Dependent variable (+/- SE):
	SP500 Stock Price Index
Constant	4,095.182 (+/- 479.696)
	p = 0.000***
Real disposable income growth	-81.496 (+/- 14.759)
	p = 0.00001***
Nominal disposable income growth	80.089 (+/- 14.957)
	p = 0.00001***
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	-254.363 (+/- 62.644)
	p = 0.0004***
LN_30-year Treasury Yield	-11,963.390 (+/- 831.027)
	p = 0.000***
LN_20-year Treasury Yield	9,499.734 (+/- 821.155)
	p = 0.000***
1-month Treasury Yield	-1,999.444 (+/- 318.878)
	p = 0.00000***
1-year Treasury Yield	4,213.612 (+/- 659.155)
	p = 0.00000***
LN_1-year Treasury Yield	-919.620 (+/- 159.275)
	p = 0.00001***
1-year Treasury Yield_2	-889.679 (+/- 152.473)
	p = 0.00001***
1-month Treasury Yield_2	541.262 (+/- 104.327)
	p = 0.00002***
Observations	40
R^2	0.979
Adjusted R^2	0.972
Residual Std. Error	146.769 (df = 29)
F Statistic	138.524*** (df = 10; 29)
Note:	*p<0.1 **p<0.05 ***p<0.01

House and Commercial Real Estate Price Indexes

REGRESSION FOR HOME PRICE INDEX

	Dependent variable (+/- SE):
	Home Price Index
Constant	-402.987 (+/- 119.429)
	p = 0.004***
Real disposable income growth	-3.218 (+/- 0.893)
	p = 0.002***
Nominal disposable income growth	3.452 (+/- 0.855)
	p = 0.001***
Unemployment Rate	-11.052 (+/- 2.479)
	p = 0.0003***
CPI Inflation Rate	2.271 (+/- 0.658)
	p = 0.003***
BBB corporate yield	-37.571 (+/- 7.127)
	p = 0.00005***
30-year Mortgate Rate	26.926 (+/- 8.162)
	p = 0.004***
7-year Treasury Yield	2,045.163 (+/- 306.032)
	p = 0.00001***
LN_7-year Treasury Yield	-1,702.655 (+/- 223.694)
	p = 0.00000***
3-month Treasury Yield	-111.193 (+/- 24.105)
	p = 0.0002***
5-year Treasury Yield	-1,634.334 (+/- 227.142)
	p = 0.00000***
LN_5-year Treasury Yield	1,268.052 (+/- 183.915)
	p = 0.00001***
3-year Treasury Yield	345.272 (+/- 67.466)
	p = 0.0001***
LN_3-year Treasury Yield	-224.000 (+/- 69.636)
	p = 0.005***
1-year Treasury Yield	142.476 (+/- 45.358)
	p = 0.006***
LN_1-year Treasury Yield	-32.771 (+/- 9.283)
	p = 0.003***
6-month Treasury Yield_2	-97.182 (+/- 28.463)
	p = 0.003***

5-year Treasury Yield_2	213.376 (+/- 43.523)
	p = 0.0001***
3-month Treasury Yield_2	83.090 (+/- 26.209)
	p = 0.006***
7-year Treasury Yield_2	-296.318 (+/- 50.817)
	p = 0.00002***
Market Volatility Index_2	0.005 (+/- 0.001)
	p = 0.002***
Observations	40
R^2	0.988
Adjusted R^2	0.976
Residual Std. Error	6.177 (df = 19)
F Statistic	78.706*** (df = 20; 19)

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

REGRESSION FOR COMMERCIAL REAL ESTATE PRICE INDEX

	Dependent variable (+/- SE):
	Commercial Real Estate Price Index
Constant	-838.738 (+/- 168.374)
	$p = 0.00004^{***}$
Real disposable income growth	-5.849 (+/- 1.388)
	$p = 0.0003^{***}$
Nominal disposable income growth	5.848 (+/- 1.403)
	$p = 0.0004^{***}$
CPI Inflation Rate	4.989 (+/- 1.093)
	$p = 0.0002^{***}$
BBB corporate yield	-35.314 (+/- 6.675)
	$p = 0.00002^{***}$
Market Volatility Index	0.799 (+/- 0.235)
	$p = 0.003^{***}$
7-year Treasury Yield	1,860.828 (+/- 215.407)
	$p = 0.000^{***}$
LN_7-year Treasury Yield	-1,589.923 (+/- 180.333)
	$p = 0.000^{***}$
5-year Treasury Yield	-483.738 (+/- 102.659)
	$p = 0.0001^{***}$
LN_5-year Treasury Yield	980.241 (+/- 149.597)
	$p = 0.00000^{***}$
LN_3-year Treasury Yield	-274.604 (+/- 44.985)
	$p = 0.00001^{***}$
1-year Treasury Yield_2	-42.646 (+/- 4.805)
	$p = 0.000^{***}$
3-year Treasury Yield_2	142.472 (+/- 14.059)
	$p = 0.000^{***}$
7-year Treasury Yield_2	-314.552 (+/- 36.604)
	$p = 0.000^{***}$
Observations	40
R^2	0.947
Adjusted R^2	0.921
Residual Std. Error	13.018 (df = 26)
F Statistic	35.943^{***} (df = 13; 26)

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

Market Volatility Index

REGRESSION FOR MARKET VOLATILITY INDEX

	Dependent variable (+/- SE):
	Market Volatility Index
Constant	-186.363 (+/- 24.087)
	$p = 0.00003^{***}$
SP500 Stock Price Index	0.166 (+/- 0.008)
	$p = 0.000^{***}$
US Fed Reserve O-N Loan Rate	-432.157 (+/- 24.970)
	$p = 0.00000^{***}$
Moody's AAA Curve	110.741 (+/- 12.849)
	$p = 0.00002^{***}$
Moody's BAA Curve	-35.581 (+/- 6.484)
	$p = 0.0004^{***}$
Real GDP growth	5.124 (+/- 0.733)
	$p = 0.0001^{***}$
Nominal GDP growth	-3.065 (+/- 0.680)
	$p = 0.002^{***}$
Real disposable income growth	9.450 (+/- 0.872)
	$p = 0.00001^{***}$
Nominal disposable income growth	-9.475 (+/- 0.854)
	$p = 0.00001^{***}$
Unemployment Rate	16.646 (+/- 2.172)
	$p = 0.00004^{***}$
CPI Inflation Rate	-2.847 (+/- 0.317)
	$p = 0.00001^{***}$
BBB corporate yield	21.819 (+/- 3.622)
	$p = 0.0002^{***}$
30-year Mortgate Rate	-39.566 (+/- 5.328)
	$p = 0.00004^{***}$
Dow Total Stock Market Index	-0.009 (+/- 0.0004)
	$p = 0.000^{***}$
US Avg Retail Gasoline Price ($-gal; all grades, all formulations)	37.065 (+/- 2.584)
	$p = 0.00000^{***}$
LN_20-year Treasury Yield	-140.546 (+/- 42.321)
	$p = 0.009^{***}$
10-year Treasury Yield	-551.167 (+/- 54.830)
	$p = 0.00001^{***}$

LN_10-year Treasury Yield	1,229.398 (+/- 115.372)
	$p = 0.00001^{***}$
1-month Treasury Yield	402.929 (+/- 24.600)
	$p = 0.00000^{***}$
7-year Treasury Yield	749.763 (+/- 76.187)
	$p = 0.00001^{***}$
LN_7-year Treasury Yield	-818.475 (+/- 123.452)
	$p = 0.0001^{***}$
3-month Treasury Yield	217.135 (+/- 16.371)
	$p = 0.00000^{***}$
5-year Treasury Yield	456.425 (+/- 47.575)
	$p = 0.00001^{***}$
LN_5-year Treasury Yield	-456.880 (+/- 80.716)
	$p = 0.0004^{***}$
6-month Treasury Yield	-241.645 (+/- 30.937)
	$p = 0.00003^{***}$
3-year Treasury Yield	-1,058.282 (+/- 76.482)
	$p = 0.00000^{***}$
LN_3-year Treasury Yield	368.493 (+/- 38.011)
	$p = 0.00001^{***}$
1-year Treasury Yield	187.403 (+/- 28.514)
	$p = 0.0002^{***}$
LN_1-year Treasury Yield	91.140 (+/- 6.242)
	$p = 0.00000^{***}$
3-year Treasury Yield_2	57.334 (+/- 5.441)
	$p = 0.00001^{***}$
20-year Treasury Yield_2	-30.997 (+/- 2.757)
	$p = 0.00001^{***}$
Observations	40
R^2	0.997
Adjusted R^2	0.987
Residual Std. Error	1.458 (df = 9)
F Statistic	98.534^{***} (df = 30; 9)

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[85]
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[86]

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

[86] 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)[87].
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)[88].
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.

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

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

	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 datasets[89].

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[89] 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/BAMLC0A4CBBBEY), with "Quarterly" frequency and "Average" aggregation method
Mortgage rate	Federal Reserve Economic Research website (https://fred.stlouisfed.org/series/MORTGAGE30US), with "Quarterly" frequency and "Average" aggregation method
Prime rate	Federal Reserve Economic Research website (https://fred.stlouisfed.org/series/MPRIME), with "Quarterly" frequency and "Average" aggregation method
Dow Jones Total Stock Market Index (end-of-qtr value)	Dow-Jones as provided by the Wall Street Journal (https://quotes.wsj.com/index/DWCF/advanced-chart)
House Price Index	https://data.nasdaq.com/data/FED/FL075035243_Q-interest-rates-and-price-indexes-owneroccupied-real-estate-corelogic-national-sa-quarterly-levels-nsa
Commercial Real Estate Price Index	https://data.nasdaq.com/data/FED/FL075035503_Q-interest-rates-and-price-indexes-commercial-real-estate-price-index-quarterly-levels-nsa
Market Volatility Index (VIX)	Federal Reserve Economic Research website (https://fred.stlouisfed.org/series/VIXCLS), with "Quarterly" frequency and "Average" aggregation method
Euro Area Real GDP Growth	Quarterly series for "European Union GDP Annual Growth Rate" per tradingeconomics.com
Euro Area Inflation	Quarterly average of monthly series for "European Union Inflation Rate" per tradingeconomics.com
Euro Area Bilateral Dollar Exchange Rate (USD/Euro)	End-of-quarter rates from the H.10 Release, Foreign Exchange Rates, Federal Reserve Board.
Developing Asia Real GDP Growth	The nominal GDP-weighted aggregate of the Real GDP growth for China, India, South Korea, Hong Kong Special Administrative Region, and Taiwan per OECD
Developing Asia Inflation	The nominal GDP-weighted aggregate of the inflation rate for China, India, South Korea, Hong Kong Special Administrative Region, and Taiwan per OECD
Developing Asia bilateral dollar exchange rate (F/USD, index)	End-of-quarter rates from the H.10 Release, Foreign Exchange Rates, Federal Reserve Board.
Japan Real GDP Growth	Quarterly average of monthly series for "Japan GDP Growth Rate" per tradingeconomics.com
Japan Inflation	Quarterly average of monthly series for "Japan Inflation Rate" per tradingeconomics.com
Japan Bilateral Dollar Exchange Rate (Yen/USD)	End-of-quarter rates from the H.10 Release, Foreign Exchange Rates, Federal Reserve Board.
UK Real GDP Growth	Quarterly average of monthly series for "United Kingdom GDP Growth Rate" per tradingeconomics.com
UK Inflation	Quarterly average of monthly series for "United Kingdom Inflation Rate" per tradingeconomics.com
UK Bilateral Dollar Exchange Rate (USD/Pound)	End-of-quarter rates from the H.10 Release, Foreign Exchange Rates, Federal Reserve Board.

While all data that is required for the Annual Stress Tests is available from at https://www.federalreserve.gov/supervisionreg/files/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's[90] "forecast" package[91]; specifically, the "ets" function (see p.39 of https://cran.r-project.org/web/packages/forecast/forecast.pdf)[92] is designed to automatically determine the best fitting representation out of the "Generic 'ETS' Methodology" (discussed later in this section), including optimal parameters thereto, given a sequence of values. In our work, we have restricted our study to only "additive" forms (i.e., we set "additive.only=TRUE" in our calls), and our optimization criteria is set to the mean of absolute residuals (i.e., "opt.crit=mae"). Therefore, calls to generate our estimates through this procedure look something like the following command, where "s" is an appropriately populated array, vector, time series, or similar object.

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

    The results of this call are shown above each dataset, including the representation type returned (as described later this section), the initial values that are used by the software, the optimal smoothing parameters estimated, and the $n+1^{st}$ forecasted value given the first n values of the metric's sequence (the "fitted" values)[93], 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

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[90] As of this writing, v.4.1.2 of the "R" language is available at https://cran.r-project.org/.

[91] As of this writing, v.8.16 of the forecast package is available at https://CRAN.R-project.org/package=forecast.

[92] 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.

[93] 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)[94].

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

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

```
> sp<-c(130.659129, 1250.520109, 998.4076848, 812.047, 799.5264066, 927.5045326,
1041.372826, … )
> sp_ts<-ts(sp,freq=4,end=c(2017,4))
> sp_ts
      Qtr1      Qtr2      Qtr3      Qtr4
2008           130.6591 1250.5201  998.4077
2009  812.0470  799.5264  927.5045 1041.3728
   …

> m<-ets(sp_ts,model='ZZZ',opt.crit=c('mae'),additive.only=TRUE)
> dsp_ts<-diff(sp_ts)
> dsp_ts
        Qtr1        Qtr2        Qtr3        Qtr4
2008                   1119.860980 -252.112424
2009 -186.360685  -12.520593  127.978126  113.868293
   …

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

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

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

   - the slope of the "best fitting" line (based on minimizing the total absolute error) using the immediately preceding 2 years of values[95];
   - 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

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

[95] 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 slopes[96].

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 ŷ given a history of values denoted as y_t. The ε_{T+1} term denotes an error term, the *residual*, which determines the value of the forecasting function.) This framework generates reliable forecasts quickly and for a wide spectrum of time series.

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

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[96] 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	-0.660926
S&P 500 Stock Price Index	Moody's BAA Curve	-0.733638
S&P 500 Stock Price Index	**Dow Jones Total Stock Market Index**	**0.986616**
S&P 500 Stock Price Index	**Residential Home Price Index**	**0.976326**
S&P 500 Stock Price Index	**Commercial Real Estate Index**	**0.958252**
S&P 500 Stock Price Index	30-year Treasury Yield	-0.619715
Cost of Federal Funds	Moody's AAA Curve	0.812149
Cost of Federal Funds	Moody's BAA Curve	0.754021
Cost of Federal Funds	BBB Corporate Yield	0.768432
Cost of Federal Funds	30-year Mortgage Rate	0.874873
Cost of Federal Funds	**Prime Rate**	**0.996609**
Cost of Federal Funds	US Average Retail Gasoline Price	-0.633855
Cost of Federal Funds	30-year Treasury Yield	0.797438
Cost of Federal Funds	20-year Treasury Yield	0.798498
Cost of Federal Funds	10-year Treasury Yield	0.859832
Cost of Federal Funds	**1-month Treasury Yield**	**0.993448**
Cost of Federal Funds	7-year Treasury Yield	0.897141
Cost of Federal Funds	**3-month Treasury Yield**	**0.996498**
Cost of Federal Funds	5-year Treasury Yield	0.92267
Cost of Federal Funds	**6-month Treasury Yield**	**0.993775**
Cost of Federal Funds	**3-year Treasury Yield**	**0.955012**
Cost of Federal Funds	**1-year Treasury Yield**	**0.986628**
Moody's AAA Curve	**Moody's BAA Curve**	**0.979243**
Moody's AAA Curve	**BBB Corporate Yield**	**0.951568**
Moody's AAA Curve	**30-year Mortgage Rate**	**0.983965**
Moody's AAA Curve	Prime Rate	0.796491
Moody's AAA Curve	Dow Jones Total Stock Market Index	-0.830036
Moody's AAA Curve	Residential Home Price Index	-0.864629
Moody's AAA Curve	Commercial Real Estate Index	-0.878043
Moody's AAA Curve	US Average Retail Gasoline Price	-0.726539
Moody's AAA Curve	**30-year Treasury Yield**	**0.985159**
Moody's AAA Curve	**20-year Treasury Yield**	**0.984232**
Moody's AAA Curve	**10-year Treasury Yield**	**0.985467**
Moody's AAA Curve	**7-year Treasury Yield**	**0.96695**
Moody's AAA Curve	3-month Treasury Yield	0.818761
Moody's AAA Curve	5-year Treasury Yield	0.947777
Moody's AAA Curve	6-month Treasury Yield	0.823258
Moody's AAA Curve	3-year Treasury Yield	0.90563
Moody's AAA Curve	1-year Treasury Yield	0.839349
Moody's BAA Curve	**BBB Corporate Yield**	**0.98668**
Moody's BAA Curve	**30-year Mortgage Rate**	**0.955986**
Moody's BAA Curve	Prime Rate	0.737366
Moody's BAA Curve	Dow Jones Total Stock Market Index	-0.851755
Moody's BAA Curve	Residential Home Price Index	-0.852709
Moody's BAA Curve	Commercial Real Estate Index	-0.85256
Moody's BAA Curve	US Average Retail Gasoline Price	-0.690183
Moody's BAA Curve	30-year Treasury Yield	0.948776
Moody's BAA Curve	20-year Treasury Yield	0.933351
Moody's BAA Curve	10-year Treasury Yield	0.948616
Moody's BAA Curve	7-year Treasury Yield	0.91871

Moody's BAA Curve	3-month Treasury Yield	0.757638
Moody's BAA Curve	5-year Treasury Yield	0.896486
Moody's BAA Curve	6-month Treasury Yield	0.763409
Moody's BAA Curve	3-year Treasury Yield	0.84884
Moody's BAA Curve	1-year Treasury Yield	0.779748
Real GDP Growth Rate	**Nominal GDP Growth Rate**	**0.977281**
Real Disposable Income Growth Rate	**Nominal Disposable Income Growth Rate**	**0.975714**
BBB Corporate Yield	30-year Mortgage Rate	0.94192
BBB Corporate Yield	Prime Rate	0.752299
BBB Corporate Yield	Dow Jones Total Stock Market Index	-0.80052
BBB Corporate Yield	Residential Home Price Index	-0.795818
BBB Corporate Yield	Commercial Real Estate Index	-0.778589
BBB Corporate Yield	US Average Retail Gasoline Price	-0.644815
BBB Corporate Yield	30-year Treasury Yield	0.908931
BBB Corporate Yield	20-year Treasury Yield	0.887724
BBB Corporate Yield	10-year Treasury Yield	0.926189
BBB Corporate Yield	7-year Treasury Yield	0.902106
BBB Corporate Yield	3-month Treasury Yield	0.770407
BBB Corporate Yield	5-year Treasury Yield	0.886853
BBB Corporate Yield	6-month Treasury Yield	0.777478
BBB Corporate Yield	3-year Treasury Yield	0.848764
BBB Corporate Yield	1-year Treasury Yield	0.791532
30-year Mortgage Rate	Prime Rate	0.859043
30-year Mortgage Rate	Dow Jones Total Stock Market Index	-0.76954
30-year Mortgage Rate	Residential Home Price Index	-0.794858
30-year Mortgage Rate	Commercial Real Estate Index	-0.81147
30-year Mortgage Rate	US Average Retail Gasoline Price	-0.72029
30-year Mortgage Rate	**30-year Treasury Yield**	**0.97463**
30-year Mortgage Rate	**20-year Treasury Yield**	**0.979877**
30-year Mortgage Rate	**10-year Treasury Yield**	**0.993011**
30-year Mortgage Rate	1-month Treasury Yield	0.675458
30-year Mortgage Rate	**7-year Treasury Yield**	**0.988764**
30-year Mortgage Rate	3-month Treasury Yield	0.883119
30-year Mortgage Rate	**5-year Treasury Yield**	**0.980963**
30-year Mortgage Rate	6-month Treasury Yield	0.889206
30-year Mortgage Rate	**3-year Treasury Yield**	**0.954806**
30-year Mortgage Rate	1-year Treasury Yield	0.904098
Prime Rate	US Average Retail Gasoline Price	-0.626012
Prime Rate	30-year Treasury Yield	0.777742
Prime Rate	20-year Treasury Yield	0.791056
Prime Rate	10-year Treasury Yield	0.844218
Prime Rate	**1-month Treasury Yield**	**0.991067**
Prime Rate	7-year Treasury Yield	0.882861
Prime Rate	**3-month Treasury Yield**	**0.992252**
Prime Rate	5-year Treasury Yield	0.909948
Prime Rate	**6-month Treasury Yield**	**0.989706**
Prime Rate	3-year Treasury Yield	0.94567
Prime Rate	**1-year Treasury Yield**	**0.981913**
Dow Jones Total Stock Market Index	Residential Home Price Index	0.895624
Dow Jones Total Stock Market Index	Commercial Real Estate Index	0.91506
Dow Jones Total Stock Market Index	30-year Treasury Yield	-0.826954
Dow Jones Total Stock Market Index	20-year Treasury Yield	-0.781945
Dow Jones Total Stock Market Index	10-year Treasury Yield	-0.777857
Dow Jones Total Stock Market Index	7-year Treasury Yield	-0.725807
Dow Jones Total Stock Market Index	5-year Treasury Yield	-0.688365
Dow Jones Total Stock Market Index	3-year Treasury Yield	-0.626907
Residential Home Price Index	**Commercial Real Estate Index**	**0.968405**
Residential Home Price Index	US Average Retail Gasoline Price	0.671364
Residential Home Price Index	30-year Treasury Yield	-0.854824
Residential Home Price Index	20-year Treasury Yield	-0.802481
Residential Home Price Index	10-year Treasury Yield	-0.810581
Residential Home Price Index	7-year Treasury Yield	-0.772469
Residential Home Price Index	5-year Treasury Yield	-0.738558

Residential Home Price Index	3-year Treasury Yield	-0.681713
Residential Home Price Index	1-year Treasury Yield	-0.610353
Commercial Real Estate Index	US Average Retail Gasoline Price	0.687961
Commercial Real Estate Index	30-year Treasury Yield	-0.88299
Commercial Real Estate Index	20-year Treasury Yield	-0.862799
Commercial Real Estate Index	10-year Treasury Yield	-0.834688
Commercial Real Estate Index	7-year Treasury Yield	-0.795666
Commercial Real Estate Index	3-month Treasury Yield	-0.602867
Commercial Real Estate Index	5-year Treasury Yield	-0.758813
Commercial Real Estate Index	6-month Treasury Yield	-0.602223
Commercial Real Estate Index	3-year Treasury Yield	-0.69944
Commercial Real Estate Index	1-year Treasury Yield	-0.619274
US Average Retail Gasoline Price	30-year Treasury Yield	-0.711453
US Average Retail Gasoline Price	20-year Treasury Yield	-0.71136
US Average Retail Gasoline Price	10-year Treasury Yield	-0.730008
US Average Retail Gasoline Price	7-year Treasury Yield	-0.736381
US Average Retail Gasoline Price	3-month Treasury Yield	-0.649009
US Average Retail Gasoline Price	5-year Treasury Yield	-0.736301
US Average Retail Gasoline Price	6-month Treasury Yield	-0.645651
US Average Retail Gasoline Price	3-year Treasury Yield	-0.711523
US Average Retail Gasoline Price	1-year Treasury Yield	-0.660666
30-year Treasury Yield	**20-year Treasury Yield**	**0.996079**
30-year Treasury Yield	**10-year Treasury Yield**	**0.987589**
30-year Treasury Yield	**7-year Treasury Yield**	**0.969399**
30-year Treasury Yield	3-month Treasury Yield	0.808684
30-year Treasury Yield	5-year Treasury Yield	0.947106
30-year Treasury Yield	6-month Treasury Yield	0.813073
30-year Treasury Yield	3-year Treasury Yield	0.902205
30-year Treasury Yield	1-year Treasury Yield	0.831152
20-year Treasury Yield	**10-year Treasury Yield**	**0.992826**
20-year Treasury Yield	**7-year Treasury Yield**	**0.972696**
20-year Treasury Yield	3-month Treasury Yield	0.807356
20-year Treasury Yield	5-year Treasury Yield	0.94795
20-year Treasury Yield	6-month Treasury Yield	0.81619
20-year Treasury Yield	3-year Treasury Yield	0.903598
20-year Treasury Yield	1-year Treasury Yield	0.837901
10-year Treasury Yield	1-month Treasury Yield	0.657966
10-year Treasury Yield	**7-year Treasury Yield**	**0.99371**
10-year Treasury Yield	3-month Treasury Yield	0.871143
10-year Treasury Yield	**5-year Treasury Yield**	**0.981994**
10-year Treasury Yield	6-month Treasury Yield	0.876894
10-year Treasury Yield	**3-year Treasury Yield**	**0.951219**
10-year Treasury Yield	1-year Treasury Yield	0.893388
1-month Treasury Yield	7-year Treasury Yield	0.762793
1-month Treasury Yield	**3-month Treasury Yield**	**0.9982**
1-month Treasury Yield	5-year Treasury Yield	0.8378
1-month Treasury Yield	**6-month Treasury Yield**	**0.99272**
1-month Treasury Yield	3-year Treasury Yield	0.918449
1-month Treasury Yield	**1-year Treasury Yield**	**0.982246**
7-year Treasury Yield	3-month Treasury Yield	0.90995
7-year Treasury Yield	**5-year Treasury Yield**	**0.996389**
7-year Treasury Yield	6-month Treasury Yield	0.915904
7-year Treasury Yield	**3-year Treasury Yield**	**0.977855**
7-year Treasury Yield	1-year Treasury Yield	0.931095
3-month Treasury Yield	5-year Treasury Yield	0.93551
3-month Treasury Yield	**6-month Treasury Yield**	**0.99873**
3-month Treasury Yield	**3-year Treasury Yield**	**0.967681**
3-month Treasury Yield	**1-year Treasury Yield**	**0.994416**
5-year Treasury Yield	6-month Treasury Yield	0.941542
5-year Treasury Yield	**3-year Treasury Yield**	**0.991315**
5-year Treasury Yield	**1-year Treasury Yield**	**0.955134**
6-month Treasury Yield	**3-year Treasury Yield**	**0.973733**
6-month Treasury Yield	**1-year Treasury Yield**	**0.997947**

3-year Treasury Yield	1-year Treasury Yield	0.984029

Appendix D: Mortgage Delinquencies

The following tables, Table 6 through Table 10, present the delinquency rates of mortgages held by Freddie Mac for May 2022 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 August 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	1374	1355	10	0	1	8	0.73%	0.66%	1.38%
	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	5366	5316	22	9	1	18	0.41%	0.52%	0.93%
	2 units	34	34	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	35268	34853	194	41	21	159	0.55%	0.63%	1.18%
	2 units	30	30	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	408	403	1	0	0	4	0.25%	0.98%	1.23%
	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	9255	9165	43	8	6	33	0.47%	0.51%	0.97%
	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%
Decatur, AL	1 unit	2547	2516	19	3	1	8	0.75%	0.47%	1.22%
	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	2414	2384	14	2	2	12	0.58%	0.66%	1.24%
	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	3079	3021	32	1	1	24	1.04%	0.84%	1.88%
	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	1428	1404	9	2	2	11	0.63%	1.05%	1.68%
	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	16267	16137	62	8	7	53	0.38%	0.42%	0.80%
	2 units	25	25	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	51	51	0	0	0	0	0.00%	0.00%	0.00%
Mobile, AL	1 unit	6537	6442	40	5	2	48	0.61%	0.84%	1.45%
	2 units	16	16	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	7004	6918	43	7	3	33	0.61%	0.61%	1.23%

	2 units	23	23	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	11	9	0	0	2	0	0.00%	18.18%	18.18%
Tuscaloosa, AL	1 unit	5843	5768	39	6	4	26	0.67%	0.62%	1.28%
	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	12348	12128	104	20	10	86	0.84%	0.94%	1.78%
	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 Aug 2022

Table 7: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30+ dpd) as of August 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	30966	30688	133	25	14	106	0.43%	0.47%	0.90%
	2 units	411	404	5	0	0	2	1.22%	0.49%	1.70%
	3+ units	47	46	1	0	0	0	2.13%	0.00%	2.13%
Crestview-Fort Walton Beach-Destin, FL	1 unit	8435	8351	42	12	1	29	0.50%	0.50%	1.00%
	2 units	18	18	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	21751	21527	115	14	12	83	0.53%	0.50%	1.03%
	2 units	183	183	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	52	51	0	0	0	1	0.00%	1.92%	1.92%
Gainesville, FL	1 unit	6945	6878	34	7	4	22	0.49%	0.48%	0.97%
	2 units	28	28	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	15	13	0	2	0	0	0.00%	13.33%	13.33%
Homosassa Springs, FL	1 unit	3655	3618	19	2	1	15	0.52%	0.49%	1.01%
	2 units	28	28	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	4	4	0	0	0	0	0.00%	0.00%	0.00%
Jacksonville, FL	1 unit	47312	46874	199	47	20	172	0.42%	0.51%	0.93%
	2 units	203	201	2	0	0	0	0.99%	0.00%	0.99%
	3+ units	124	124	0	0	0	0	0.00%	0.00%	0.00%
Lakeland-Winter Haven, FL	1 unit	17884	17695	78	21	16	74	0.44%	0.62%	1.06%
	2 units	111	111	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	41	41	0	0	0	0	0.00%	0.00%	0.00%
Miami-Fort Lauderdale-Pompano Beach, FL	1 unit	157040	154471	1030	259	141	1139	0.66%	0.98%	1.64%
	2 units	1341	1322	6	2	3	8	0.45%	0.97%	1.42%
	3+ units	590	580	5	0	0	5	0.85%	0.85%	1.70%
Naples-Marco Island, FL	1 unit	14504	14386	53	5	6	54	0.37%	0.45%	0.81%
	2 units	51	51	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	36309	35984	147	39	20	119	0.41%	0.49%	0.90%
	2 units	191	190	1	0	0	0	0.52%	0.00%	0.52%
	3+ units	33	33	0	0	0	0	0.00%	0.00%	0.00%
Ocala, FL	1 unit	8880	8785	40	14	6	35	0.45%	0.62%	1.07%

	2 units	26	26	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	23	23	0	0	0	0	0.00%	0.00%	0.00%
Orlando-Kissimmee-Sanford, FL	1 unit	84945	83880	446	118	61	440	0.53%	0.73%	1.25%
	2 units	343	341	0	0	1	1	0.00%	0.58%	0.58%
	3+ units	96	95	1	0	0	0	1.04%	0.00%	1.04%
Palm Bay-Melbourne-Titusville, FL	1 unit	21830	21582	125	25	10	88	0.57%	0.56%	1.14%
	2 units	61	61	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	28	27	0	0	0	1	0.00%	3.57%	3.57%
Panama City, FL	1 unit	5042	4973	40	7	3	19	0.79%	0.58%	1.37%
	2 units	45	45	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	11235	11071	74	16	10	64	0.66%	0.80%	1.46%
	2 units	79	78	1	0	0	0	1.27%	0.00%	1.27%
	3+ units	43	43	0	0	0	0	0.00%	0.00%	0.00%
Port St. Lucie, FL	1 unit	18340	18097	128	19	10	86	0.70%	0.63%	1.33%
	2 units	71	70	0	0	0	1	0.00%	1.41%	1.41%
	3+ units	17	17	0	0	0	0	0.00%	0.00%	0.00%
Punta Gorda, FL	1 unit	8454	8376	32	8	5	33	0.38%	0.54%	0.92%
	2 units	35	34	1	0	0	0	2.86%	0.00%	2.86%
	3+ units	7	7	0	0	0	0	0.00%	0.00%	0.00%
Sebastian-Vero Beach, FL	1 unit	6371	6297	34	5	5	30	0.53%	0.63%	1.16%
	2 units	16	15	0	0	0	1	0.00%	6.25%	6.25%
	3+ units	9	9	0	0	0	0	0.00%	0.00%	0.00%
Sebring-Avon Park, FL	1 unit	2145	2124	10	3	1	7	0.47%	0.51%	0.98%
	2 units	21	19	2	0	0	0	9.52%	0.00%	9.52%
	3+ units	5	5	0	0	0	0	0.00%	0.00%	0.00%
Tallahassee, FL	1 unit	9890	9783	52	18	4	33	0.53%	0.56%	1.08%
	2 units	58	58	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	105453	104315	477	123	73	465	0.45%	0.63%	1.08%
	2 units	565	554	9	0	0	2	1.59%	0.35%	1.95%
	3+ units	289	288	0	0	1	0	0.00%	0.35%	0.35%
The Villages, FL	1 unit	3007	2994	7	0	0	6	0.23%	0.20%	0.43%
	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	10320	10155	72	16	16	61	0.70%	0.90%	1.60%
	2 units	351	346	2	0	0	3	0.57%	0.86%	1.43%
	3+ units	56	54	1	0	0	1	1.79%	1.79%	3.57%

Source: STACR Freddie Mac, as of 23 Aug 2022

Table 8: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30+ dpd) as of August 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	1808	1780	11	3	0	14	0.61%	0.94%	1.55%
	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	23365	22965	172	38	25	165	0.74%	0.98%	1.71%
	2 units	60	58	2	0	0	0	3.33%	0.00%	3.33%
	3+ units	66	66	0	0	0	0	0.00%	0.00%	0.00%
Hammond, LA	1 unit	2345	2309	11	8	1	16	0.47%	1.07%	1.54%
	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	3663	3580	29	9	5	40	0.79%	1.47%	2.27%
	2 units	5	4	0	0	0	1	0.00%	20.00%	20.00%
	3+ units	5	4	0	1	0	0	0.00%	20.00%	20.00%
Lafayette, LA	1 unit	9725	9519	67	17	13	109	0.69%	1.43%	2.12%
	2 units	12	12	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	31	29	2	0	0	0	6.45%	0.00%	6.45%
Lake Charles, LA	1 unit	3878	3795	32	9	8	34	0.83%	1.32%	2.14%
	2 units	15	15	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	2828	2766	29	7	3	23	1.03%	1.17%	2.19%
	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	30765	30191	198	62	23	291	0.64%	1.22%	1.87%
	2 units	1609	1587	10	3	0	9	0.62%	0.75%	1.37%
	3+ units	400	388	1	0	0	11	0.25%	2.75%	3.00%
Shreveport-Bossier City, LA	1 unit	7484	7350	60	9	5	60	0.80%	0.99%	1.79%
	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	6136	5985	62	8	5	76	1.01%	1.45%	2.46%
	2 units	469	459	3	0	0	7	0.64%	1.49%	2.13%
	3+ units	96	95	0	1	0	0	0.00%	1.04%	1.04%

Source: STACR Freddie Mac, as of 23 Aug 2022

Table 9: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30+ dpd) as of August 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	4779	4698	38	9	9	25	0.80%	0.90%	1.70%
	2 units	32	32	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	13	13	0	0	0	0	0.00%	0.00%	0.00%
Hattiesburg, MS	1 unit	2338	2301	18	3	1	15	0.77%	0.81%	1.58%
	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	9121	8975	58	17	7	64	0.64%	0.97%	1.60%
	2 units	12	11	1	0	0	0	8.33%	0.00%	8.33%
	3+ units	4	4	0	0	0	0	0.00%	0.00%	0.00%
Memphis, TN-MS-AR	1 unit	5850	5767	44	12	4	23	0.75%	0.67%	1.42%
	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	11050	10824	85	22	16	103	0.77%	1.28%	2.05%
	2 units	16	16	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 Aug 2022

Table 10: Percentage of Freddie Mac Mortgages by Status (Current, 30 dpd and 30 + dpd) as of August 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	3840	3784	30	6	0	20	0.78%	0.68%	1.46%
	2 units	20	20	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	4485	4410	27	9	5	34	0.60%	1.07%	1.67%
	2 units	15	15	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	98715	97834	466	91	39	285	0.47%	0.42%	0.89%
	2 units	1111	1106	4	0	0	1	0.36%	0.09%	0.45%
	3+ units	232	228	1	0	0	3	0.43%	1.29%	1.72%
Beaumont-Port Arthur, TX	1 unit	5583	5468	47	13	6	49	0.84%	1.22%	2.06%
	2 units	4	4	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	8	8	0	0	0	0	0.00%	0.00%	0.00%
Brownsville-Harlingen, TX	1 unit	2768	2708	26	7	5	22	0.94%	1.23%	2.17%
	2 units	35	35	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	30	30	0	0	0	0	0.00%	0.00%	0.00%
College Station-Bryan, TX	1 unit	6909	6856	19	4	2	28	0.28%	0.49%	0.77%
	2 units	103	103	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	65	65	0	0	0	0	0.00%	0.00%	0.00%
Corpus Christi, TX	1 unit	7130	6998	61	18	6	47	0.86%	1.00%	1.85%
	2 units	17	17	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	18	18	0	0	0	0	0.00%	0.00%	0.00%
Dallas-Fort Worth-Arlington, TX	1 unit	268081	265176	1377	276	155	1097	0.51%	0.57%	1.08%
	2 units	847	839	4	0	0	4	0.47%	0.47%	0.95%
	3+ units	227	223	2	0	0	2	0.88%	0.88%	1.76%
El Paso, TX	1 unit	6477	6357	56	13	3	48	0.87%	0.99%	1.85%
	2 units	69	68	0	0	0	1	0.00%	1.45%	1.45%
	3+ units	32	32	0	0	0	0	0.00%	0.00%	0.00%
Houston-The Woodlands-Sugar Land, TX	1 unit	192905	189982	1215	310	163	1235	0.63%	0.89%	1.52%
	2 units	334	329	1	0	0	4	0.30%	1.20%	1.50%
	3+ units	287	279	3	0	0	5	1.05%	1.74%	2.79%
Killeen-Temple, TX	1 unit	6565	6484	34	8	6	33	0.52%	0.72%	1.23%

	2 units	212	212	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	184	181	0	1	0	2	0.00%	1.63%	1.63%
Laredo, TX	1 unit	1877	1839	21	5	1	11	1.12%	0.91%	2.03%
	2 units	3	2	1	0	0	0	33.33%	0.00%	33.33%
	3+ units	11	11	0	0	0	0	0.00%	0.00%	0.00%
Longview, TX	1 unit	2827	2775	28	3	2	19	0.99%	0.85%	1.84%
	2 units	17	17	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	8307	8205	59	14	5	24	0.71%	0.52%	1.23%
	2 units	117	117	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	18	18	0	0	0	0	0.00%	0.00%	0.00%
McAllen-Edinburg-Mission, TX	1 unit	4340	4232	44	9	5	50	1.01%	1.48%	2.49%
	2 units	17	16	0	0	0	1	0.00%	5.88%	5.88%
	3+ units	194	192	0	0	0	2	0.00%	1.03%	1.03%
Midland, TX	1 unit	6134	6019	42	11	5	57	0.69%	1.19%	1.88%
	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	2304	2244	24	6	5	25	1.04%	1.56%	2.60%
	2 units	4	4	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	0	0	0	0	0	0	0.00%	0.00%	0.00%
San Angelo, TX	1 unit	2539	2498	14	7	2	18	0.55%	1.06%	1.62%
	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	55829	55120	342	67	32	268	0.61%	0.66%	1.27%
	2 units	395	391	3	0	0	1	0.76%	0.25%	1.01%
	3+ units	215	214	0	0	0	1	0.00%	0.47%	0.47%
Sherman-Denison, TX	1 unit	4438	4373	34	11	3	17	0.77%	0.70%	1.47%
	2 units	36	36	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	1225	1203	12	1	1	8	0.98%	0.82%	1.80%
	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	4656	4594	29	8	2	23	0.62%	0.71%	1.33%
	2 units	12	12	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	1163	1143	8	0	1	11	0.69%	1.03%	1.72%

	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%
Waco, TX	1 unit	5051	4972	47	6	7	19	0.93%	0.63%	1.56%
	2 units	53	53	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	1541	1520	6	1	0	14	0.39%	0.97%	1.36%
	2 units	7	7	0	0	0	0	0.00%	0.00%	0.00%
	3+ units	3	2	1	0	0	0	33.33%	0.00%	33.33%
Outside all MSAs	1 unit	35963	35332	300	55	33	243	0.83%	0.92%	1.76%
	2 units	475	469	3	1	0	2	0.63%	0.63%	1.26%
	3+ units	62	61	1	0	0	0	1.61%	0.00%	1.61%

Data: STACR Freddie Mac, as of 23 Aug 2022

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