

Macroeconomic Forecasts, 3Q2024
Domestic Metrics



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Summary

According to a New York Times/Siena poll¹, 47% of the respondents indicated that they perceived the economy as poor. Only 24% of those polled thought the economy was excellent or very good. A poll conducted by The Economist magazine² found that 40% of those polled identified the economy as poor compared to the 21% that rated the economy as excellent or very good. The perception that the economy is poor or terrible is at odds with economists. Mark Zandi, chief economist at Moody's Analytics, posted³ recently that the current economy is "about as good as it gets."

How is it that the "average Joe on the street" has such a different take on the economy than professional economists? Simple. The average Joe is looking at a current level (current prices of milk, for example) compared to a past level (prices of milk in January 2020) while the economists are examining the trends-in-trends of those prices over shorter, more defined periods (i.e. how the price of milk has changed in the last year and how that price change has changed in the last year.) Because everyone has his or her own reference period, they are likely to compare the current prices or current interest rate to some 'idealized' period, regardless of whether they are actually buying milk now (or then) or shopping for a mortgage. Because the mortgage rate is higher or the current price of a dozen eggs is higher than the period they happen to be thinking about, then the economy is terrible.

The good news is that by all statistical measures the economy is in very good shape. Although we might agree with Mark Zandi, we do believe that the economy has missed an economic recession, has worked through a soft-landing, and is now in a steady growth phase. In the absence of a negative economic shock, the economy is on a path of expansion and will continue that path for the foreseeable future.

¹ <https://www.nytimes.com/interactive/2024/10/08/us/elections/times-siena-poll-likely-electorate-crosstabs.html>

² https://today.yougov.com/topics/politics/explore/topic/The_Economist_YouGov_polls

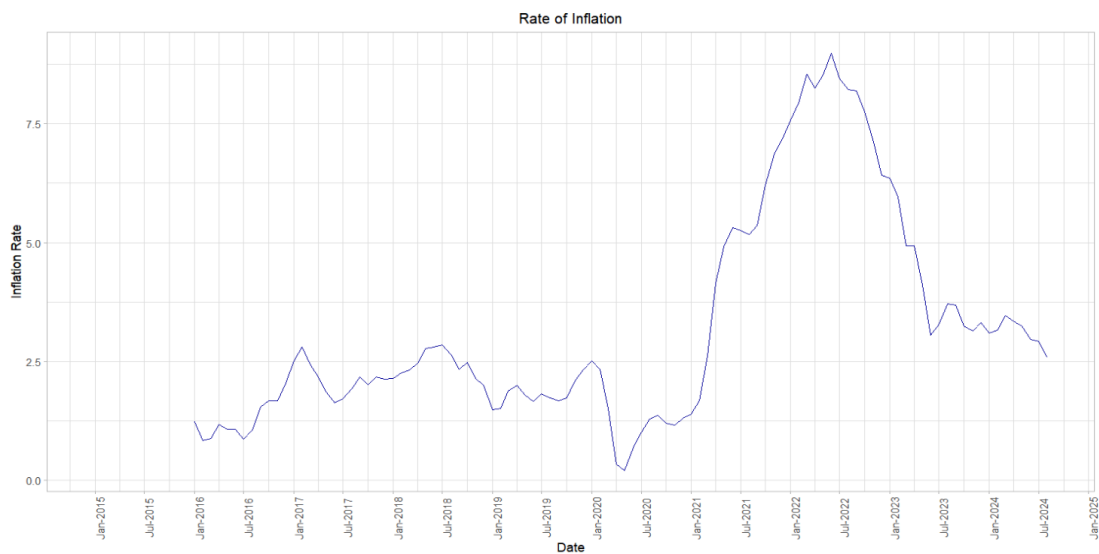
³ <https://tinyurl.com/yz4j94tu>

Macroeconomic Indicators

Inflation & Cost of Living

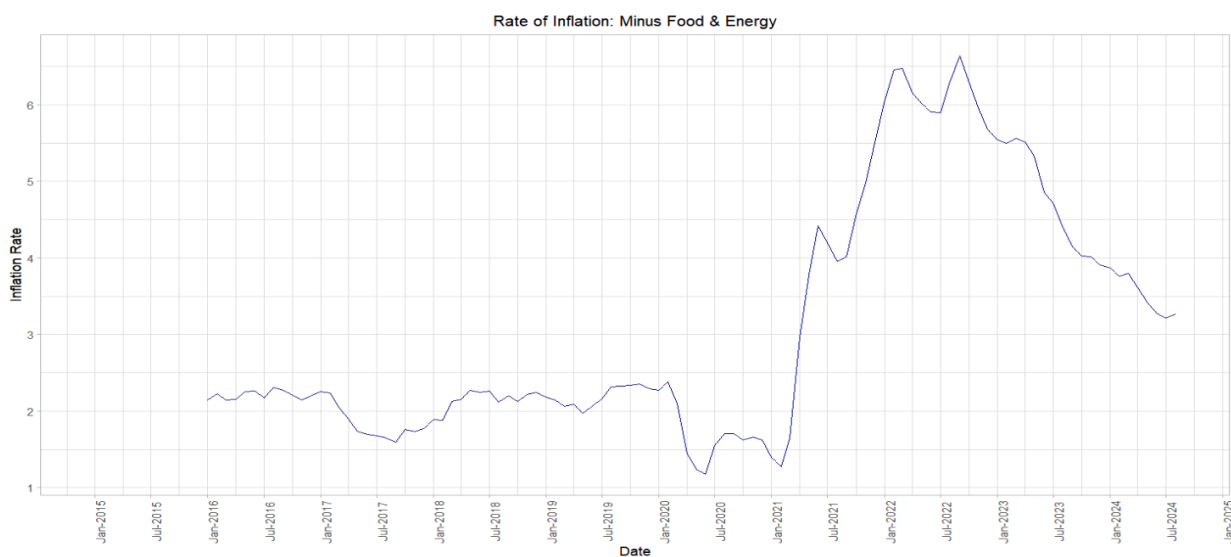
The primary concerns of the economy (dating back to 1Q2022) are related to inflation and the policy responses to inflation. We believe that consumers are acutely aware of the relative prices of energy, food, and housing relative to some reference period. Of course, as economists, we are examining the rate of change over a year or from quarter-to-quarter. Examining these one-year changes, we see that inflation is becoming quite contained. So much so that the Federal Reserve has moved away from contractionary policy to an expansionary stance. The inflation rate has not reached the Fed's goal of 2% annually. However, the inflation rate has continued to trend below 3% for nearly the last year.

Figure 1: National Overall Rate of Inflation



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

Figure 2: Rate of Inflation Minus Food & Energy



Inflation: Fuel

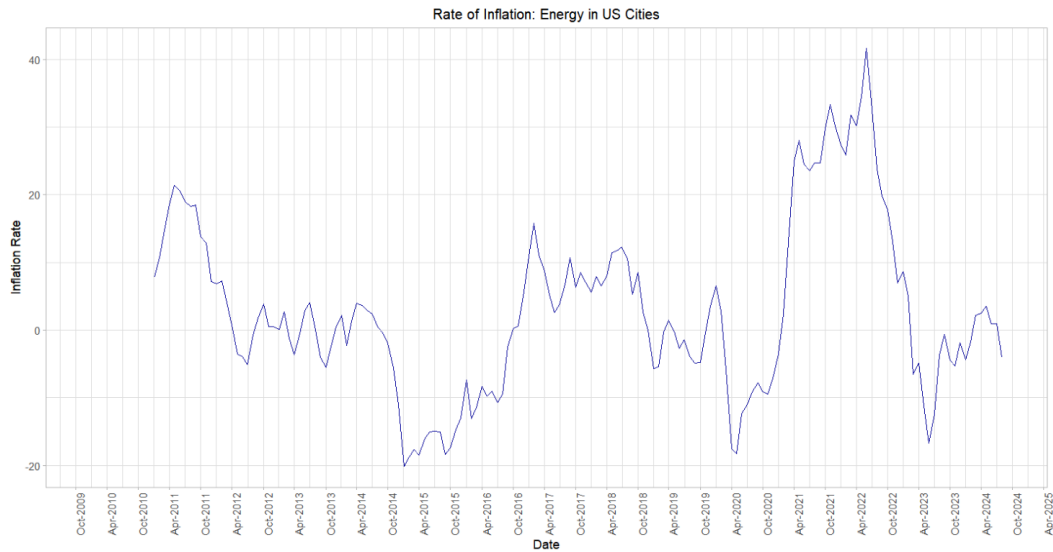
The current price of a gallon of regular gas is more than \$0.50 cheaper than one year ago. This is consistent with the overall trend in prices and inflation. The inflation rate minus food and energy (see Figure 2) is higher than the rate of inflation that includes fuel and food.

Table 1: Average Gas Prices (per Gallon) in US, as of Oct. 7, 2024

	Regular	Mid-Grade	Premium	Diesel	E85
Current Avg.	\$3.174	\$3.649	\$4.007	\$3.568	\$2.620
Yesterday Avg.	\$3.173	\$3.657	\$4.008	\$3.573	\$2.620
Week Ago Avg.	\$3.216	\$3.694	\$4.045	\$3.566	\$2.659
Month Ago Avg.	\$3.281	\$3.758	\$4.112	\$3.667	\$2.711
Year Ago Avg.	\$3.722	\$4.199	\$4.535	\$4.532	\$3.048

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

Figure 3: US National Energy Price Inflation, 2010-Present



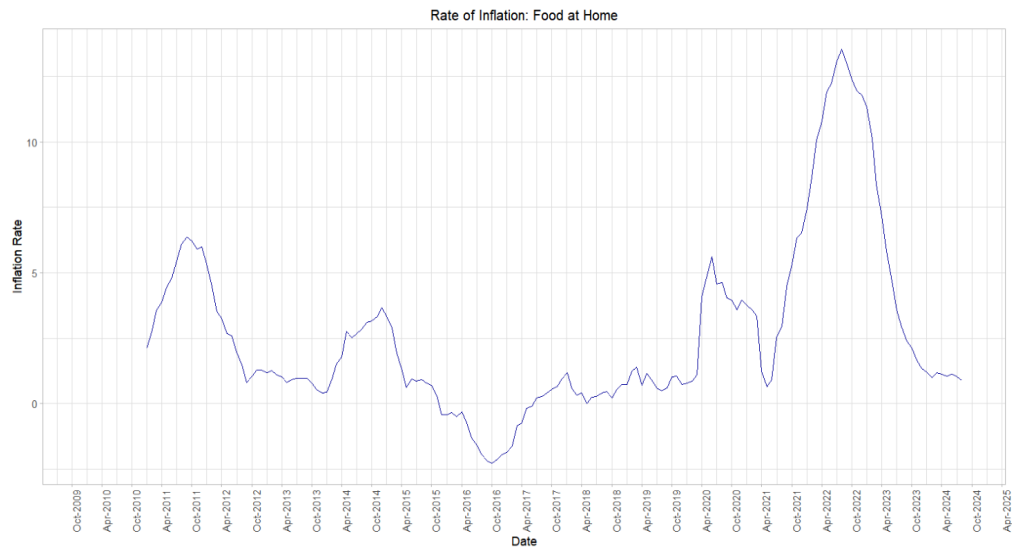
Source: Federal Reserve Economic Database (<https://fred.stlouisfed.org/>)

Inflation: Food

We are seeing the rate of inflation for food falling. However, the price of food commodities, from milk to eggs, has remained higher than the pre-pandemic prices. This may be one of the statistics that is driving consumer discontent on the economy. Although inflation has mostly been contained, it is very unlikely that the price of eggs, milk, bread, and packaged food products will fall back to pre-pandemic prices. The rapid increase in prices of these products was driven by supply chain issues and there are few reasons for food producers to reduce prices.

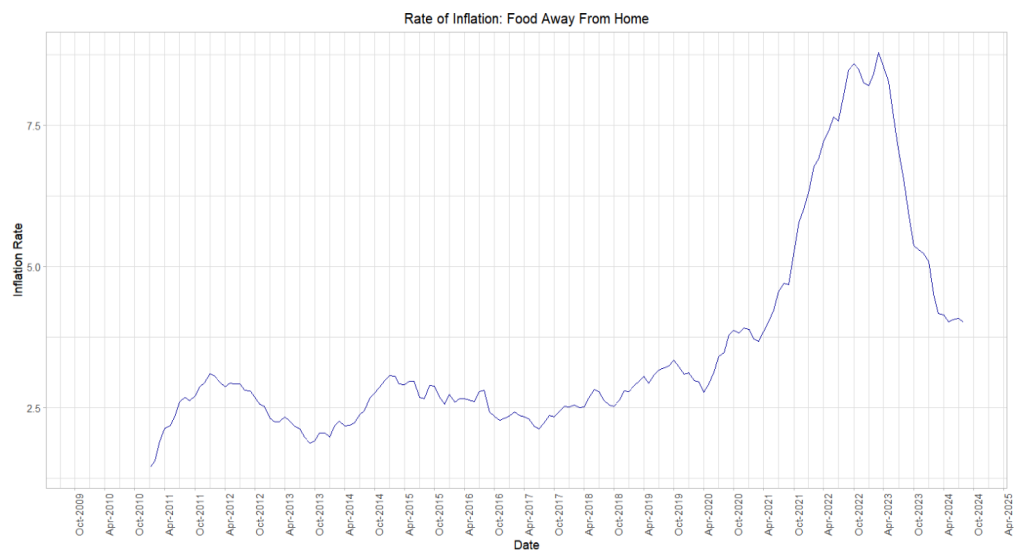
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Figure 4: US National Food Price Inflation (at Home), 2010-Present



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

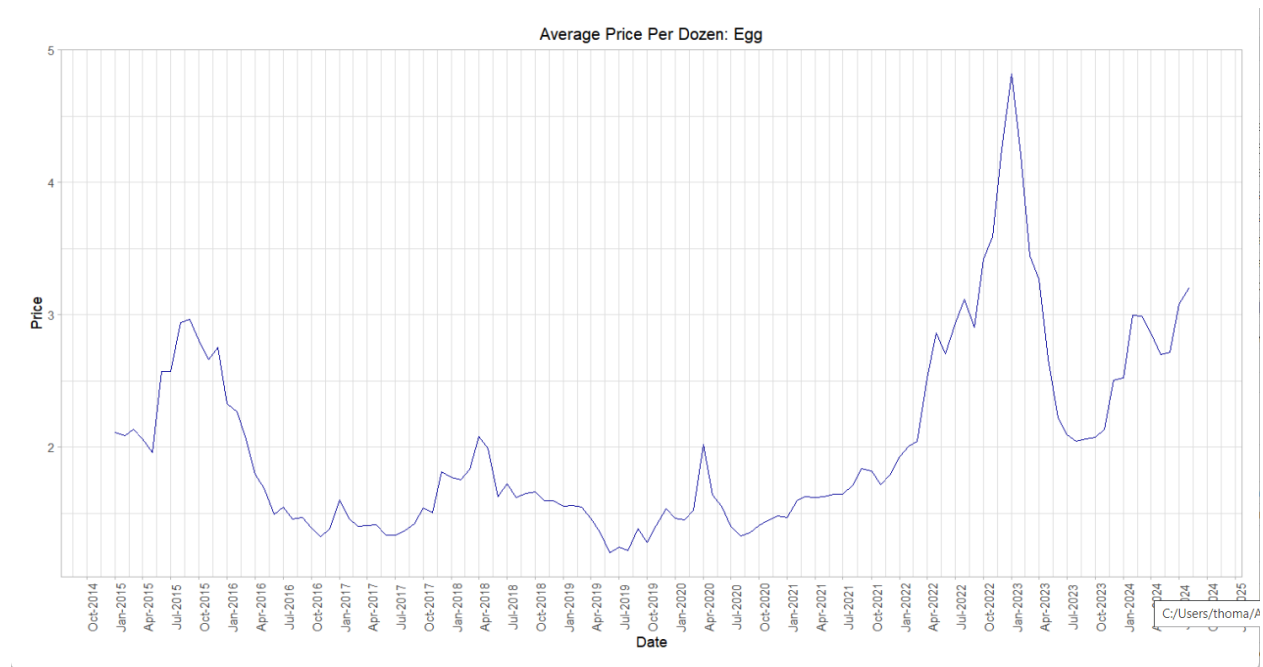
Figure 5: Inflation: Price of Food Away from Home



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

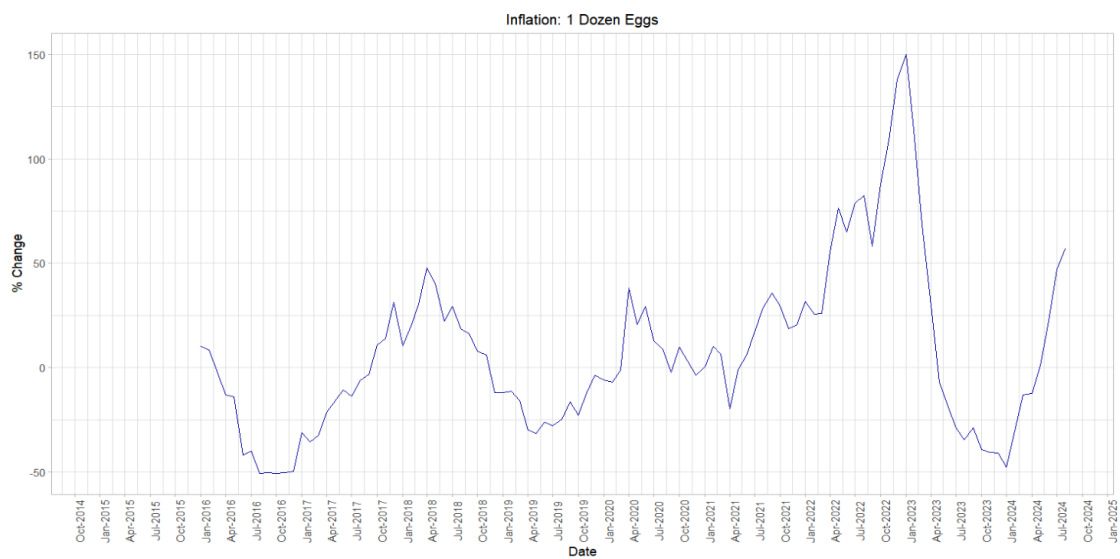
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Figure 6: US National Food Price: Average Price Per 1 Dozen Eggs (US Cities 2015 – Present)



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

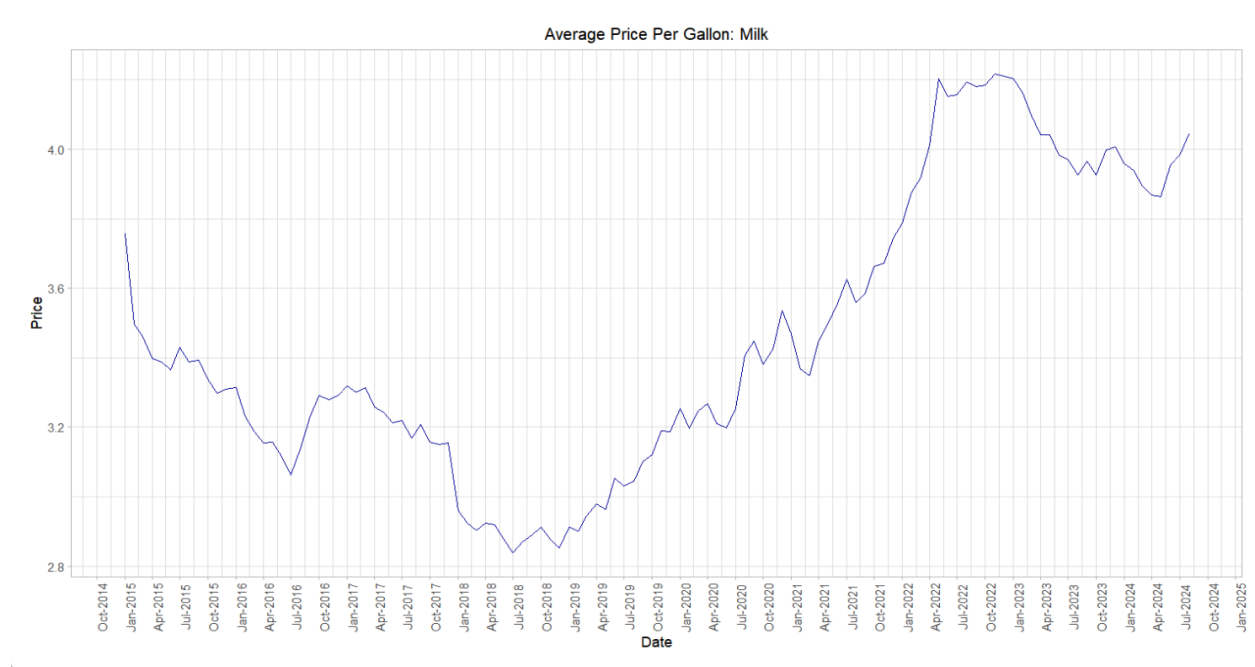
Figure 7: US National Food Price Inflation: Year-over-Year Change in Price of 1 Dozen Eggs



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

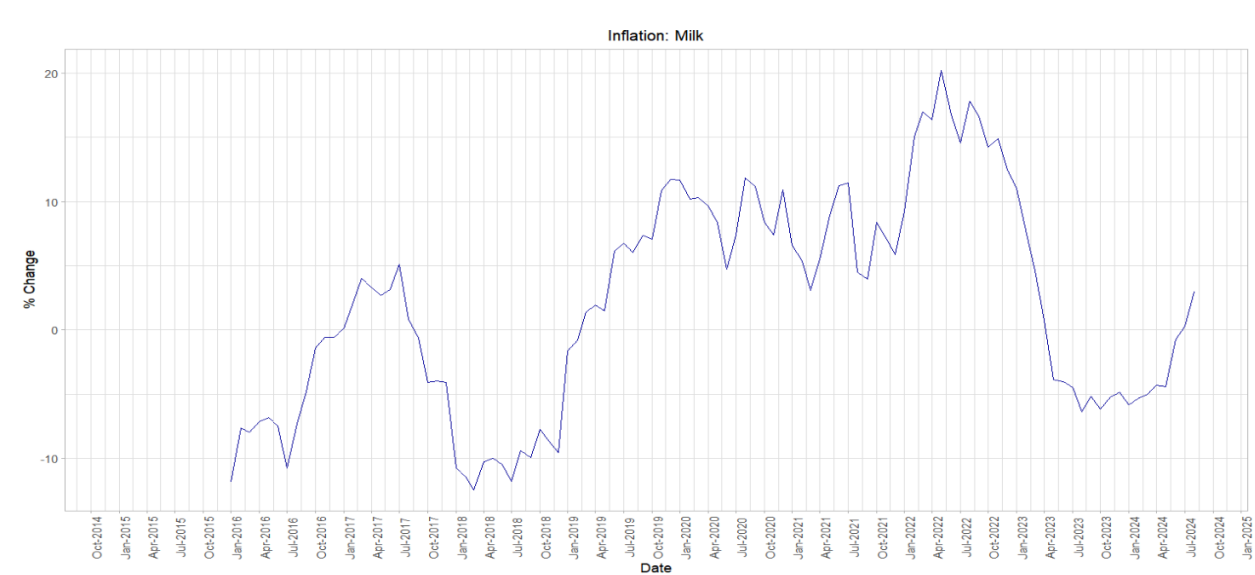
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Figure 8: US National Food Price: 1 Gallon of Milk (US Cities 2015 – Present)



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

Figure 9: US National Price Inflation: Year-over-Year Change in Price of 1 Gallon Milk



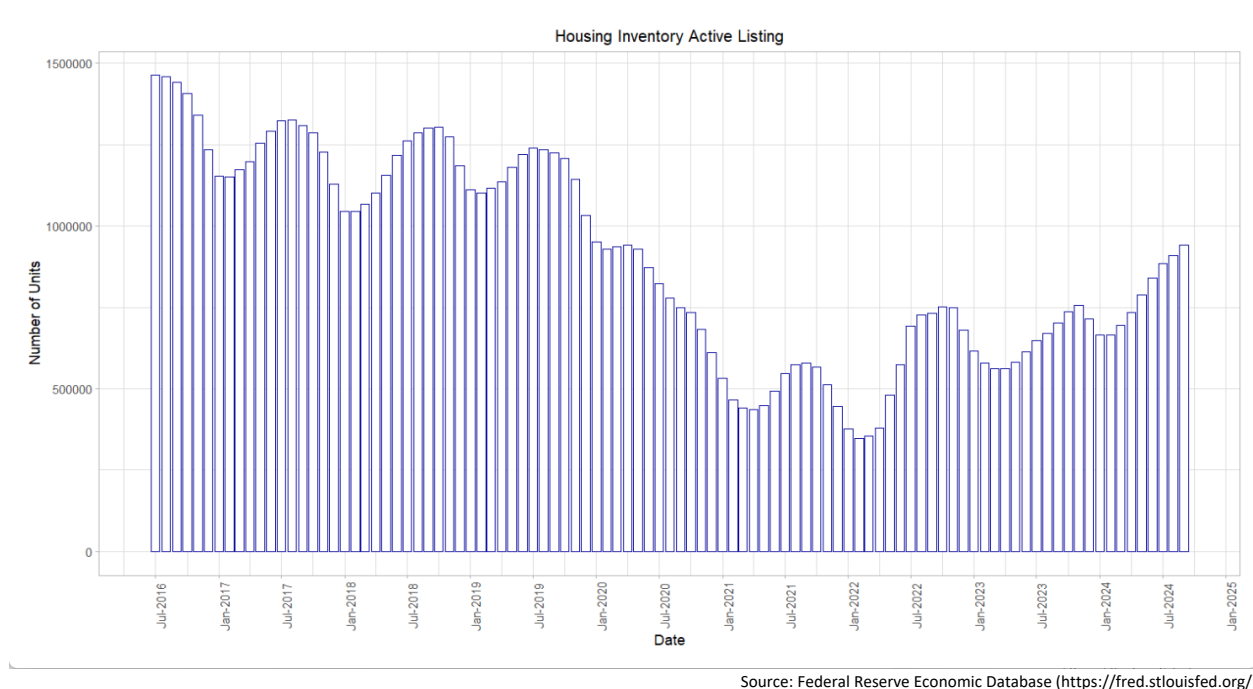
Source: Federal Reserve Economic Database (<https://fred.stlouisfed.org/>)

Housing Prices and Housing Inflation

Since early in the pandemic, the US has seen an upward spike in the price of single-family housing units. The median price of houses spiked in early Summer 2022 and then fell through early Summer 2023. This relief was short lived; the median price of housing is continuing to increase. We believe that this is primarily driven by relatively low supply – the inventory of housing has decreased quite a bit since the pandemic and active home listings have not yet reached pre-pandemic levels. The Case-Shiller index revealed a decrease in the year-over-year movement in housing prices and, very briefly, showed a small negative movement in housing price movement (indicating deflation in housing prices). The negative trend was short lived and housing prices are starting to increase again.

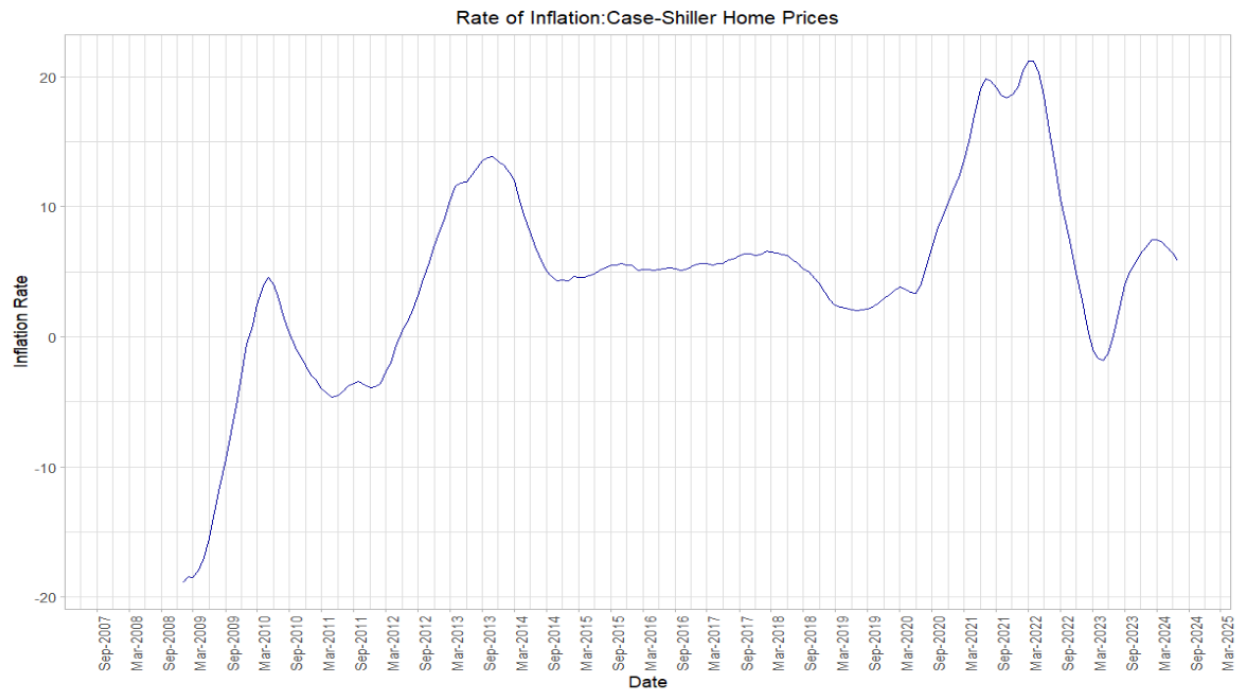
Although mortgage rates have started to decrease with the decrease in the Federal Funds target rate, mortgage rates are still quite a bit higher than the rates during the pandemic. This is another area where consumers are acutely aware of the relative prices. Even if most consumers are not “in the market” for a new home (or a new mortgage), the fact that mortgage rates are higher than “recent memories” gives many consumers a “bad taste” towards the economy.

Figure 10: US National Residential Housing Inventory (Active Listings), 2015 – Present



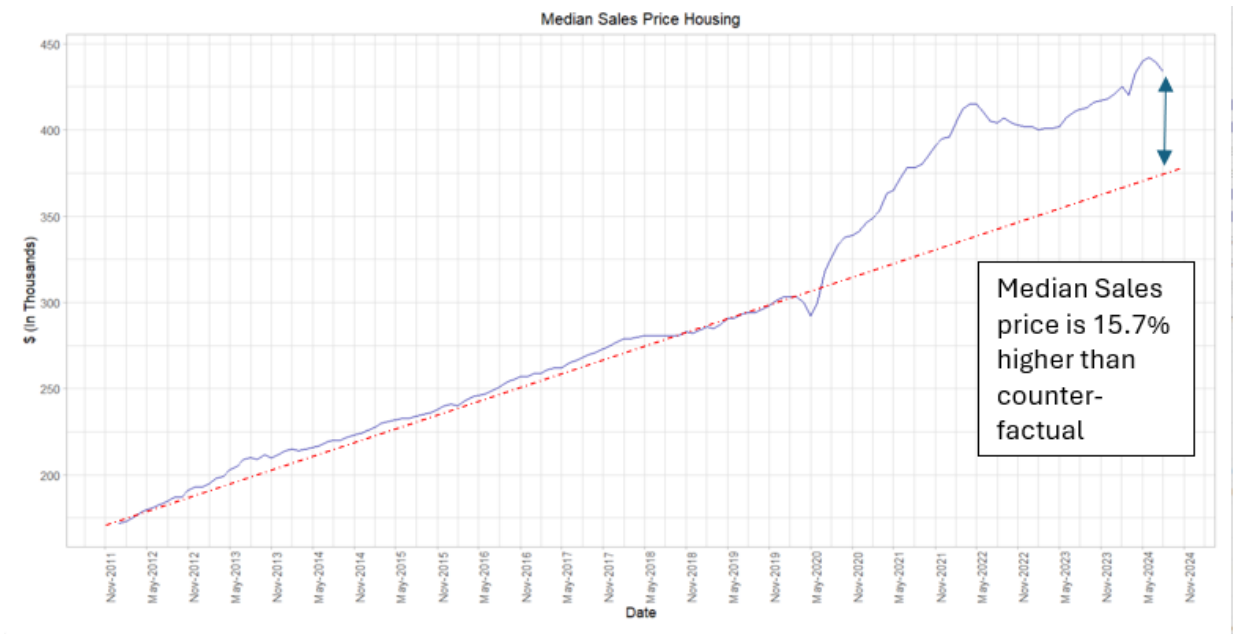
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Figure 11: US National Home Price Inflation Case-Shiller, 2009-Present



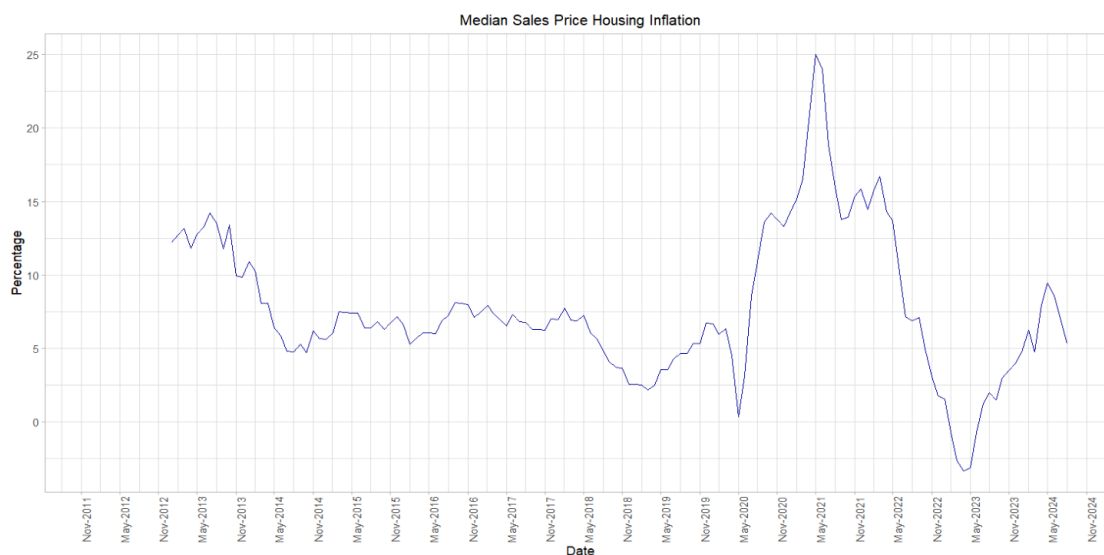
Source: Federal Reserve Economic Database (<https://fred.stlouisfed.org/>)

Figure 12: Median Sales Price



Source: Redfin (<https://www.redfin.com/news/data-center/>)

Figure 13: US National Home Price Inflation (Redfin), Feb 2018-Nov 2022



Source: Redfin (<https://www.redfin.com/news/data-center/>)

Inflation: Summary

We believe that because the out-of-pocket costs of some goods and services (food and housing, in particular) are higher than pre-pandemic levels, consumers are still worried about inflation. The average consumer is likely to confuse the cost of goods and the change in the cost of goods. Even though “inflation” is now quite low, consumers still see high prices and attach an “inflation” label to the current state of the economy. The average price of homes is not coming back to pre-pandemic levels and it is unlikely that some groceries prices will see pre-pandemic levels as well. The Fed’ is not going to change the perception of consumers that the economy is in an inflationary state.

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Figure 14: US Consumer Inflation Expectations

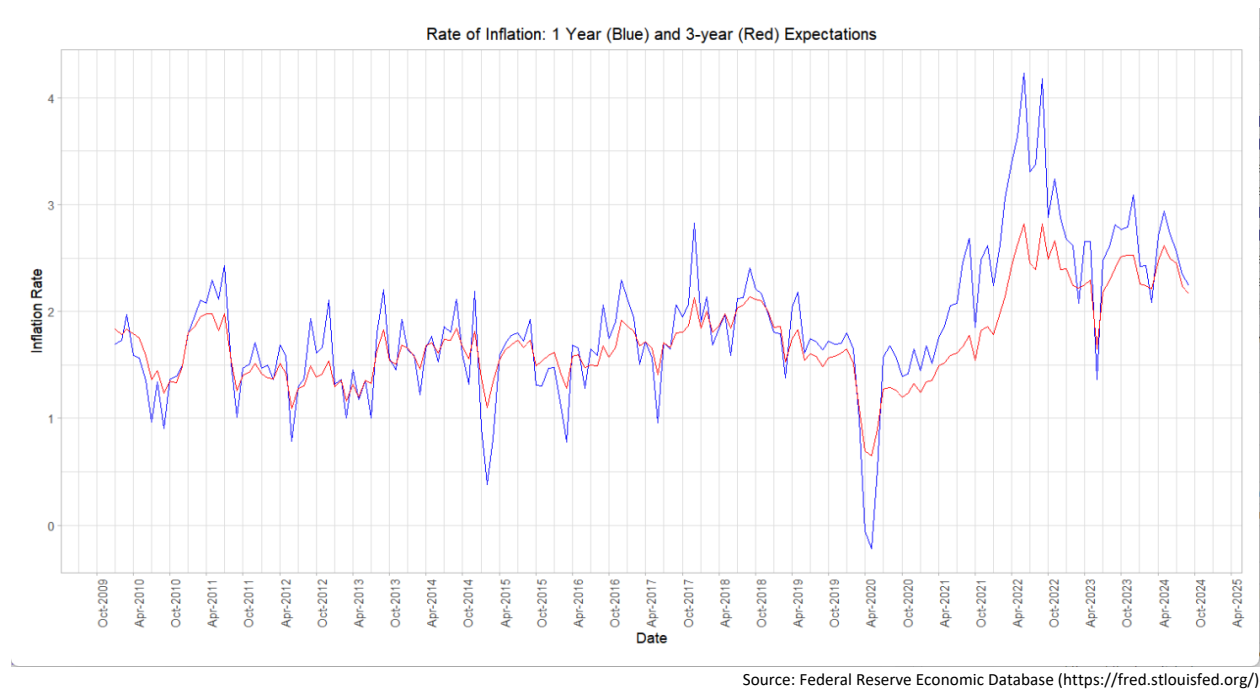


Figure 15: US National Consumer Confidence

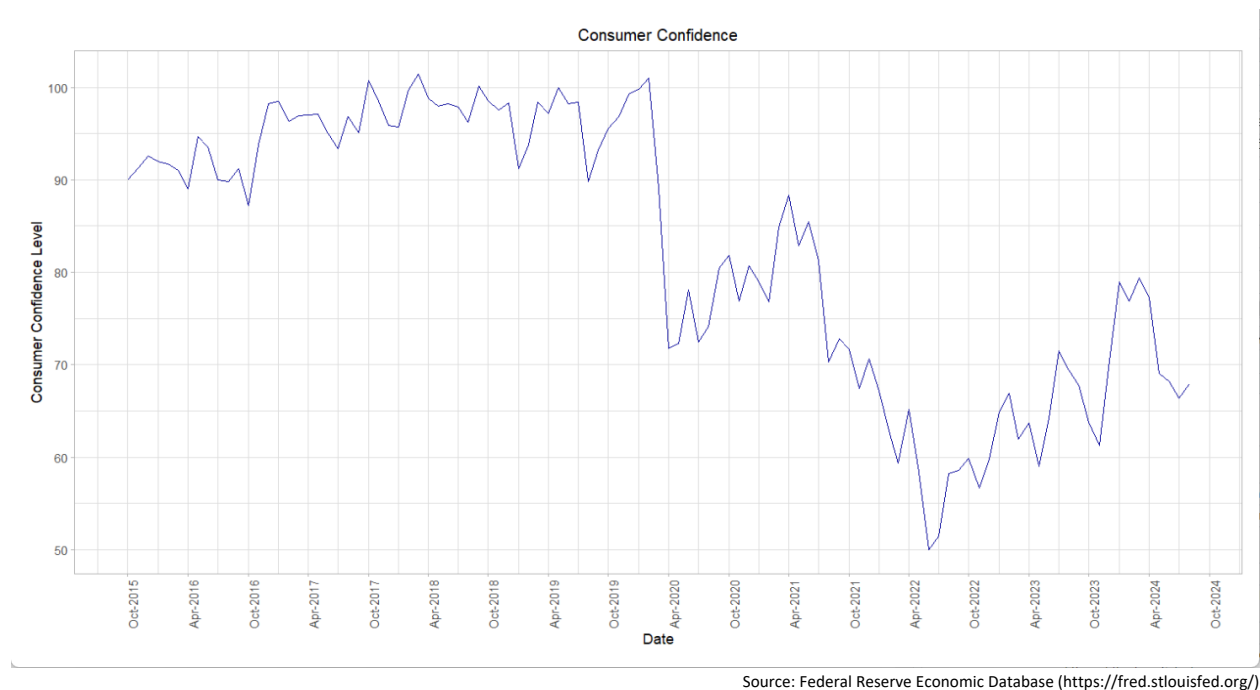
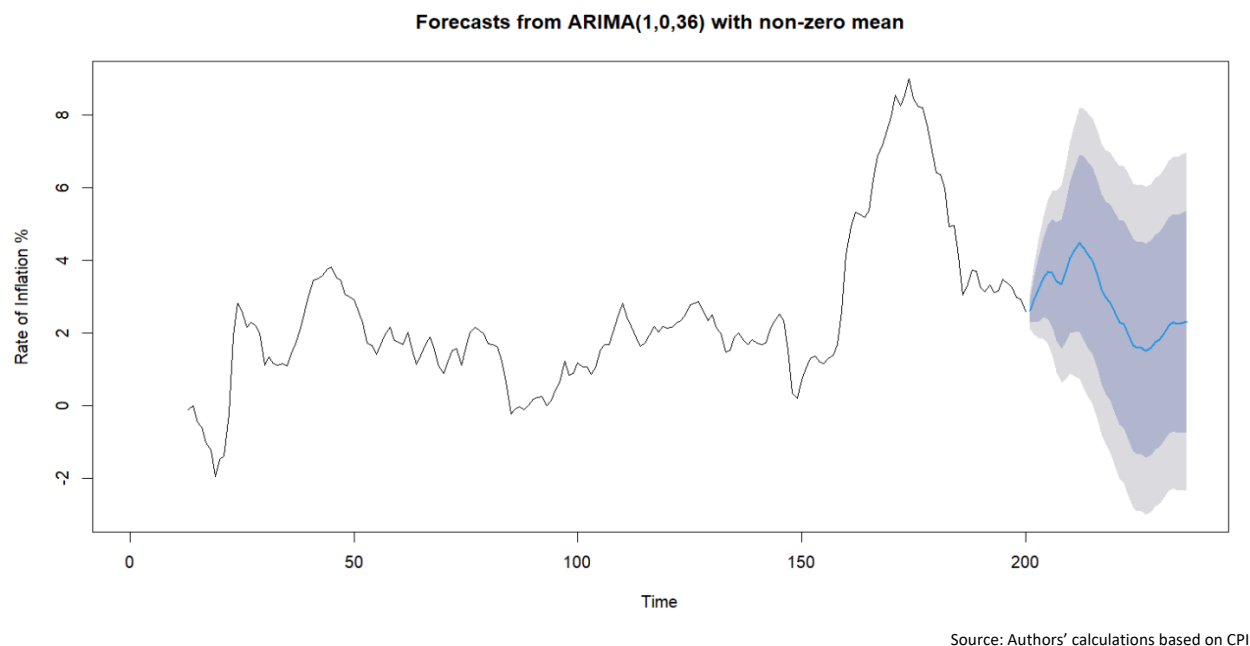
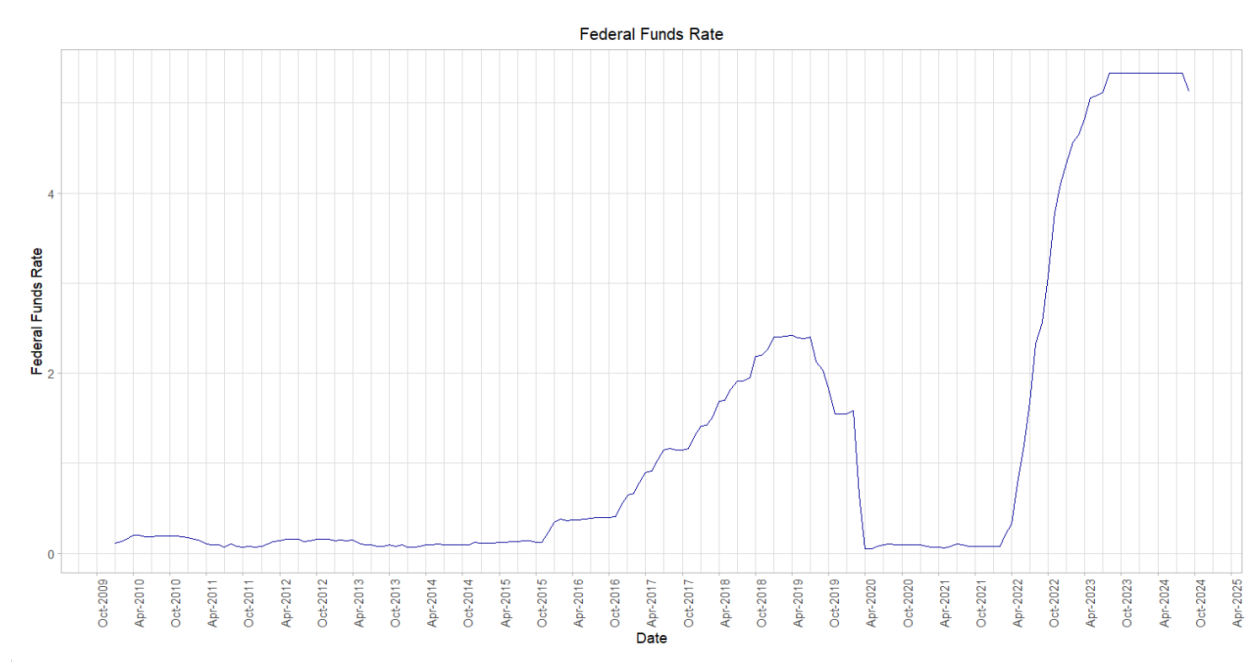


Figure 16: 36-month ARIMA Model for US Inflation



Our forecast inflation levels have continued to prove quite accurate. The current forecast suggests that inflation will hover at or around 3.5% for the near term and then start increasing back towards 4%. Given the upward pressure in housing prices and the new expansionary policy of the Fed', there is certainly room for inflation to take hold again in the economy. The Fed' was a bit slow to combat inflation in 2021 – suggesting that the price increases were “transitory.” We do not believe that the Fed' will be making the mistake of showing a delayed response. However, the model is definitely building in the delayed response to the forecast.

Figure 17: Effective Federal Funds Rate, 2010-Present

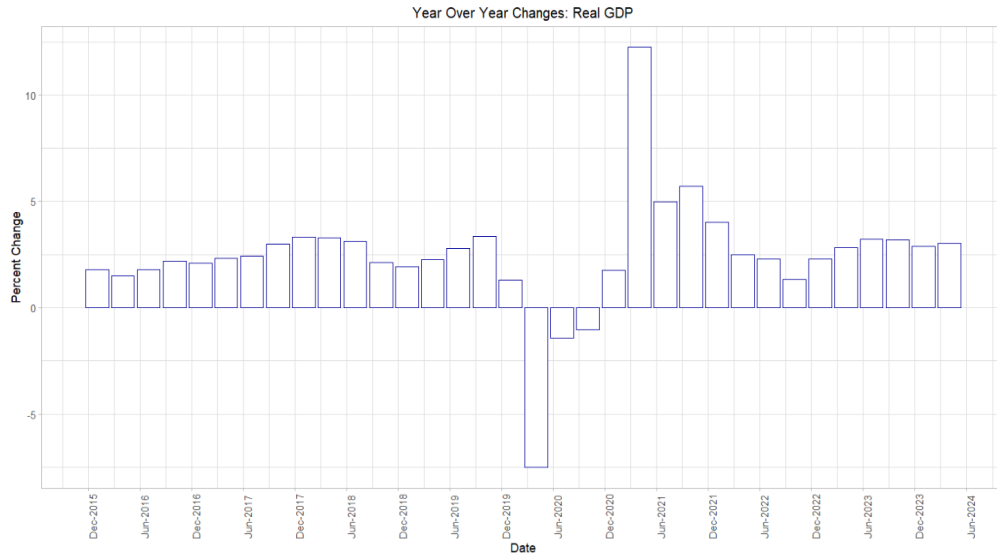


Source: Federal Reserve Economic Database (<https://fred.stlouisfed.org/>)

Macroeconomic Indicators: Other

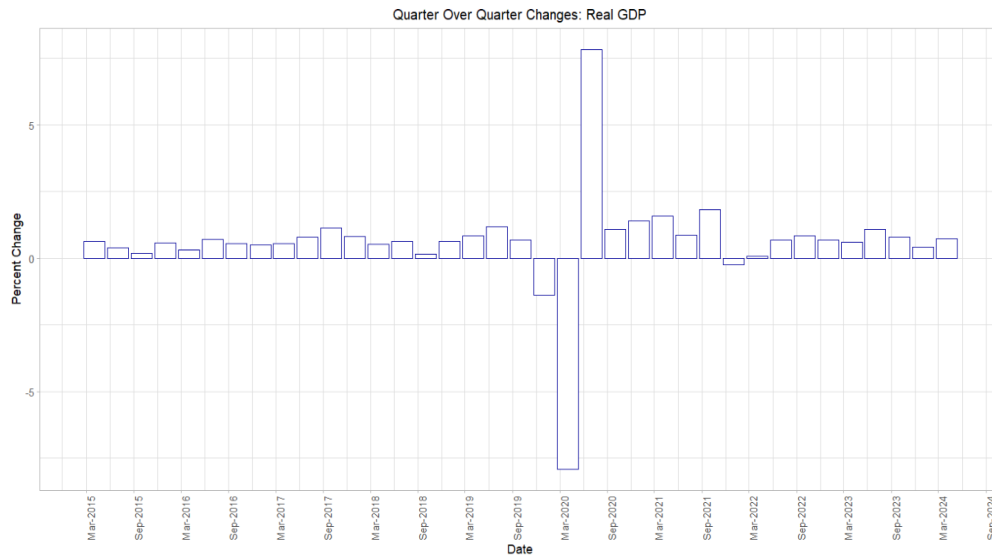
Real GDP of the United States is still quite strong and the jobs report continues to show strength throughout most sectors. ***We are suggesting that the annual rate of real GDP growth will be between 2.75% and 3.00% for 2024.*** In the absence of a decline in housing prices, we are inclined to stay away from the “as good as it gets” assertion and evaluate the current economic condition as “very good.”

Figure 18: Y/Y Change in Real GDP



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

Figure 19: Q/Q % Change in Real GDP

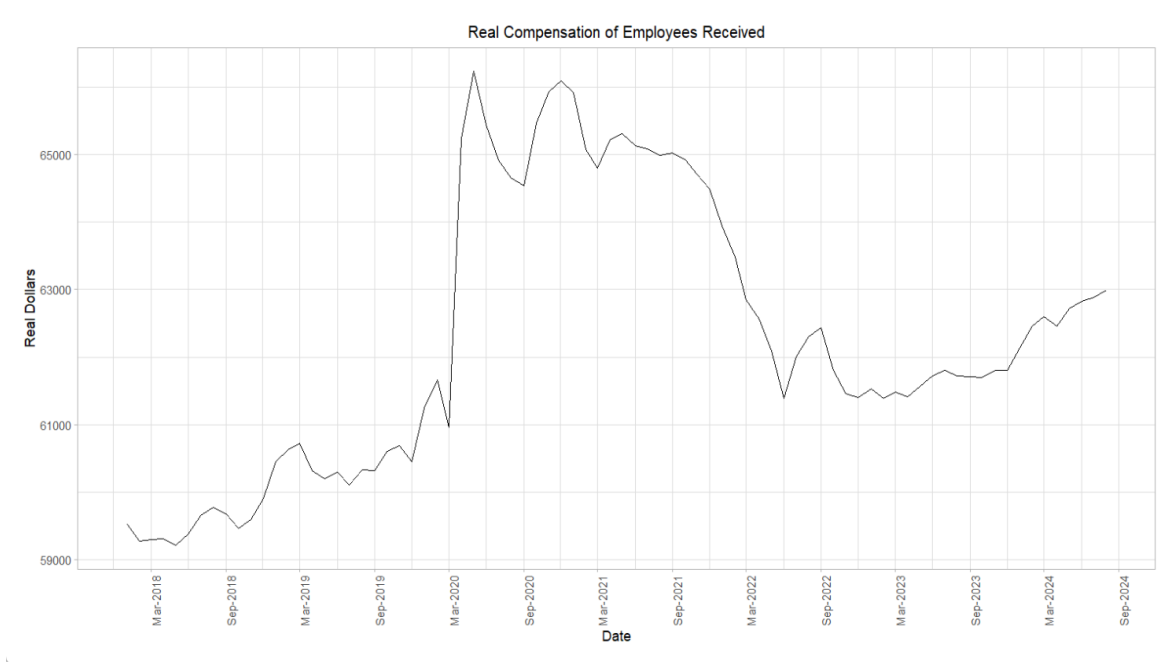


Source: Federal Reserve Economic Database (<https://fred.stlouisfed.org/>)

Inflation & Real Wages

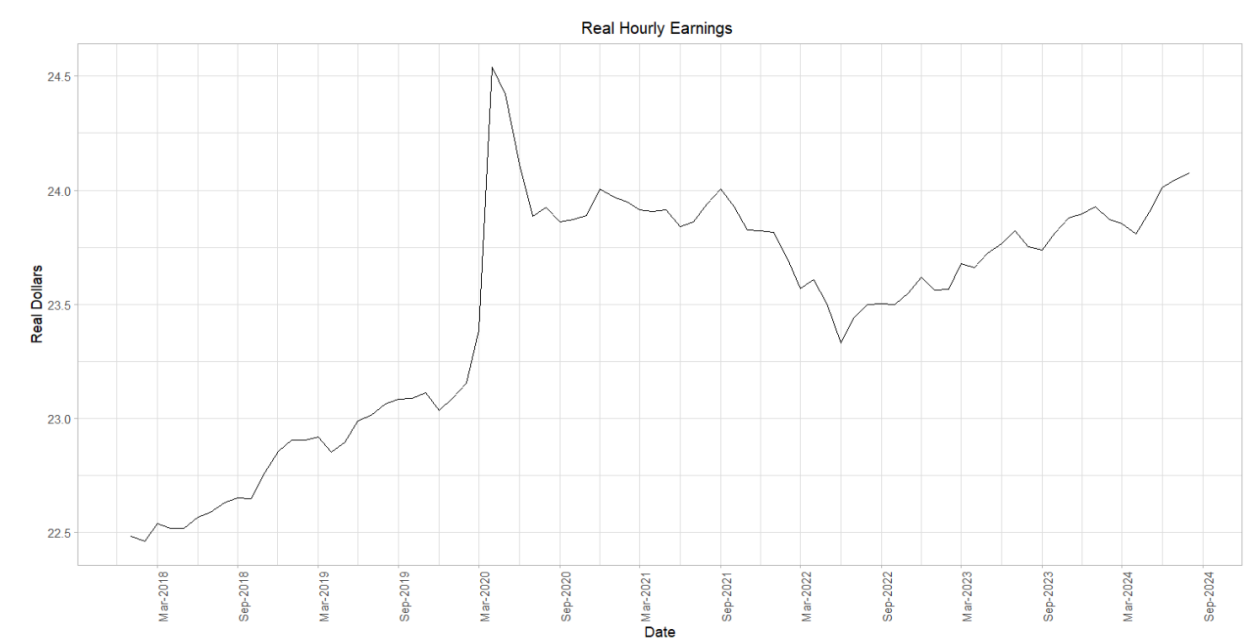
Figure 20 and Figure 21 show national overall average real wages (for both annual compensation and hourly wages). We suspect that one of the underlying reasons consumers are expressing an increase in pessimism regarding the economy is that real wages have trended down since mid 2022. Although real wages are slightly higher than they were prior to the pandemic, the myopic nature of most consumers' consideration of their wages and wealth suggest that they aren't happy with the small gains that have occurred.

Figure 20: Real Compensation of Employees



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

Figure 21: Real Hourly Wages (Nationwide)

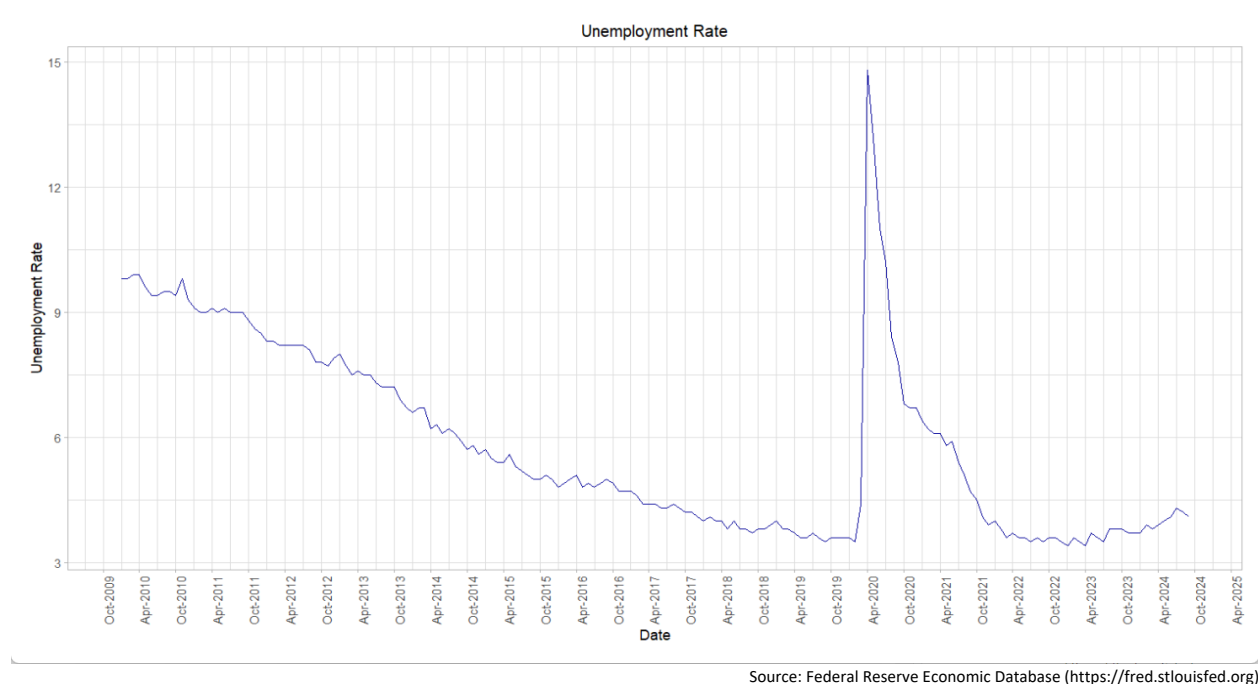


Source: Federal Reserve Economic Database (<https://fred.stlouisfed.org>)

Unemployment and Labor Force Participation

The unemployment rate for June, 2024, was 4.0%. The economy saw 27 consecutive months of sub-4% unemployment, matching the record set between November, 1967 and January, 1970. This current stretch of unemployment is impressive, as the economy continues to add record numbers of jobs. The unemployment rate has recently bounced between 4.2% and 4.4%. These small movements are not indicative that the economy is falling apart. In fact, the US made significant job gains in September.

Figure 22: US National Unemployment Rate



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Figure 23: US National Labor Force Participation Rate

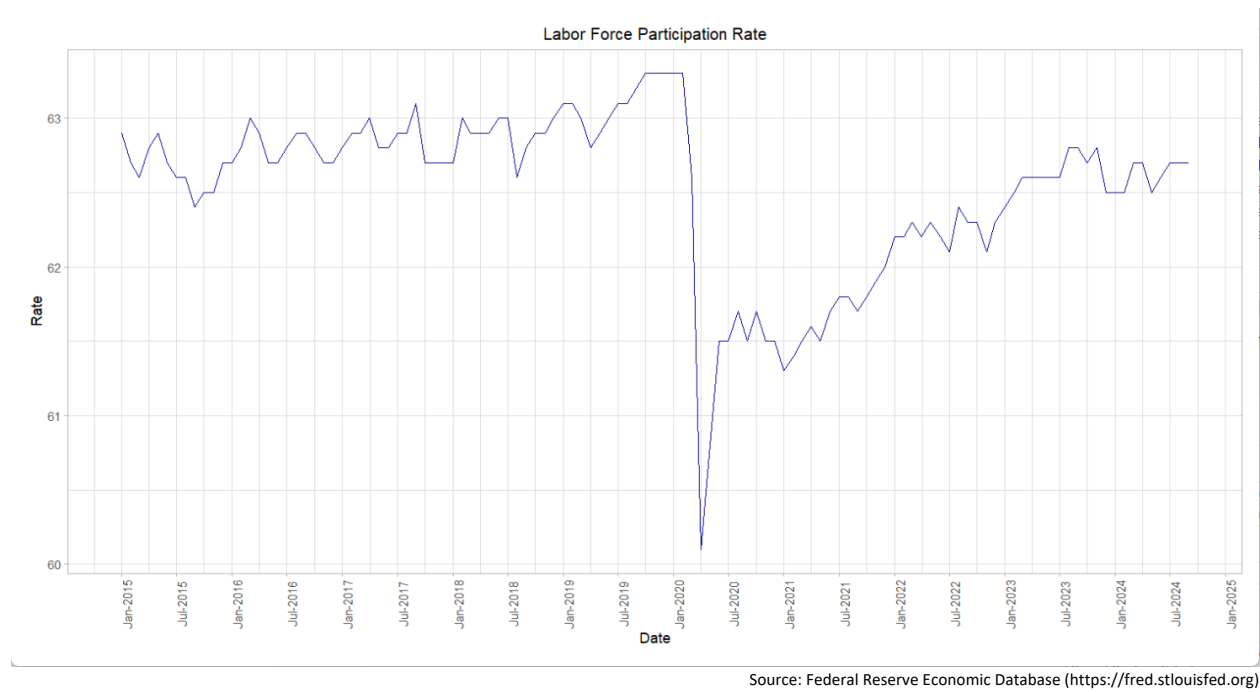
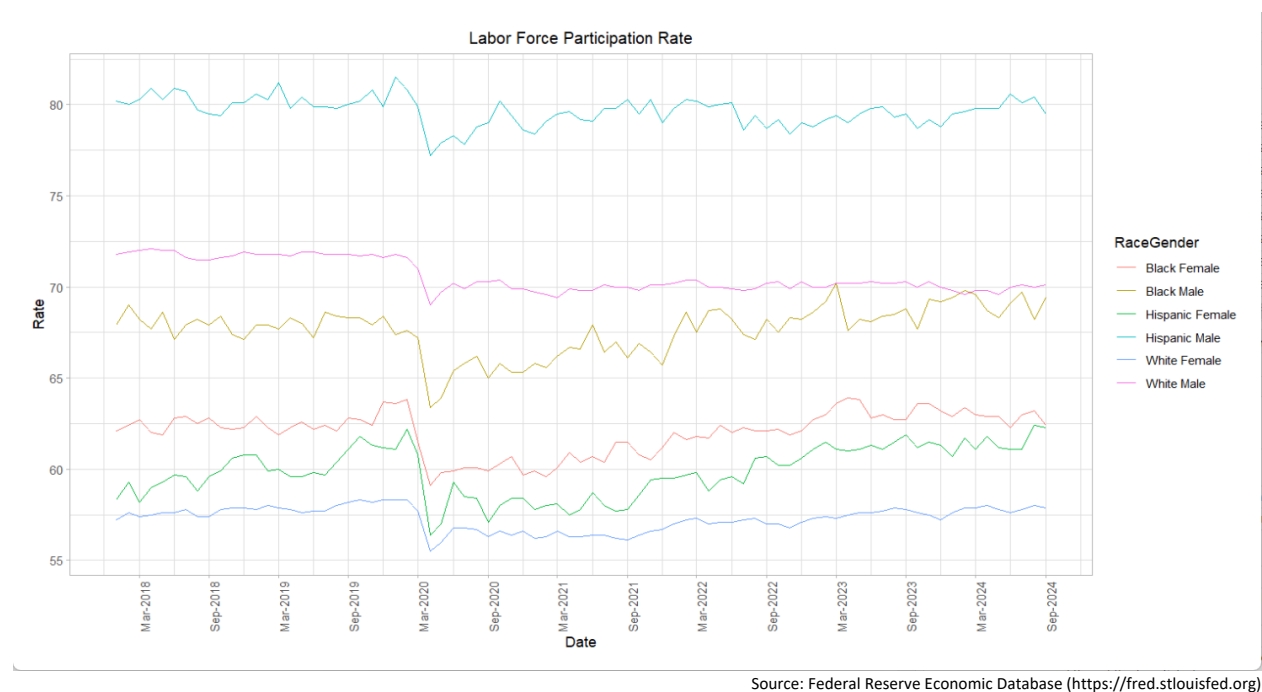


Figure 24: US Employment to Population Ratio (%)



Figure 25: Labor Force Participation Rate by Gender and Race



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

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. “Avian flu” (strain H5N1) has been recently reported as being found in cattle⁴, a jump to mammals that concerns scientists about it pervasively making its way into humans⁵.

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. In the recent past, the U.S. has made allegations against foreign governments that there has been interference in federal elections (and caused social unrest) by using freely available social networks. Further, we are expecting to see interference from domestic and foreign forces using artificial intelligence during the upcoming U.S. Presidential election⁶. 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: Over the past five years, sophisticated attacks on businesses have (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.”⁷ In 2023, it is believed that 10% of all entities were attacked with ransomware⁸, with an average cost of about \$5.1M per breach globally⁹.

⁴ <https://www.cdc.gov/bird-flu/situation-summary/mammals.html>

⁵ https://www.cdc.gov/bird-flu/situation-summary/index.html?CDC_AA_refVal=https://www.cdc.gov/bird-flu/php/avian-flu-summary/index.html

⁶ See <https://apnews.com/article/artificial-intelligence-elections-disinformation-chatgpt-bc283e7426402f0b4baa7df280a4c3fd>

⁷ See <https://us.norton.com/internetsecurity-malware-ransomware-5-dos-and-donts.html>

⁸ <https://blog.checkpoint.com/research/check-point-research-2023-the-year-of-mega-ransomware-attacks-with-unprecedented-impact-on-global-organizations/>

⁹ <https://www.fisherphillips.com/en/news-insights/ransomware-costs-businesses-record-high-1-billion-in-2023.html#:~:text=Not%20including%20the%20payouts%2C%20the,a%2013%25%20increase%20from%202022.>

4. Societal Unrest, including Domestic Social Changes and Terrorism: Since 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.¹⁰
5. Unanticipated Changes in Leadership: As we saw in early August, there are different ways in which changes in leadership may occur. Most recently, Kamala Harris was surprisingly thrust onto the campaign trail after a poor debate performance against former President Trump by President Biden¹¹. We have previously speculated about the possibility of health issues by either President Biden, or former President Trump, but changes in the country's leadership by any means will likely have a disruptive impact.
6. Supply Chain Disruptions: The blockage of the Suez Canal by the tanker Ever Given in March 2021 highlighted the fragility of certain key bottlenecks in distribution of many goods, including paper products, oil, and food¹². Now, shipyard workers on the Eastern seaboard and Gulf Coast voted to strike in October 2024, which will hamper at least 50% of imports into the US¹³. (They have subsequently returned to work until January 2025 after initial positive responses regarding their demands.¹⁴) These ports import a variety of goods including technology, textiles, and perishable goods (including food & medical supplies). If another event such as these workers returning to strike, the impact will likely resemble the situation from mid-2020 when ports slowed to a crawl due to shortages of workers to unload transport vessels, and inflationary conditions¹⁵; significant layoffs across the economy could also result if manufacturers are not able to export their goods¹⁶.
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 & Nevis¹⁷. Ecuador, Senegal, and China have canceled or withdrawn their currencies¹⁸. Along these lines, on January 10, 2024, the SEC approved the listing and trading of a number of spot bitcoin exchange-traded product (ETP) shares¹⁹.
8. Global unrest: As we have now seen, Russia's (now stagnant) invasion of the Ukraine has led to a dramatic impact on the energy and grain sectors globally²⁰. The impact of the Israel's current

¹⁰ See <https://www.insurancebusinessmag.com/us/risk-management/news/global-civil-unrest-on-the-rise-as-costofliving-crisis-intensifies-449683.aspx>

¹¹ <https://www.brookings.edu/articles/bidens-debate-performance-threatens-his-ability-to-win/>

¹² <https://www.nytimes.com/2021/07/17/world/middleeast/suez-canal-stuck-ship-ever-given.html>

¹³ <https://www.cnn.com/2024/09/30/ports-strike-truckers-rails-billions-in-cargo-shutdown.html>

¹⁴ <https://www.cnn.com/2024/10/03/business/port-strike-union-deal/index.html>

¹⁵ <https://apnews.com/article/port-strike-ila-dockworkers-begins-e5468e760f46a64e4322d1702beb1f72>

¹⁶ <https://abcnews.go.com/Business/looming-port-strike-fuel-inflation-cause-layoffs-experts/story?id=114070962>

¹⁷ <https://www.atlanticcouncil.org/cbdctracker/>

¹⁸ Ibid.

¹⁹ See <https://www.reuters.com/technology/spot-bitcoin-etfs-start-trading-big-boost-crypto-industry-2024-01-11/> and <https://www.sec.gov/news/statement/gensler-statement-spot-bitcoin-011023>

²⁰ <https://www.brookings.edu/articles/how-would-trump-and-harris-handle-the-russia-ukraine-war/>

conflict(s) (with Hamas, Lebanon, and Iran) has also been speculated as impacting global economies²¹. Speculation regarding Iran's motives entails that Iran is interested in furthering its nuclear weapons program in order to supply arms to Russia to help with their aforementioned conflict in Ukraine²². Regardless, Iran's unwillingness to work with the International Atomic Energy Agency (as called for by a United Nations resolution)²³ is causing concerns that could lead to actions that would significantly alter the U.S. consumer's economic balance, directly and indirectly.

²¹ <https://www.washingtonpost.com/world/2024/09/30/israel-lebanon-hezbollah-hamas-war-news-gaza/> and <https://www.nytimes.com/live/2024/10/01/world/israel-lebanon-hezbollah>

²² <https://www.heritage.org/middle-east/report/iran-inching-toward-nuclear-weapons-breakout-what-does-mean-the-united-states>

²³ Per <https://www.iaea.org/sites/default/files/24/06/gov2024-39.pdf> and https://www.iaea.org/sites/default/files/unsc_resolution2231-2015.pdf

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 ... U.S. 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 following²⁴:

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)

²⁴ 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 130 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 ²⁵
1-month, 3-month, 6-month, and 3-year Treasury yield	... depends on ...	1-year Treasury yield
5-year Treasury yield		3-year Treasury yield*
7-year Treasury yield		5-year Treasury yield*
10-year Treasury yield		7-year Treasury yield*
20-year and 30-year Treasury yield, and		10-year Treasury yield*
30-year Mortgage rate		7-year Treasury yield*
Moody’s AAA yield		30-year Mortgage rate*
Prime Rate		1-year Treasury yield

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

²⁵ 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

The Gross Domestic Product (GDP) of the US (or another country, or portion thereof) is the value of goods and services produced and sold. “Nominal” and “real” versions of GDP reflect the value of those goods and services with the effects of inflation (using then “current day \$”) and without the effects of inflation (using “chained \$” that are pegged to a particular time). GDP is generally examined as a combination of subcategories of production: personal consumption, investment, government spending, imports, and exports. The difference in nominal GDP and real GDP is significantly affected by interest rates that are adjusted by central banks (the Federal Open Market Committee, or “FOMC”, in the US).

Annualized GDP is reported to have increased by 3.0% in 2Q2024, the ninth consecutive quarter of increased GDP²⁶. Nominal quarterly income increased by \$315B, and earnings were also up. Real Gross Domestic Product was up by 3.0% between 2Q2023 and 2Q2024²⁷, with nominal GDP up by 5.43% over the same period²⁸. This increase was driven by increased consumer spending, and residential *and* commercial real estate investments²⁹.

Disposable personal income increased by \$260.4 billion ($\pm 5.0\%$) in 2Q2024, while real disposable personal income increased by 2.4%³⁰.

Looking at Figure 27, we see that the Q/Q percent change of the components contributing to overall GDP are tightly concentrated with Personal Consumption and Government Spending being the most concentrated segments. However, we also look at Figure 28 to determine the relative scale of each component, and the likelihood of it impacting the overall GDP figures; therein, we see that Personal Consumption is approximately an order of magnitude greater than the other components, and has been so since 2015. More notably, we see the rate of increase of Personal Consumption is worryingly steeper than any other component since the COVID-19 pandemic, increasing by an average of almost \$300B ($\pm 2\%$) per quarter since mid 2021.

²⁶ See <https://www.bea.gov/news/2024/gross-domestic-product-state-and-personal-income-state-2nd-quarter-2024> and <https://finance.yahoo.com/news/gdp-us-economy-grows-at-3-annualized-pace-in-second-quarter-123353258.html>

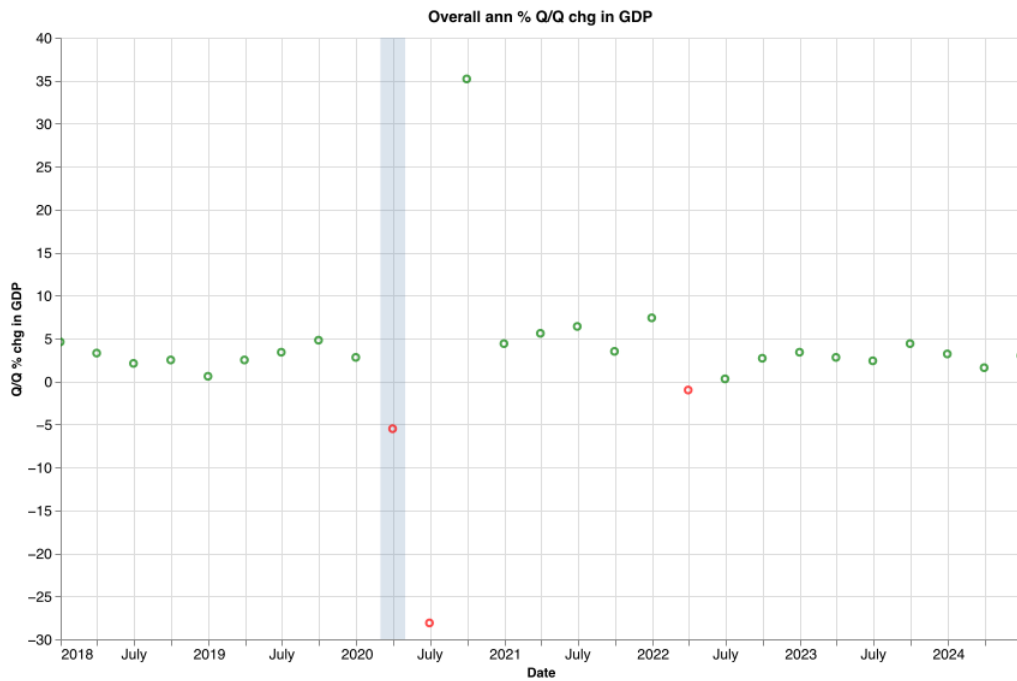
²⁷ <https://fred.stlouisfed.org/series/GDPC1>

²⁸ <https://fred.stlouisfed.org/series/NGDPSAXDCUSQ>

²⁹ <https://www.bea.gov/news/2024/gross-domestic-product-third-estimate-corporate-profits-revised-estimate-and-gdp-0>

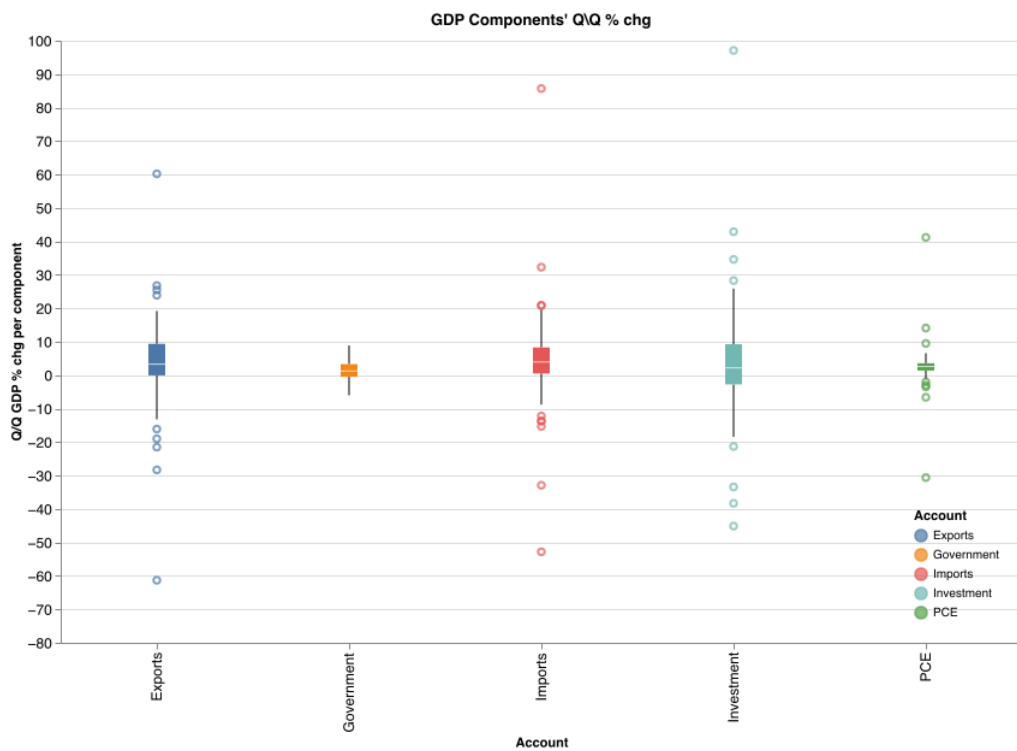
³⁰ Ibid.

Figure 26: Annualized % Q/Q change in US GDP



Source: Author's calculations

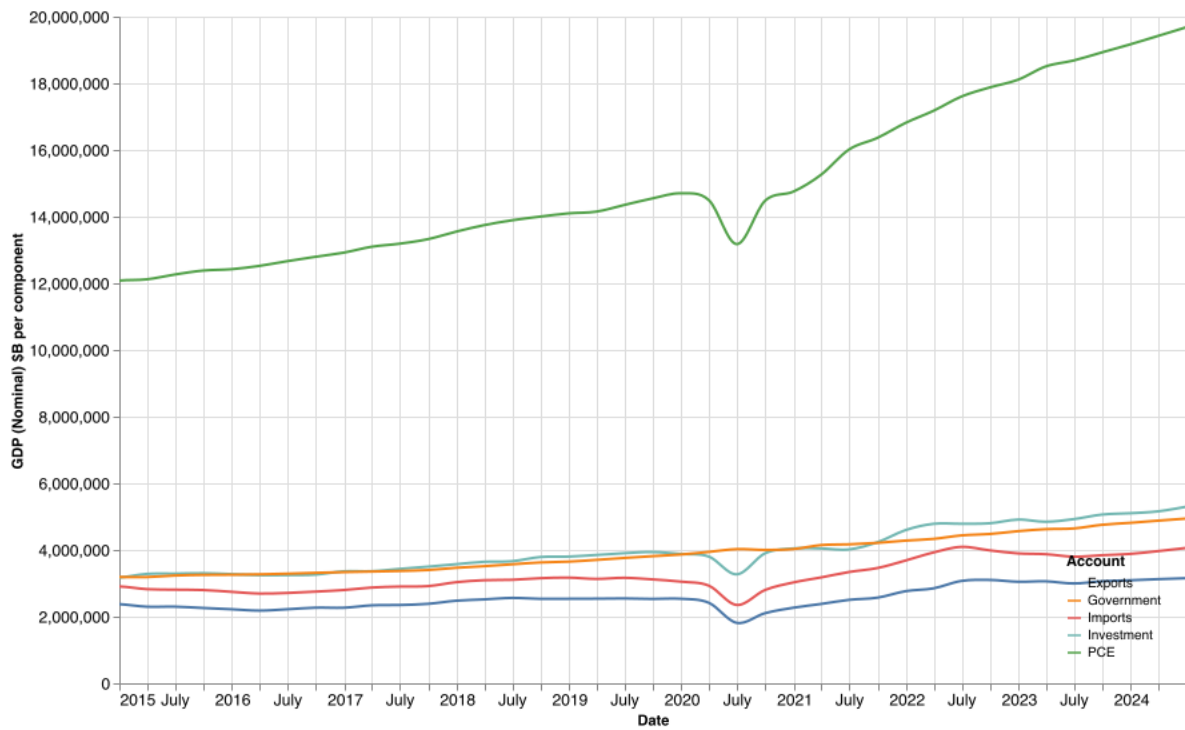
Figure 27: GDP Components' Historical Q/Q % change (since 1Q2000, inclusive)



Source: Author's calculations

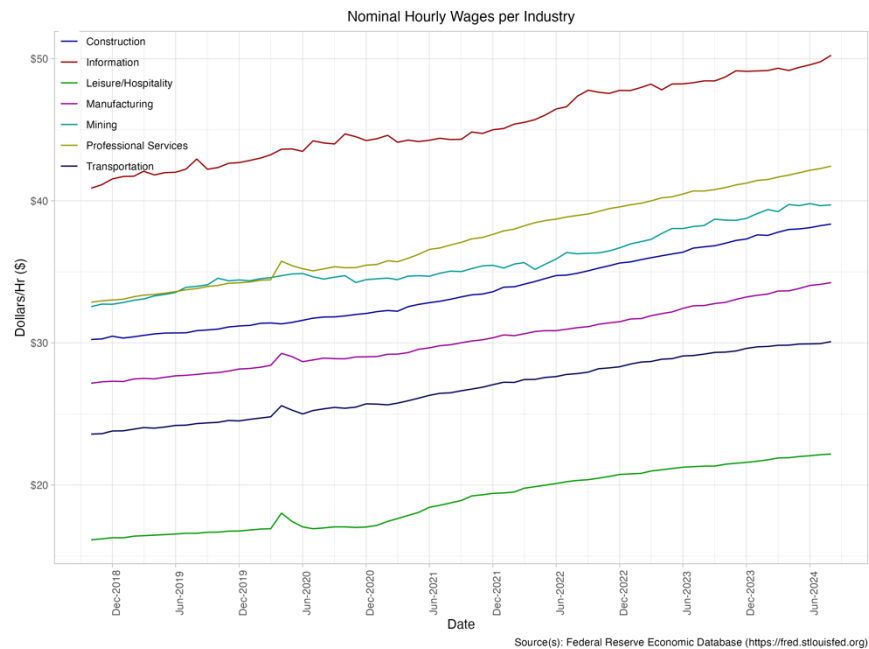
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Figure 28: GDP Quarterly Component Size [\$B]



Source: Author's calculations

Figure 29: Nominal Hourly Wages per Industry



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

We have previously reported that wages have been remarkably volatile since the pandemic, and how many employees have been very willing to change employers in order to optimize their earning potential and benefits. This point dovetails with our previous comments regarding Americans' dissatisfaction with the economy. Average wages across several industries are shown in Figure 29; the wages shown are the monies that drive much of the consumption shown. However, the growth rate of wages shown (ranging from \$4 per hour to \$7 per hour over the preceding three years is not close to sustaining this rate. We have also previously reported that COVID stimulus funds have been depleted, and the press is reporting the fervor around employees retaining the flexibility and economics of "work from home" arrangements³¹; several large companies are mandating "return to office" terms including Apple, Amazon, Blackrock, Goldman Sachs, Walmart, and Zoom³².

So the question becomes one of "where is the money coming from?" From Figure 30 and Figure 31, we see that mortgages are the predominant source of debt, rising by \$106B per quarter since it bottomed out in 2Q2013, and \$156B per quarter since YE2019 (the beginning of the COVID-19 pandemic)³³. Since HELOCs are approximately half of what they were after the 2008 crisis, we cannot infer that mortgages are being used as a transient source of capital (akin to a revolving credit line) for consumers. Instead, we see that credit card debt has risen from \$660B at YE2012 to \$1.14T today³⁴ (1.73x in just over 10 years, 1.38x when accounting for inflation per FRED³⁵), and car loans have grown from \$700B in 2Q2010 to \$1.6B today³⁶ (almost 2.3x in 13 years, 1.86x when accounting for inflation³⁷). We also notice that student loans (in current-day dollars) have approximately doubled since 2010, a point that also concerns us.

The point of the discussion is to note that total cumulative debt has increased by over \$100B during 2Q2023. The number of employed people in the US is approximately 161.43M³⁸, with the average accrued income per employee being almost \$1200 per week (i.e., \$14,400 per quarter). Quick calculations lead us to a disturbing conclusion: an increase of debt by 4.35% of the total earnings across the population during 2Q2023 (i.e., prior to the recent rate adjustments by the FOMC). While Y/Y inflation declined to 3.2% in 2Q2024³⁹ and annualized core inflation (i.e., excluding food and energy prices) dropped to 3.43% in 2Q2024⁴⁰, the debt amassed by consumers during the pandemic and subsequent years is still a significant anchor to growth. Government debt (in a country with a strong credit rating) can be refinanced easily, but consumer debt is not as easily managed.

Per Figure 32, we note that debt delinquencies appear to be increasing, and have been since mid-2021. (The percentage of "current" balances dropped to 88.1% in 2009, peaked in mid-2022 at 97.5%, and are now 96.8%.) While significant delinquencies are not at the levels seen during the 2008 "housing crisis", we see that earning capacity first appeared strained in 2021, and we see that "significantly impaired" debt has been increasing since 3Q2022. Since we are not seeing significant increases in 60-day, 90-day,

³¹ See <https://fortune.com/2024/09/29/amazon-employees-angry-andy-jassy-rto-mandate/>

³² <https://www.businessinsider.com/companies-requiring-return-to-office-rto-mandate> ; <https://www.forbes.com/sites/jasonwingard/2024/09/27/amazon-killed-remote-work--is-rto-the-new-normal/> ; and <https://www.forbes.com/sites/karadennison/2024/07/10/how-return-to-office-policies-are-impacting-employees-in-2024/>

³³ <https://www.wsj.com/finance/americans-credit-debt-spending-interest-rates-f3836f23>

³⁴ See <https://www.newyorkfed.org/microeconomics/hhdc> for analyzed data

³⁵ <https://fred.stlouisfed.org/series/CPIAUCSL>

³⁶ See <https://www.newyorkfed.org/microeconomics/hhdc> for analyzed data

³⁷ <https://fred.stlouisfed.org/series/CPIAUCSL>

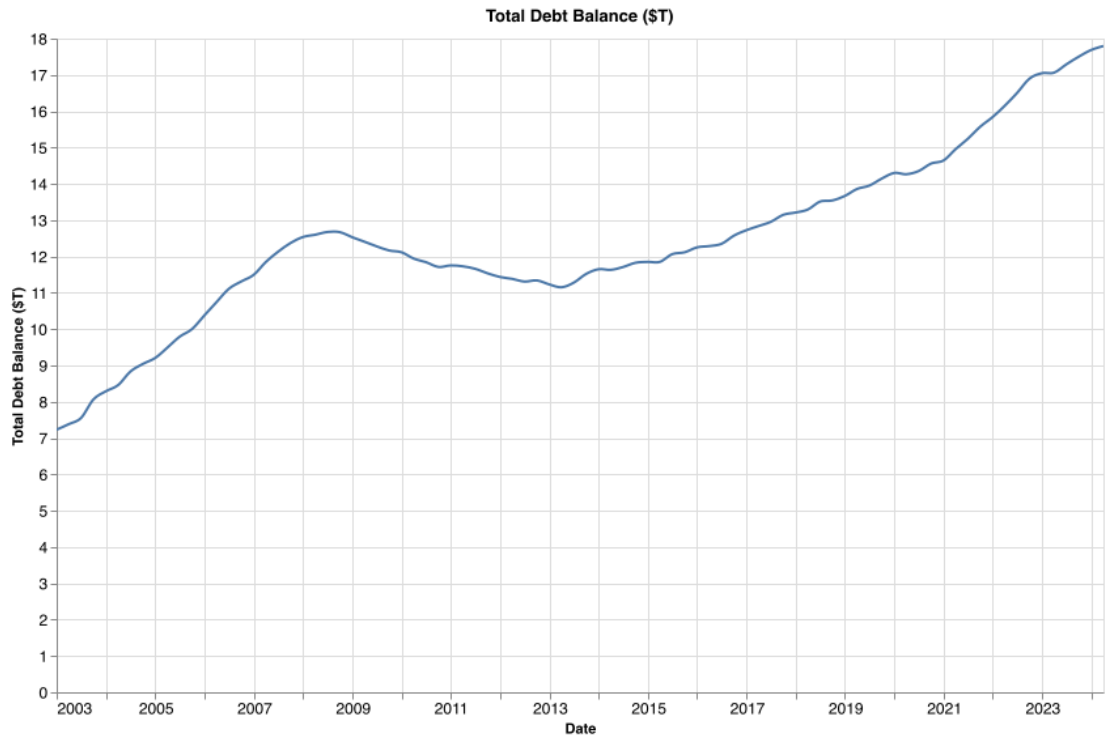
³⁸ https://ycharts.com/indicators/us_employed_persons.

³⁹ <https://fred.stlouisfed.org/series/CPIAUCSL>

⁴⁰ <https://fred.stlouisfed.org/series/CPILFESL>

and 120-day late loans at the expected levels, it appears that lenders are still remembering the lessons of 2008, and are trying to remain cognizant of their portfolios post-pandemic.

Figure 30: Total Debt Balance (\$T)



Source: NY Federal Reserve Bank (<https://www.newyorkfed.org/microeconomics/hhdc>)

Figure 31: Debt Balance Composition (\$T)

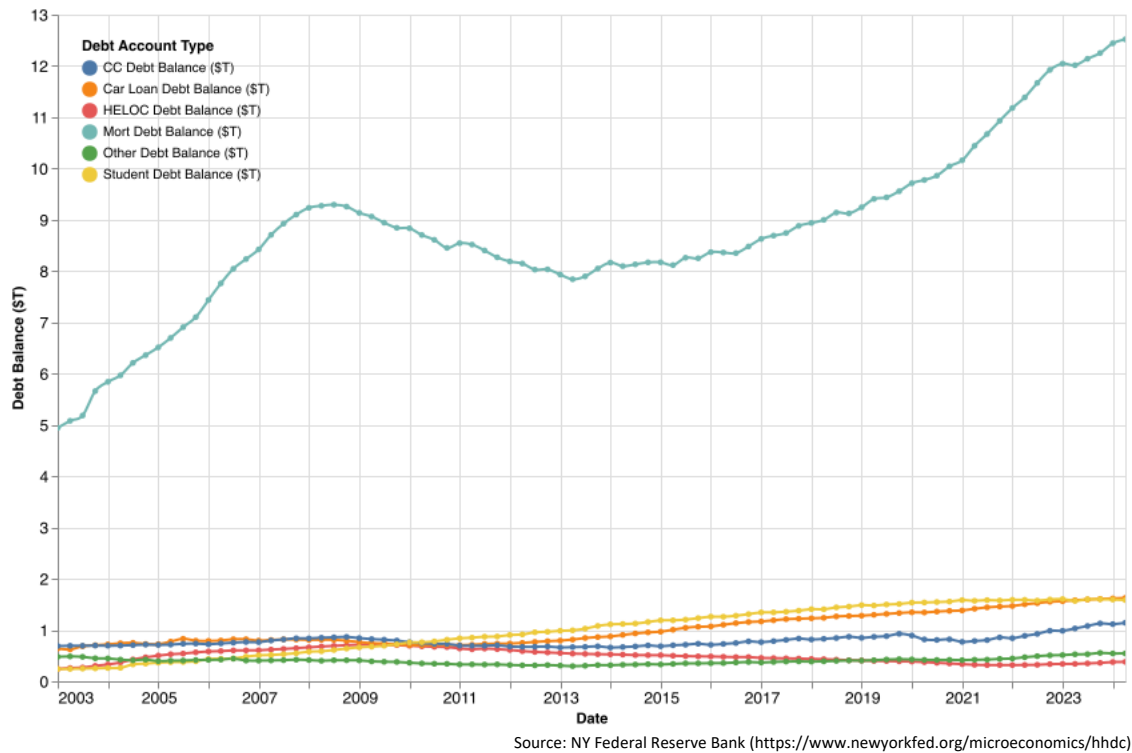
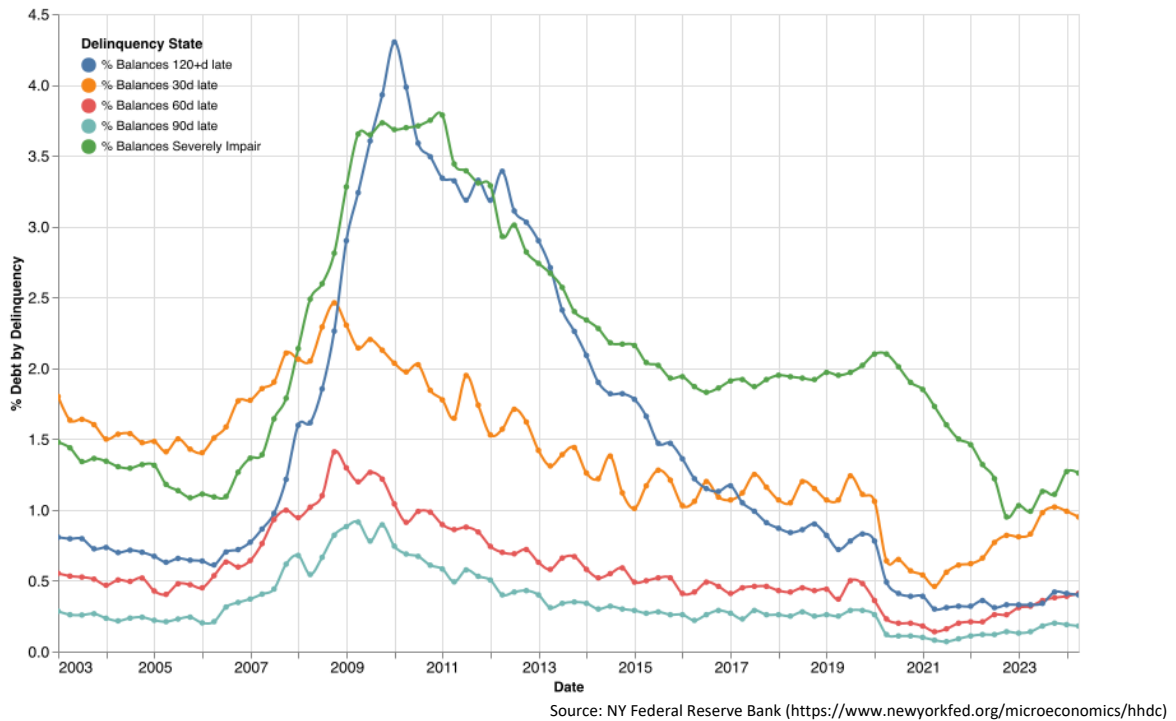


Figure 32: Delinquency Rates by Delinquency Period

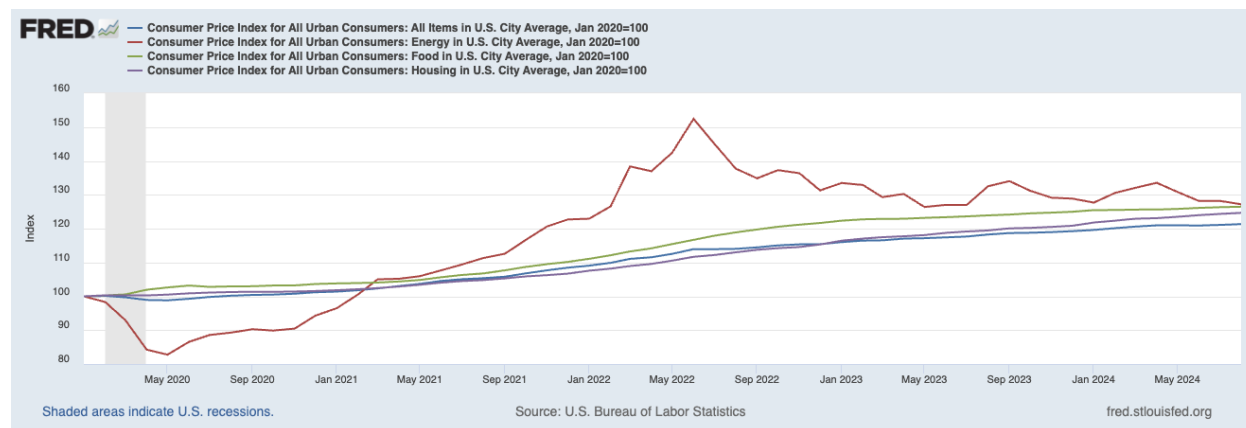


This leads us to comment on inflation. During and after the pandemic, we saw extremely volatile prices for energy, first dramatically dropping as the population became primarily “home bound”, and then

rising as retarded supplies needed to be redrawn. Per our previous comments, energy prices appear to be stabilizing around a 30% premium above early 2020 prices and remaining there for the past year. Food and housing are both gradually levels out to more predictable growth levels. Since mid-2022, overall inflation appears to be growing by an average of about 0.5% M/M, which is a decrease since early 2022. Inflation dropped to 2.4% from October 2023 through September 2024⁴¹.

While we expect real GDP to stay around 2.75% to 3.0% in the near-term, we believe that consumer spending will wrestle with ongoing inflation and the re-alignment of spending and saving habits. The increase in delinquencies gives us pause, and makes us believe that gradual declines in spending that accompany selective spending and cautiousness (see Figure 34 and Figure 35) should be expected.

Figure 33: Change in CPI since Jan. 2020 for All Items, Energy, Food, and Housing



⁴¹ <https://www.washingtonpost.com/business/2024/10/10/september-inflation-cpi/>

Figure 34: US Consumer Sentiment

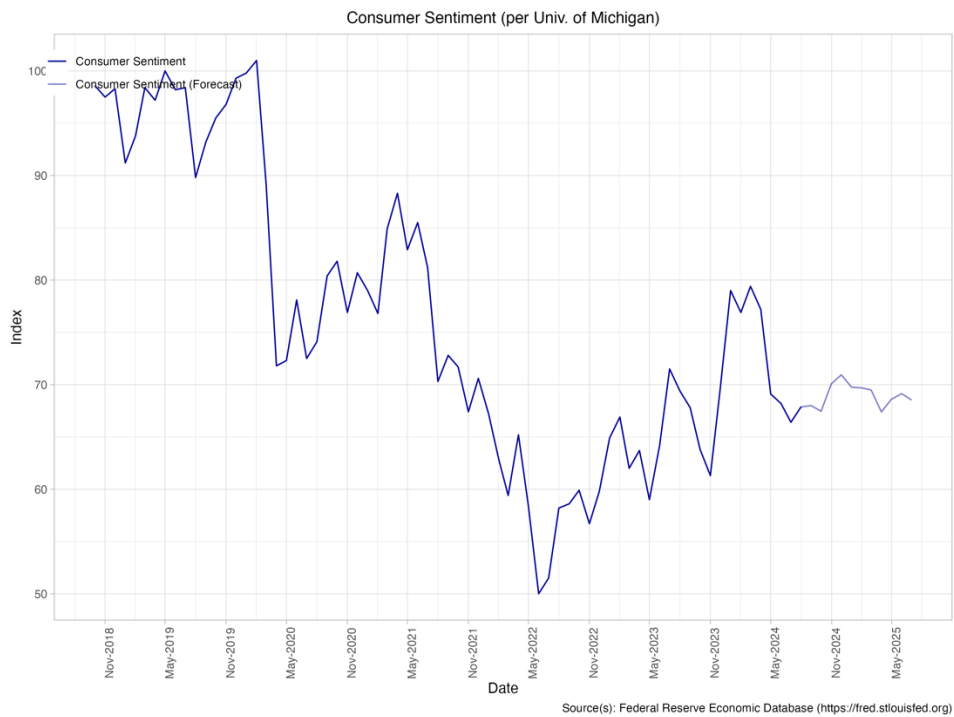
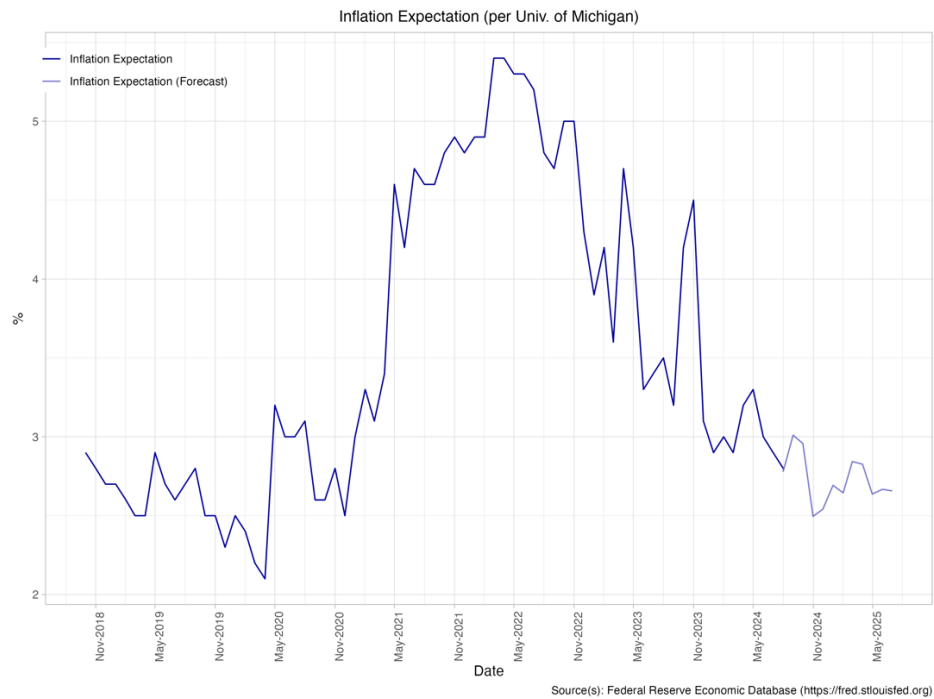


Figure 35: US Consumer Inflation Expectations



Other Commentary

- “The Bureau of Economic Analysis's third estimate of second quarter US gross domestic product (GDP) was unchanged from the second estimate which had shown 3% annualized growth. Economists had estimated the reading to show annualized growth of 2.9%. The third estimate for second quarter GDP confirms that economic growth was higher than the 1.4% annualized growth seen in the first quarter. ... ‘The revisions only strengthen our conviction that the US economy will continue to expand at a decent pace over the coming year, which suggests labor market conditions are unlikely to deteriorate markedly from here,’ Oxford Economics deputy chief economist Michael Pearce wrote in a note to clients on Thursday. (<https://finance.yahoo.com/news/gdp-us-economy-grows-at-3-annualized-pace-in-second-quarter-123353258.html>; Sep 26, 2024)
- “Future economic growth is likely to be slower. Consumers have been reducing their savings in order to spend. The savings rate was just 2.9% in July, down from 3.5% in April, and is likely to rise over the next 12 months, which will cut into spending. Gains in consumer purchases of services have begun to slow as they become more cautious about their finances. The second quarter’s jumps in consumer purchases of home furnishings, business purchases of motor vehicles and federal defense spending were likely one-offs. (<https://www.kiplinger.com/economic-forecasts/gdp>; Sep 26, 2024)
- “The economy is projected to grow by 1.9 percent each year, on average, from 2023 to 2033. This rate is close to the average growth rates of the previous two decades but slower than those in the 1980s and 1990s. Growth rates for the labor force (those working or looking for work) followed a similar trend.” (<https://www.bls.gov/opub/ted/2024/projected-gdp-growth-linked-to-slower-labor-force-growth.htm>; Sep 24, 2024)
- “The outlook for the U.S. economy is more mixed than three months ago, according to 36 forecasters surveyed by the Federal Reserve Bank of Philadelphia. The panelists predict GDP will grow at an annual rate of 1.9 percent this quarter, down from 2.0 percent in the previous survey. However, the panelists revised upward their expectations for GDP growth in the fourth quarter of 2024 from 1.5 percent in the previous survey to 1.7 percent in the current survey. Overall, the forecasters revised upward their expectations for 2024 GDP growth on an annual-average over annual-average basis from 2.5 percent to 2.6 percent.” (<https://www.philadelphiafed.org/surveys-and-data/real-time-data-research/spf-q3-2024>; Aug 9, 2024)

Employment

Analysis

Employment has, as many have pointed out, been remarkably resilient since the end of the pandemic. The national unemployment rate was 4.0% during 2Q2024 (161.2M labor force participants⁴²), and has increased to 4.3% and 4.2% (on a monthly basis) since the end of the quarter⁴³.

Looking at

⁴² <https://www.bls.gov/charts/employment-situation/civilian-employment.htm>

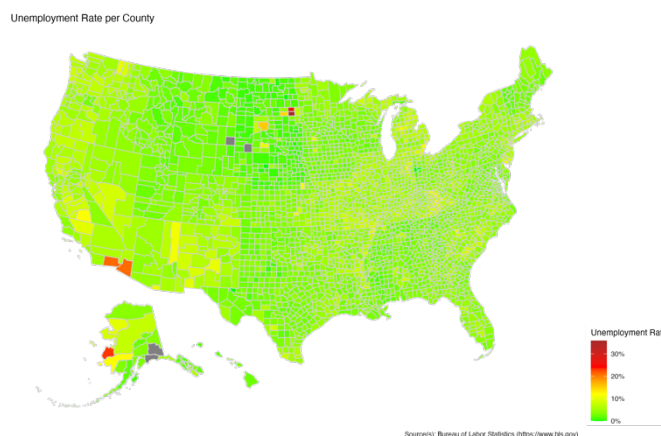
⁴³ <https://data.bls.gov/timeseries/LNS14000000> and <https://fred.stlouisfed.org/series/CE16OV>

Figure 36, the pockets of higher unemployment are even more sparse than in our previous analysis. Noting that the national unemployment rate has been reported as increasing since mid-2023, this increase is indicative of not only the fact that people are not keeping jobs, but it is also an indication that people are willing to express their interest in being part of the labor force; this expression is something that has been sporadic since the pandemic started in 2020.

A secondary indicator of the change in focus in the job market is the fact that, per the Bureau of Labor Statistics, the number of unemployed people per job opening has continued its trend of increasing since YE2022. It was at a lowest recent level of 0.5 people per job opening, but has increased to 0.9 people per opening as of July 2024.

While we will discuss the move of the FOMC to decrease targeted lending rates during Sep 2024 later in this paper, the FOMC claims a charter to help maintain the economic stability of the US, meaning that it not only (a) manages target interest rates imposed by the central bank branches, but it also (b) balances employment rates to ensure that widespread spending is maintained throughout the economy.

Figure 36: US Unemployment Rate per County (Sep 2024)



Tangentially related, two events have occurred while drafting this report that are significant to consider in light of employment, commercial supply chains, and the economy. First, shipyard workers on the Eastern seaboard and Gulf Coast have voted to strike⁴⁴, and are now returning to work (until January 2025)⁴⁵; if the strike had held, it would have hampered at least 50% of imports into the US, including food & medical supplies (and other perishable goods), clothing, electronics, automotive parts, and other types of products. The short-term impact will likely be substantially higher prices similar to the situation during the pandemic. Dockworkers are demanding pay increases, and stops to automation projects that threaten jobs.

⁴⁴ See <https://www.reuters.com/world/us/us-east-coast-dockworkers-head-toward-strike-after-deal-deadline-passes-2024-10-01/>

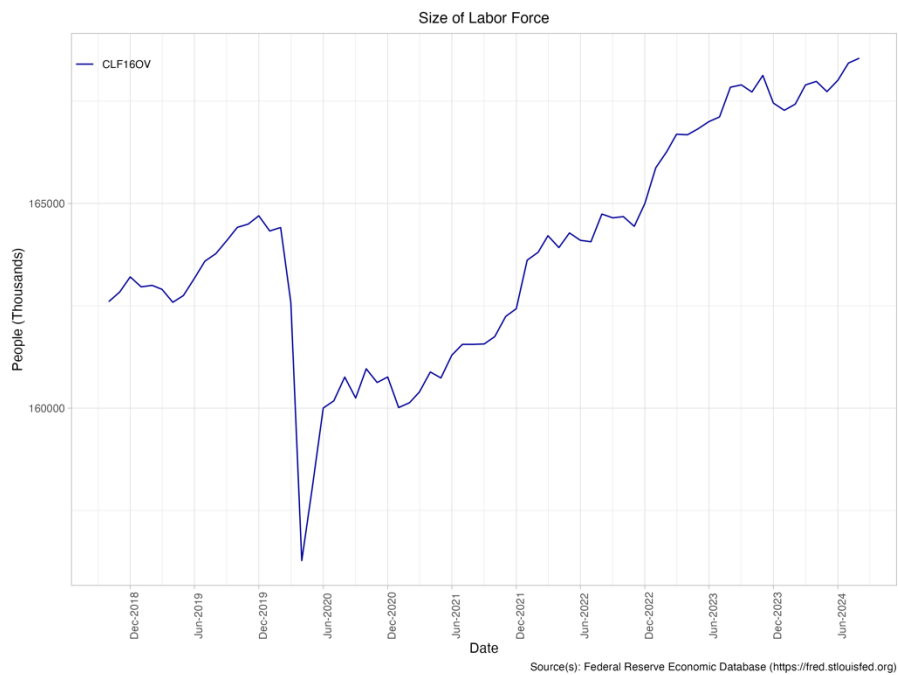
⁴⁵ <https://apnews.com/article/longshoremen-strike-ports-dockworkers-agreement-ila-f136bdcd52738e94f2938aaa79a1fa2a>

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Figure 37: US Unemployment Rate



Figure 38: Level of US Civilian Labor Force



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Figure 39: US Labor Force Participation Rate

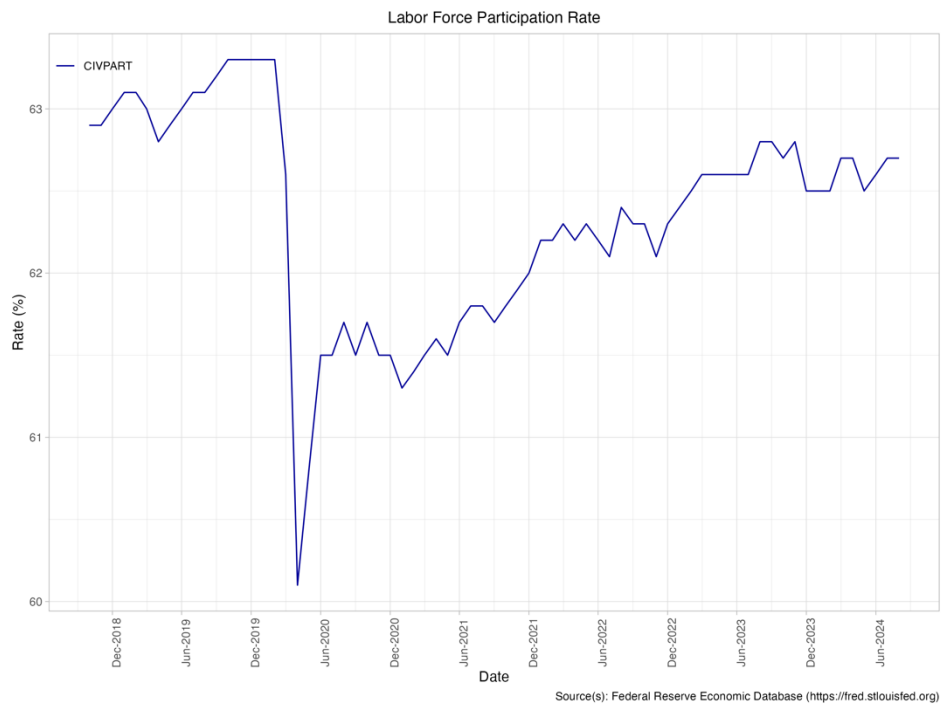


Figure 40: US Employment to Population Ratio (%)

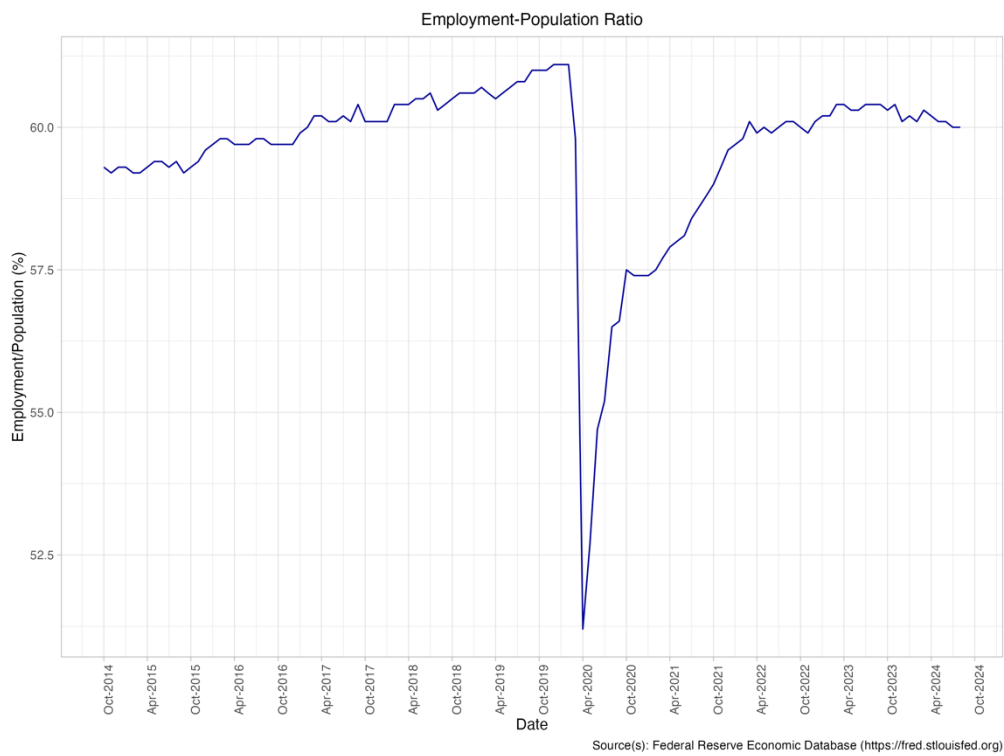
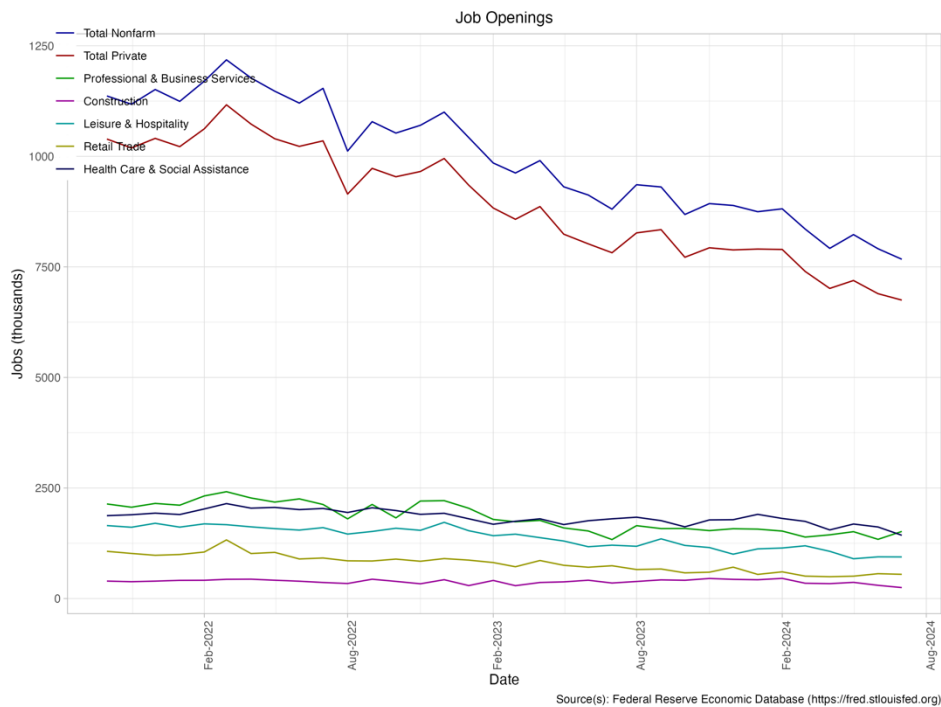


Figure 41: Job Openings



Second, tumultuous weather has had a significant impact on the US during this past month. Hurricane Helene came aground in Florida late on Thursday, September 26, 2024 near Perry, Florida⁴⁶. While it is still very early, current damage estimates for the storm are being placed between \$15B and \$26B, with economic implications rising to over \$100B; unfortunately, many of the losses will not be covered by insurance companies due to the nature of the event⁴⁷.

While the damage to property and loss of life are irreparable, another implication of this particular disaster is the impact on Spruce Pine, NC. Spruce Pine is one of a few sources in the world (and the only source in the US) of high-quality, high-purity quartz, which is essential to the semiconductor industry⁴⁸. It has been called “home to the purest quartz on the planet.”⁴⁹ Without Spruce Pine’s quartz, manufacturing chips for communication devices, military equipment & weapons, and automobiles will be substantially hampered, where still possible. Spruce Pine is currently estimating power to be restored by late-October, drinking water won’t be available until almost November, and usable infrastructure for transporting goods will likely be unavailable for “many months”⁵⁰. While semiconductor manufacturers may have “stocked up” on high-purity quartz prior to Helene’s devastation, we recall and point to the confluence of events during the COVID pandemic that hampered production of semiconductors⁵¹ to imagine the impact.

Finally, Hurricane Milton made landfall on October 9, 2024 near Siesta Key, FL, just south of Tampa; it had peaked with over 180 mph winds, generated tornadoes, and caused 13 foot storm surges as it went

⁴⁶ <https://www.nesdis.noaa.gov/news/hurricane-helene-makes-landfall-florida>

⁴⁷ <https://www.youtube.com/watch?v=Ot1BYJP8Dig>

⁴⁸ <https://www.npr.org/2024/09/30/nx-s1-5133462/hurricane-helene-quartz-microchips-solar-panels-spruce-pine>

⁴⁹ <https://www.newsobserver.com/news/business/article293265924.html>

⁵⁰ <https://www.washingtonpost.com/technology/2024/10/01/flooding-north-carolina-sand-quartz-electronics-supply-chain/>

⁵¹ <https://www.bbc.com/news/technology-56486242>

across the state. Milton had sustained winds of 120 mph at landfall, but its strength diminished to Category 1 as it moved inland across the state.⁵² Roughly one-third of Florida’s population was ordered to evacuate prior to landfall, and the ensuing congestion on interstates 75, 275, 4, and 95 (the main travel arteries out of Florida) brought average travel speeds to below 30 mph from Tampa to Gainesville, FL for evacuees⁵³. With Milton now having crossed completely over Florida, homes for three million people are currently reported as not having power, as of this writing⁵⁴. This storm alone is already expected to generate \$100B of losses for insurers to cover (with the possibility of \$250B of losses being eventually assessed)⁵⁵, and Milton is being estimated to be directly attributable for a 0.2%-0.4% negative impact on US GDP during 4Q2023⁵⁶.

Other Commentary

- “Spruce Pine [in North Carolina] supplies around 70 percent of the naturally occurring [high-purity quartz] that is needed for computing devices and products. The site’s market position and significance were underlined in 2019 when a manager for Quartz Corp, one of the two main mining companies that works the deposit, told the BBC: ‘Inside nearly every cell phone and computer chip you’ll find quartz from Spruce Pine.’” (<https://www.wired.com/story/hurricane-helene-shockwaves-semiconductor-industry-microchips-spruce-pine-north-carolina-sand-high-quality-quartz/>; Oct 1, 2024)
- “The Fed did raise its end-of-year unemployment rate forecasts for 2024 (by 0.4 percentage point to 4.4 percent), 2025 (by 0.2 percentage point to 4.4 percent), and 2026 (0.1 percentage point to 4.3 percent). ... Nonetheless, the [FOMC’s Summary of Economic Projects (SEP)] does not portend a surge in unemployment and projects that the unemployment rate will remain close to the natural rate over the next few years. Moreover, the SEP anticipates the 4.2 long-run unemployment rate will average just below the natural rate (~4.4 percent), portending a relatively healthy labor market ahead.” (<https://www.conference-board.org/brief/global-economy/fomc-analysis-sept-2024>; Sep 16, 2024).
- “Annual wage growth perked back up to 3.8% in August. Wage growth usually lags any slowdown in the labor market, but the declines in wage growth amid the labor market slowdown have been taking longer to develop than we expected. Look for pay raises to end the year at about a 3.6% annual rate. Wages of nonsupervisory employees are growing a bit faster, at 4.1%, and should end the year at a 3.8% pace.” (<https://www.kiplinger.com/economic-forecasts/jobs>; Sep 6, 2024)
- “On the employment front, the [Survey of Professional Forecasters] panelists have slightly lowered their expectations for the next three quarters compared with the previous survey. The forecasters see job gains at a monthly rate steadily decreasing from 143,900 in the current quarter to 116,200 in the second quarter of 2025. However, in the third quarter of 2025, the forecasters expect monthly job gains to bounce back to 145,800. Overall, annual-average projections for nonfarm payroll employment decreased from a monthly rate of 210,100 in 2024 to 130,000 in 2025, both lower than those in the previous survey. ... The forecasters predict the unemployment rate will most likely be in the range of 3.7 percent to 4.2 percent for 2024 and 2027, matching the expectations for the highest probability of the previous survey. However, for 2025 and 2026, the forecasters have shifted their highest unemployment rate expectations ... to

⁵² <https://www.cbsnews.com/news/hurricane-milton-florida-landfall-path-storm/>

⁵³ <https://www.nytimes.com/2024/10/08/weather/hurricane-milton-florida-evacuations.html>

⁵⁴ <https://www.nytimes.com/2024/10/10/business/dealbook/milton-cpi-inflation-economy.html>

⁵⁵ <https://www.reuters.com/business/finance/hurricane-milton-could-cost-insurers-60-bln-raise-reinsurance-rates-rbc-says-2024-10-09/>

⁵⁶ https://www.ey.com/en_us/insights/strategy/macroeconomics/assessing-hurricane-miltons-economic-impact

4.3 percent to 4.8 percent ...” (<https://www.philadelphiafed.org/surveys-and-data/real-time-data-research/spf-q3-2024>; Aug 9, 2024)

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.

Inter-bank loan rates will also track with the primary credit rate for overnight lending. The rate for inter-bank loans is generally driven by the target federal funds rate; the target federal funds rate is the target interest rate set by the Federal Open Market Committee (FOMC), and is intended as a guide for the rate at which commercial banks borrow and lend their excess reserves to each other on an overnight basis. The FOMC sets the target federal funds rate periodically based on key economic indicators that may show signs of inflation, recession, or other issues that can affect sustainable economic growth. The actual interest rate that a lending bank will charge is determined through negotiations between the two banks. The weighted average of interest rates across all transactions of this type is known as the effective federal funds rate.

Based on the most recent two “dot plots” from the FOMC Board of Governors’ meetings (Figure 42 and Figure 43), the Governors have slightly shifted their opinions (between their June 2024 and September 2024 meetings) as shown in Table 2.

Table 2: Changes in FOMC Board of Governors’ “Dot Plots” (June 2024 vs Sept 2024)

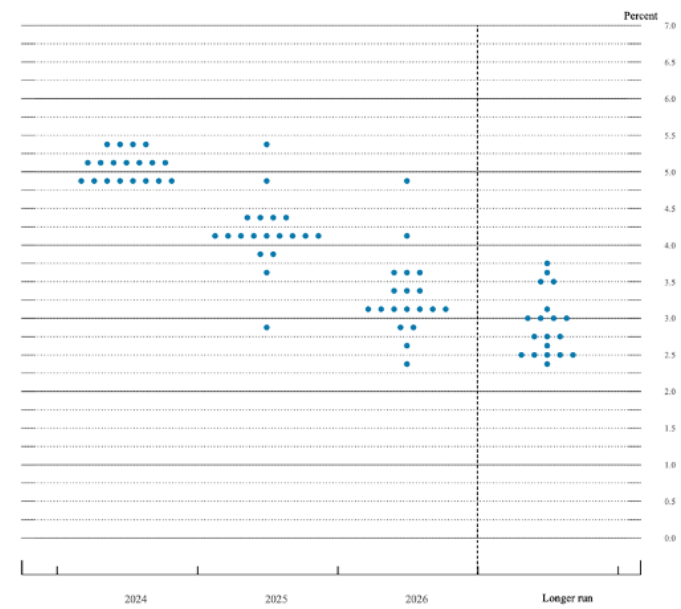
Year	June 2024 median	June 2024 range	September 2024 median	September 2024 range
2024	5.0 %-5.25%	4.75%-5.5%	4.25 %-4.5% (↓ 75bp from June)	4.0%-5.0% (↓ 50-75bp from June)
2025	4.0%-4.25%	2.75%-5.5%	3.25%-3.5% (↓ 75bp from June)	2.75%-4.25% (↓ 125bp from June)
2026	3.0%-3.25%	2.25%-5.0%	2.75%-3.0% (↓ 25bp from June)	2.25%-4.0% (↓ 100bp from June)

Since our last report, the Federal Reserve has significantly altered its stance, particularly for 2024 and 2025. Their new position, made after dropping rates by 50 bp during their September meeting, calls for another 50 bp rate drop by YE2024, meaning that their median position for YE2024 was 4.5%-4.75% in March, then 5.0%-5.25% in June (due to high consumer spending), and is now 4.25%-4.5% in September

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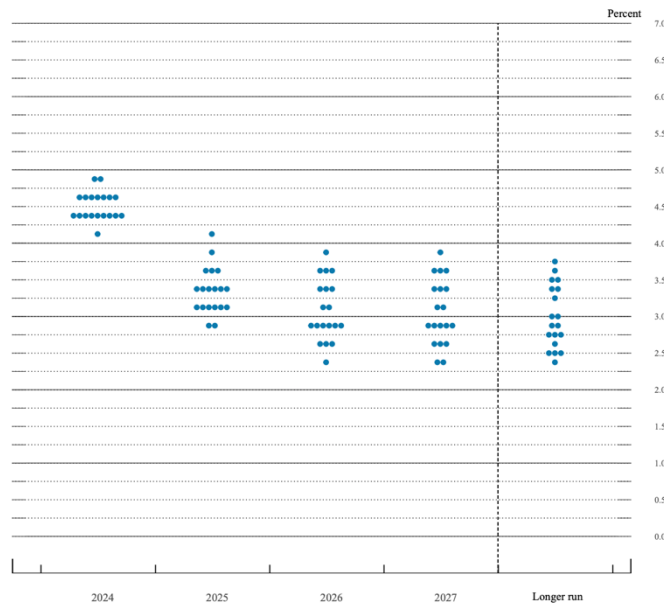
(attributed to two months of increased unemployment, and after a restatement of 818,000 estimated newly-created jobs⁵⁷).

Figure 42: FOMC "Dot Plot" from June 2024 Board of Governors' Meeting



Source: <https://www.federalreserve.gov/monetarypolicy/files/fomcprojtabl20240612.pdf>

Figure 43: FOMC "Dot Plot" from September 2024 Board of Governors' Meeting



Source: <https://www.federalreserve.gov/monetarypolicy/files/fomcprojtabl20240918.pdf>

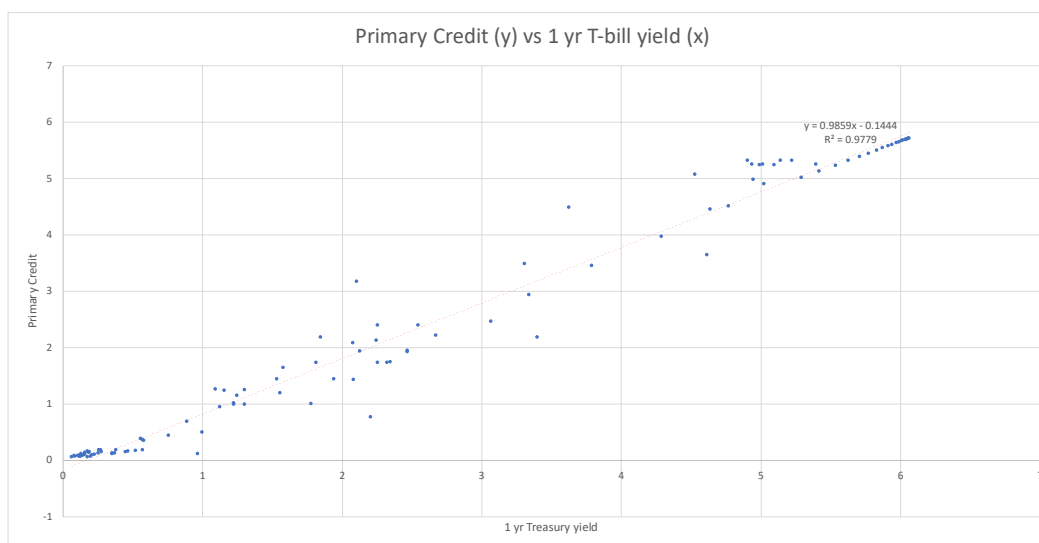
⁵⁷ <https://www.cnn.com/2024/08/21/economy/bls-jobs-revisions/index.html>

The premise behind the FOMC's strategy was to maintain higher interest rates until there was significant weakening of the job market. The restatement of fewer created jobs in several segments of private industry was interpreted as meaning that the economy was not as active as was originally thought, and was, in fact, weaker than original thought. This added perception of weakness, in conjunction with the FOMC's original sluggishness to act on what was then-considered "transitory inflation"⁵⁸, is likely what caused the FOMC to reduce rates by 50 bp instead of the originally projected 25 bp. Given the aforementioned job creation restatement, the unclear impact that the restatement will have on the FOMC's view of the economy, and the underlying concern of possibly holding rates at an unacceptably high level for too long, it appears that the FOMC is keeping their options open to possibly drop rates quickly in response to continued strong consumer spending.

Given that, we think that ***it is possible that the FOMC will drop rates by as much as 100 bp (to 4.0%-4.25%) by the end of 1Q2025.***

In Figure 44, we see the historical and projected relationship between the effective overnight lending rate and the 1-year T-bill yield.

Figure 44: Primary Credit, as a function of 1-year Treasury yield



Source: Authors' calculation

Other Commentary

- “Federal Reserve Chair Jerome Powell signaled Monday that more interest rate cuts are in the pipeline but suggested they would occur at a measured pace intended to support a still-healthy economy. ... His comments, at a conference of the National Association for Business Economics in Nashville, Tennessee, disappointed the hopes of many investors that the Fed would implement another steep half-point reduction in its key rate before the end of the year.” (<https://apnews.com/article/powell-federal-reserve-interest-rate-cuts-c8eed8640d8bd5b7fcb2a47ec70960e6>; Sept 30, 2024)

⁵⁸ See <https://thehill.com/business/4529787-yellen-regrets-saying-inflation-transitory/> and <https://www.cnn.com/2021/05/20/investing/inflation-stocks-economy-federal-reserve/index.html>

- “The Federal Reserve is likelier than not to deliver a second 50-basis-point interest rate cut in November, traders bet on Friday, after a government report showed U.S. inflation has cooled to a pace nearer to the central bank's 2% goal.” (<https://www.reuters.com/markets/us/traders-bet-second-straight-50-bps-fed-rate-cut-november-2024-09-27/>; Sept 27, 2024)
- “Expect future meeting cuts to be only a quarter-point each unless the economic situation worsens. The Fed’s ‘Summary of Economic Projections’ ... indicates that the Fed is not likely to repeat September’s large cut. The members of the Fed’s policy-making committee indicated that most saw only quarter-point cuts at one or both of the next two meetings, which will take place on November 7 and December 18.” (<https://www.kiplinger.com/economic-forecasts/interest-rates>; Sept 21, 2024)

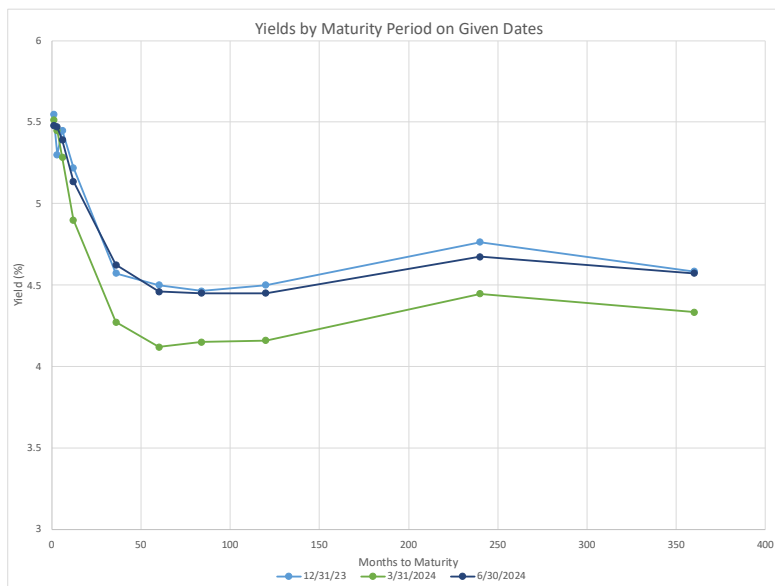
Treasury Yields (1, 3, & 6-month; 1, 3, 5, 7, 10, 20, & 30-year series)

Analysis

Yield curves are expected to rise in rates as maturity durations increase. For the past several years, however, we have seen the highest yields for the shortest durations, meaning that investors want to have relatively rapid access to their principal investments, and an indication that they are very concerned about the possibility of a recession.

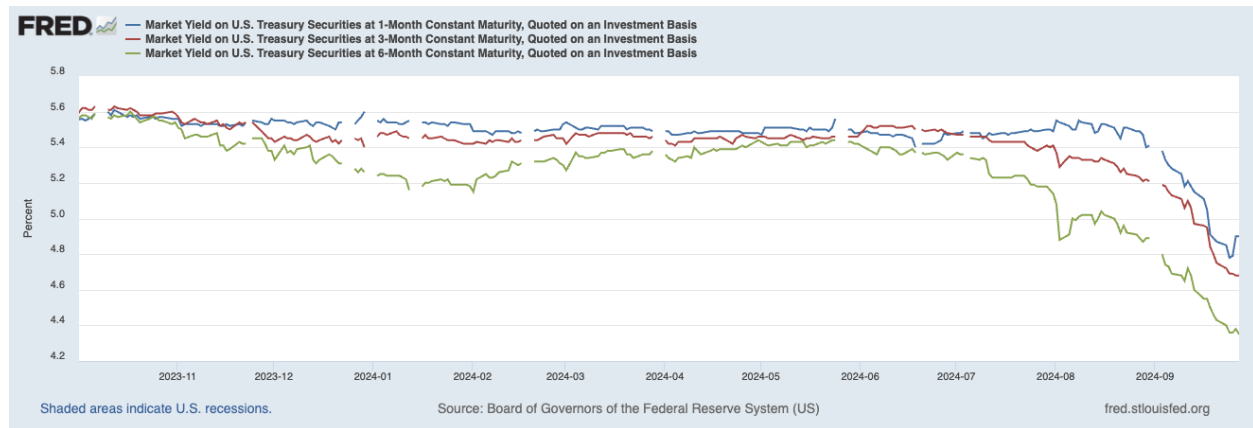
Recently, the peak yields have been offered for six-month to two-year commitments. As investors feel that we are approaching the “worst” point of the evolving economy (and the expectation is now that it is improving), shorter durations should and will peak. In fact, as of June 30, 2024, 1-month Treasury yields are only 1 bp higher than 3-month maturities. (See Figure 45.) Since then, the difference in yield for the two maturities has widened with 3-month Treasury yields falling faster than 1-month yields. A comparison of 1-month, 3-month, and 6-month yields over time is shown in Figure 46.

Figure 45: Historical Treasury Yield Curves as a function of time-to-maturity



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

Figure 46: Historical Yield for 1-month, 3-month, and 6-month Treasuries

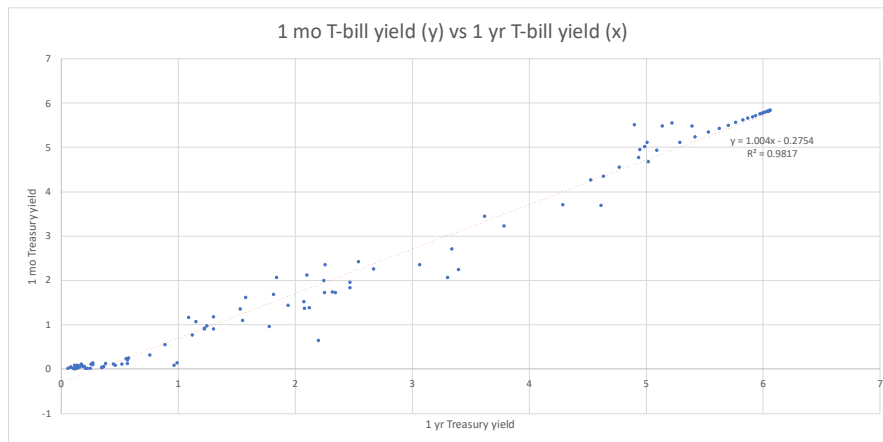


Returning to Figure 45, ***we do not expect the yield curve's shape to change significantly until at least YE2025***. Returns at the short end will remain high when compared to pre-pandemic yields, though we expect them to continue to falter if the FOMC is able to reduce their target yields without driving either inflation or unemployment up. Global, geo-political tension will also affect this possibility. We still view that the next milestone in for the yield curve will be flattening across all maturities, as investors attempt to reshape it.

As much as we would like to view the yield curve and the forces acting on the yield curve to be apolitical, it would be naïve to assume such. It is expected that the economic recovery that is currently being traversed will continue if Vice-President Harris wins the election this fall. If President Trump is re-elected, his policies will be neither passed nor felt immediately upon being sworn in, despite his extremely “pro-business” legacy. Similarly, it is not clear how treasury yields will react in response to his positions; it would seem reasonable to assume (given Trump’s past history) that pressure on financial, technology, and other sectors’ equities would be lessened, which would drive their returns up, and impose upward pressure on bond yields. However, the international forces that could come into play in response to political positioning that may be take could also significantly change that calculus.

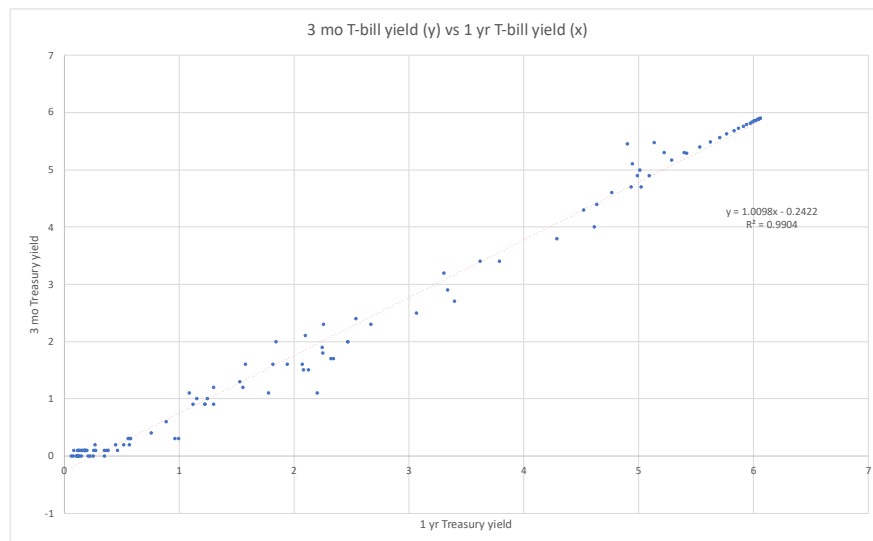
Figure 47 through Figure 55 illustrate the most significant correlations between Treasury yield rates.

Figure 47: 1-month Treasury yield rates, as a function of 1-year Treasury yield rates



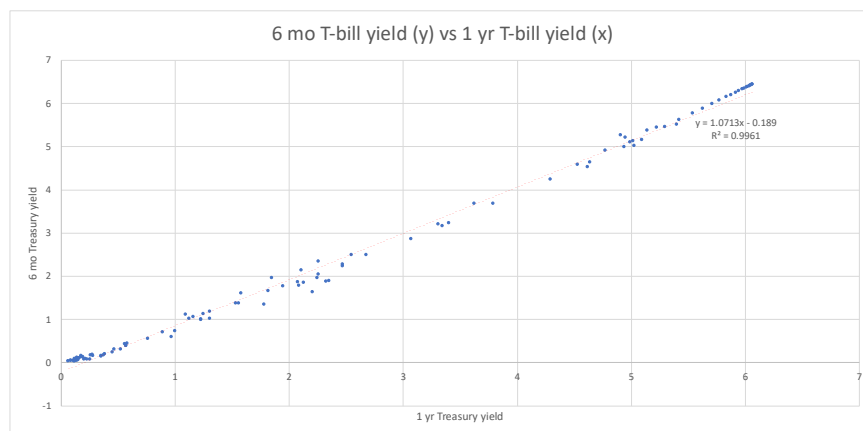
Source: Authors' calculation

Figure 48: 3-month Treasury yields, as a function of 1-year Treasury yields



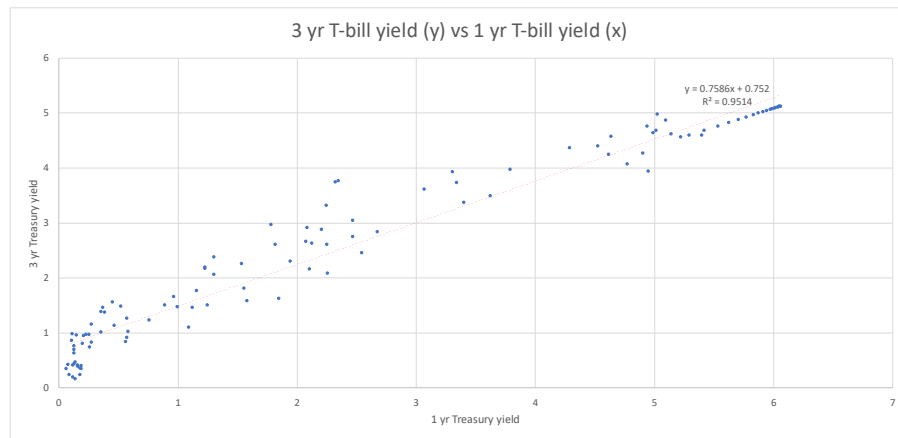
Source: Authors' calculation

Figure 49: 6-month Treasury yields, as a function of 1-year Treasury yields



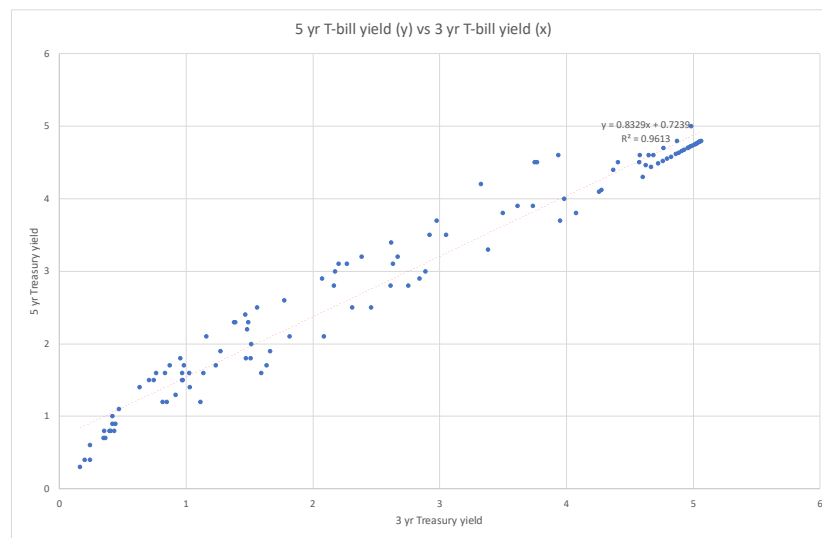
Source: Authors' calculation

Figure 50: 3-year Treasury yields, as a function of 1-year Treasury yields



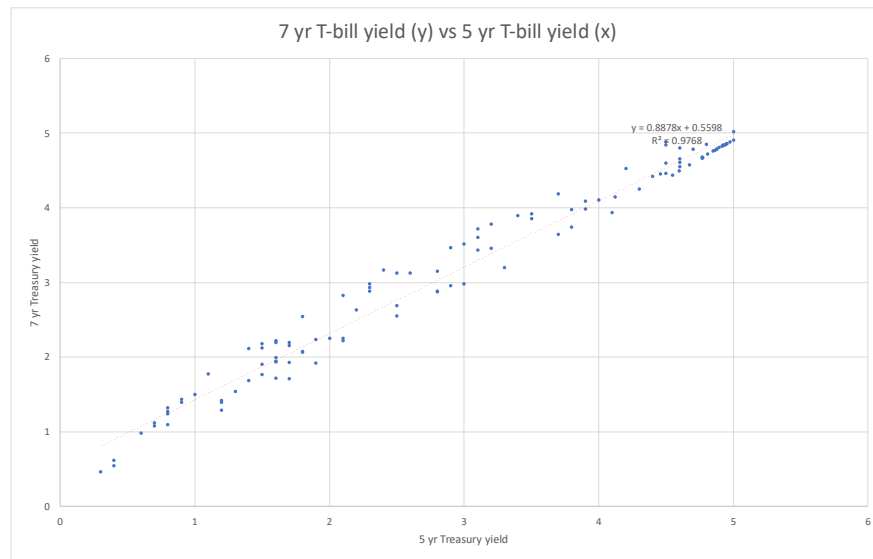
Source: Authors' calculation

Figure 51: 5-year Treasury yields, as a function of 3-year Treasury yields



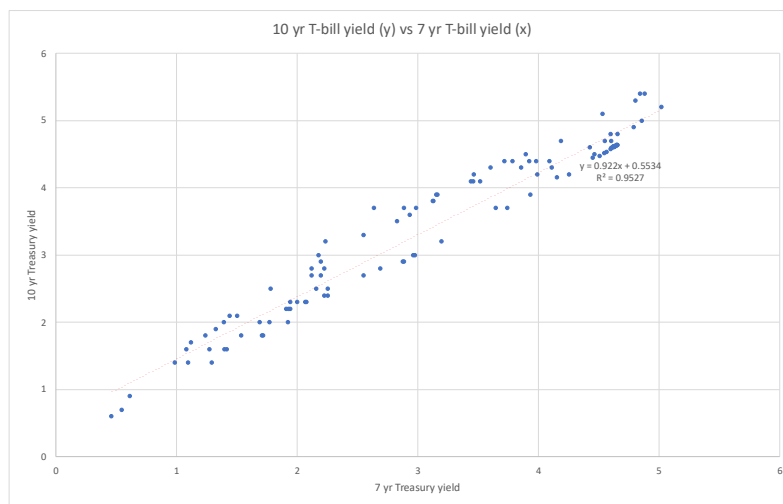
Source: Authors' calculation

Figure 52: 7-year Treasury yields, as a function of 5-year Treasury yields



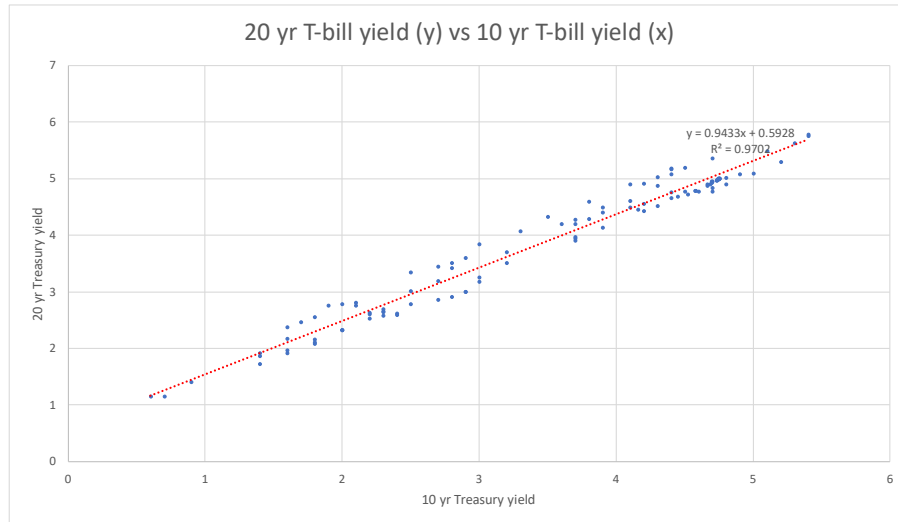
Source: Authors' calculation

Figure 53: 10-year Treasury yields, as a function of 7-year Treasury yields



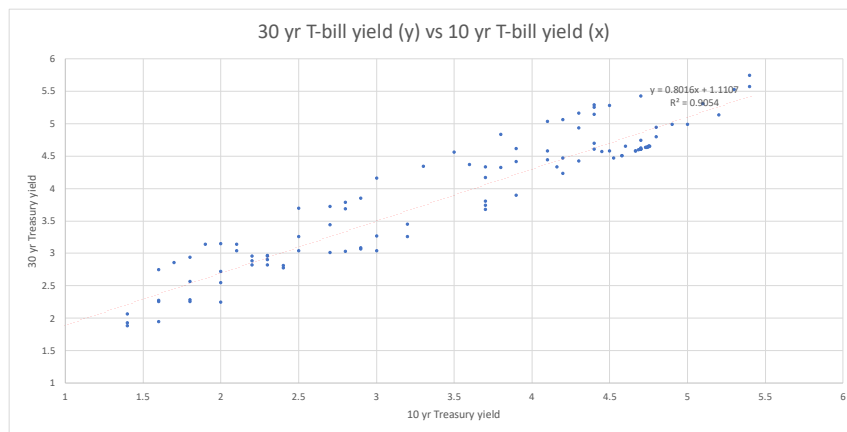
Source: Authors' calculation

Figure 54: 20-year Treasury yields, as a function of 10-year Treasury yields



Source: Authors' calculation

Figure 55: 30-year Treasury yields, as a function of 10-year Treasury yields



Source: Authors' calculation

Other Commentary

- “Over the year, bond yields declined significantly but remain notably higher than was the case at the start of 2022. Bill Merz, head of capital markets research at U.S. Bank Wealth Management, says three key factors are at play. “First is the Fed’s policy response to inflation. Second is the strength of the U.S. economy. Finally, an increasing supply of U.S. Treasury securities are coming to the market. ... New Treasury bond issuance is growing due to a combination of federal government that must be funded and the higher interest costs associated with today’s elevated interest rates,” says Merz. At the same time issuance is up, the Fed, as part of its monetary tightening policy, began allowing its large portfolio of U.S. Treasuries and agency mortgage-backed securities to mature. “That means other investors need to absorb the growing Treasury

supply,” says Merz. (<https://www.usbank.com/investing/financial-perspectives/market-news/interest-rates-affect-bonds.html>; Sept 30, 2024)

- “Long-term rates are likely to stay in the 3.5% to 4.0% range for a while. As short rates come down, long rates will not move in lockstep, because a faster-growing economy could stoke inflation fears among bond investors. There is also the pesky matter of the continuing inverted yield curve, the abnormal situation in which long-term rates are below short-term rates. Eventually, we expect that the yield curve will revert to upward-sloping, with long-term rates above short-term rates.” (<https://www.kiplinger.com/economic-forecasts/interest-rates>; Sept 21, 2024)

30-year Mortgage Rate

Analysis

Mortgage rates have been traditionally tightly correlated with mid-duration Treasury yields given the typical sources of funding and duration of held mortgages. Day-to-day, offered mortgage rates are driven by traditional supply-and-demand forces between mortgage providers, and they are also influenced by the releases of various metrics (and the reactions of investors).

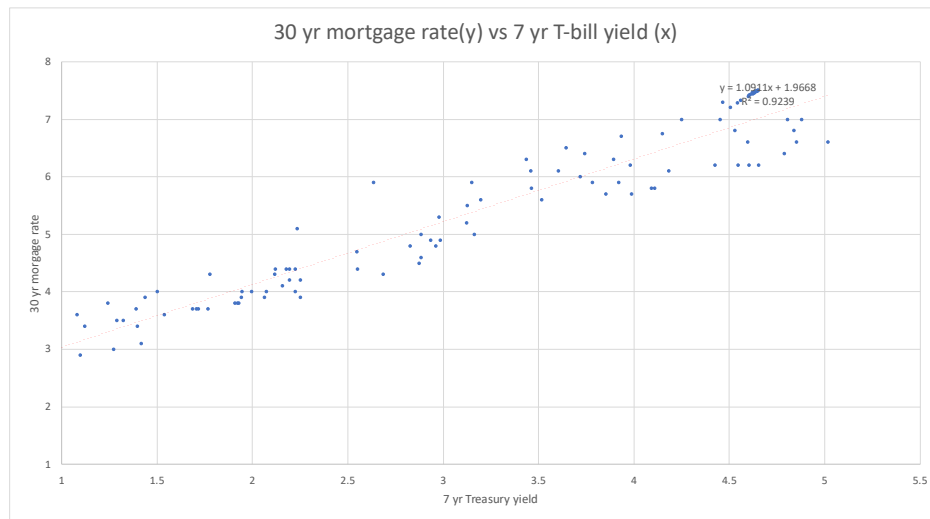
As of this writing, 30-year, fixed-rate mortgage rates are 6.08%, their lowest point since YE2023⁵⁹. Since these rates generally follow medium-duration bonds consistently, and those bonds follow the target Federal Funds rate (which was very recently dropped by 50bp per the FOMC). The FOMC has telegraphed that they could drop rates by as much as another 50bp by YE2024, so ***mortgage rates could stabilize between 5.5% and 6.0% before YE2024.***

As mortgage rates drop, pent-up demand for new mortgages and refinancings will continue to buoy rates. Additionally, the positioning by U.S. Presidential candidates in the coming months will likely impact the thinking of investors and buyers, affecting their respective concepts of where inflation will go during 2025 and beyond; while investors may bid up the yields on 10-year bonds (which will affect mortgage rates) based on candidates’ presentations in debates and polls, buyers may relent and execute sales.

See Figure 56 regarding the correlation between the US 30-year fixed-rate mortgage rates and 7-year Treasury yields.

⁵⁹ Per <https://fred.stlouisfed.org/series/MORTGAGE30US>, rates started 2024 at 6.62%, and peaked 7.22% in May of 2024

Figure 56: US 30-year (fixed rate) mortgage rate, as a function of a 7-year Treasury yield



Source: Authors' calculation

Other Commentary

- “The 10-year Treasury yield ended last week almost 8 basis points higher after the U.S. central bank lowered interest rates by 50 basis points on Wednesday. Markets had raised the probability of the outsized move ahead of the meeting, but the announcement came as a surprise to many economists. ... Federal Reserve Governor Michelle Bowman on Tuesday expanded on her dissenting vote on the Fed’s 50 basis point cut, and said she felt a more measured approach was warranted. ... Bowman said she worried that the large cut ‘could be interpreted as a premature declaration of victory on our price-stability mandate.’ She added that ‘accomplishing our mission of returning to low and stable inflation at our 2 percent goal is necessary to foster a strong labor market and an economy that works for everyone in the longer term.’” (<https://www.cnbc.com/2024/09/24/us-bonds-treasury-yields-in-focus-amid-economic-data-fed-speeches.html>; Sept 24, 2024)
- “30-year mortgage rates are likely to dip under 6% for the first time in two years, and 15-year mortgages under 5%, after the Fed’s cut. Continued progress on lowering inflation this year could result in a further decline of a few tenths of a point on home loans. Mortgage rates are still higher than normal relative to Treasuries because the recent rise in short-term interest rates crimped lenders’ profit margins on long-term loans. The eventual Fed cuts in short-term rates will boost banks’ lending margins and should bring some extra reduction in mortgage rates, too.” (<https://www.kiplinger.com/economic-forecasts/interest-rates>; Sept 21, 2024)

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

Analysis

AAA bond rates tend to track with mid-duration Treasury yields (our analysis at the moment indicates that they are most tightly correlated with 30-year interest rates), with rates for bonds with lower grades tending to be higher (in conjunction with their risk ratings).

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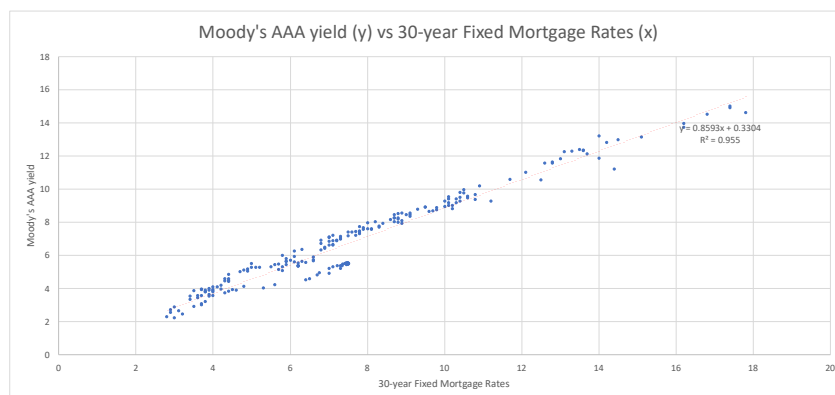
We have compared the AAA and BAA bond yields to 10/2 and 7/1 treasury yield spreads, but are finding that comparison less useful given the current inverted shape of the yield curve. The yields and related spreads for Moody's AAA & BAA Corporate Bonds; the BofA BBB Corporate Bond; and the mentioned U.S. Treasury notes & bonds are shown in Table 3⁶⁰.

Table 3: Comparison between Moody's Bond Yields, BofA BBB Yields, and U.S. Treasury Yields

Instrument	1Q2024	2Q2024	$\Delta(1Q \rightarrow 2Q)$	3Q2024	$\Delta(2Q \rightarrow 3Q)$
Moody's AAA Bonds (end of qtr)	5.01%	5.13%	+12bp	4.68%	-45bp
Moody's BAA Bonds (end of qtr)	5.75%	5.82%	+7bp	5.42%	-40bp
BAA-AAA Yield Spread	+74bp	+69bp	-5bp	+72bp	+5bp
BofA BBB Yields (end of qtr)	5.56%	5.71%	+15bp	4.97%	-74bp
1-year Treasury Yield (end of qtr)	5.03%	5.09%	+6bp	3.98%	-111bp
7-year Treasury Yield (end of qtr)	4.20%	4.33%	+13bp	3.67%	-66bp
7 yr-1 yr Yield Spread	-83bp	-76bp	+7bp	-31bp	+45bp
2-year Treasury Yield (end of qtr)	4.59%	4.71%	+12bp	3.66%	-105bp
10-year Treasury Yield (end of qtr)	4.20%	4.36%	+16bp	3.81%	-55bp
10 yr-2 yr Yield Spread	-39bp	-35bp	+4bp	+15bp	+50bp

See Figure 57 and Figure 58 for how Moody's AAA & BAA Corporate Bond yields have historically correlated with other macroeconomic metrics.

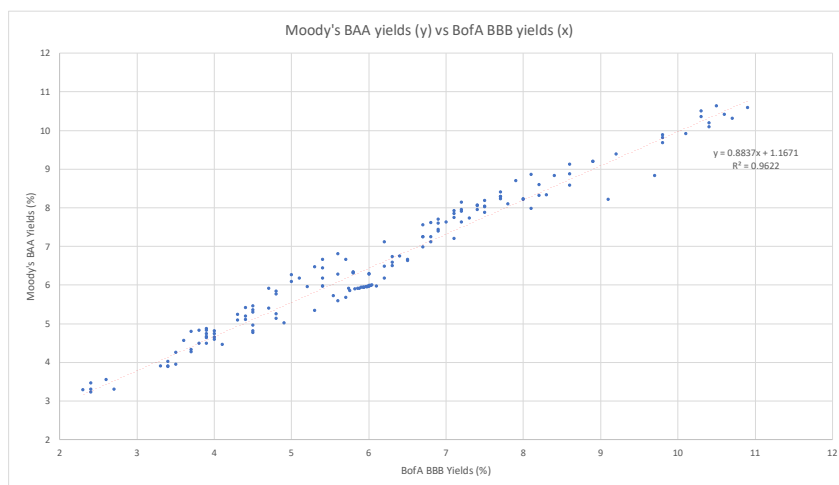
Figure 57: Moody's AAA-grade investment yields, as a function of 30-year Fixed Interest Mortgage Rates



Source: Authors' calculation

⁶⁰ See <https://fred.stlouisfed.org/series/DGS10>, <https://fred.stlouisfed.org/series/DGS7>, <https://fred.stlouisfed.org/series/DGS2>, <https://fred.stlouisfed.org/series/DGS1>, <https://fred.stlouisfed.org/series/aaa>, and <https://fred.stlouisfed.org/series/baa>

Figure 58: Moody's BAA-grade investment yields, as a function of BofA BBB yields



Source: Authors' calculation

Other Commentary

- “Other short-term interest rates will come down at the same pace as the Federal Funds rate. ... Corporate bond rates have also moved down in tandem with Treasury rates, thanks to the decline in inflation and decreasing recession fears. AAA-rated bonds are now yielding around 4.2%, BBB bonds 4.9%, and CCC-rated bond yields are around 12.3%.”
(<https://www.kiplinger.com/economic-forecasts/interest-rates>; Sept 21, 2024)

Prime Rate

Analysis

The Prime Rate is a benchmark rate that many banks use for setting consumer credit rates for creditworthy customers. It is generally based on the federal funds rate, and a spread (typically 3%) is dictated by banks as a matter of policy to specify lending rates for mortgages, small business loans, and personal loans⁶¹. The Prime Rate is currently (as of this writing) 8.0%⁶².

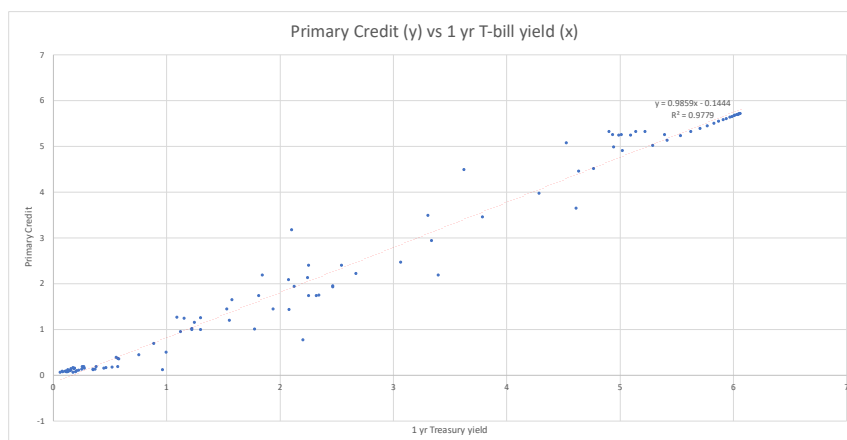
We do not expect the relationship between the federal funds rate and the Prime Rate to change in the near future. Inkeeping with our position that the FOMC will most likely reduce the federal funds rate by another 25 bp before YE2024, and by as much as 100 bp before the end of 1Q2025, that change will cause **the Prime Rate to drop in concert to between 7.75% and 8.0% by YE2024, and to approximately 7% before 2Q2024 begins.**

See Figure 59 for the relationship between the Prime Rate and 1-year Treasury yield.

⁶¹ <https://www.investopedia.com/terms/p/primerate.asp>

⁶² <https://fred.stlouisfed.org/series/DPRIME>

Figure 59: Prime Rate as a function of 1-year Treasury yields



Source: Authors' calculation

Other Commentary

- “Once the Fed does start cutting interest rates, it will likely continue doing so into 2026, but will not return short-term rates to zero. Figure on the one-month Treasury bill’s yield falling to about 3.0%, and the bank prime rate ending up around 6.0%, down from the current 8.0%, after the Fed has finished reducing its benchmark rate.” (<https://www.kiplinger.com/economic-forecasts/interest-rates>; Sept 21, 2024)

US Average Retail Gasoline Price

Analysis

The U.S. average retail price for regular unleaded gasoline is approximately \$3.20/gallon⁶³ at the time of this writing, down about 3% over the past month, down almost 10% since our last report, and down about 16% year-over-year. approximately the same price that it was one year ago. Hurricane Helene (nor, in fact, any of the storms that have been spawned the 2024 season) has not hampered Gulf production, though Helene is projected to impact demand slightly⁶⁴.

As of this writing, West Texas Intermediate (WTI) crude oil is hovering around \$70/barrel⁶⁵. (See Figure 60 and Figure 61.) Production by OPEC+ countries is not currently expected to change in the near future⁶⁶, with the Northern Hemisphere entering the winter season, and US gasoline supplies reverting to ethanol blends.

The biggest concern at the moment is the potential of an oil supply disruption due to the current conflicts in the Middle East. Israel appears to be lashing out at Hamas, Lebanon, Hezbollah, Yemen, and Iran⁶⁷, all of which have evolved as a result of Israel’s tensions with Palestine in the Gaza Strip region. In

⁶³ <https://gasprices.aaa.com/>

⁶⁴ <https://gasprices.aaa.com/pump-prices-pause-as-a-hurricane-comes-ashore/>

⁶⁵ <https://oilprice.com/>

⁶⁶ <https://www.reuters.com/business/energy/opec-set-keep-output-policy-unchanged-panel-meeting-2024-10-02/>

⁶⁷ See <https://www.reuters.com/world/middle-east/israel-launches-strikes-yemeni-houthi-targets-2024-09-29/>

October 2023, Hamas reignited simmering tensions by firing rockets into Israel at a music festival in a surprise attack that killed over 1,300 people, and injured 3,300⁶⁸. Since that time, Israel has sought to eliminate Hamas through an intensive ground war, and has attacked the other mentioned groups and states as allies to Hamas, directly or indirectly⁶⁹.

Returning to domestic production, 2024 has delivered 2 major storms, and 7 hurricanes since June 1, 2024. This activity has been driven by the unusually warm waters in the Atlantic Ocean this year. While significant storm activity since Hurricane Helene has been isolated in the Atlantic, October and November are expected to be extremely active months⁷⁰; it is extremely possible that domestic crude oil (originating in the Gulf of Mexico) could still be easily and substantially impacted.

Other Commentary

- “Analysts have cut their 2024 oil price forecasts for a fifth consecutive month, citing weaker demand and uncertainty over OPEC’s plans, with prices expected to remain under pressure despite geopolitical risks, a Reuters poll found on Monday. ... A Reuters poll of 41 analysts and economists conducted in the past two weeks projected Brent crude would average \$81.52 per barrel in 2024, the lowest poll projection since February and down from \$82.86 projected in August.” (<https://www.reuters.com/markets/commodities/oil-forecasts-cut-5th-straight-month-demand-opec-uncertainty-2024-09-30/>; Sept 30, 2024)
- “The US Energy Information Administration lowered its 2024 crude price forecasts by more than \$1/b on Sept. 10, noting that slowing global economic activity, reduced fuel demand in China and signs of slowing US job growth have limited upward price momentum in recent months. ... In its September Short-Term Energy Outlook, the EIA decreased its 2024 forecast for Brent crude by \$1.64 to \$82.80/b and its 2025 outlook by \$1.62 to \$84.09/b. ... Similarly, the agency reduced its 2024 forecast for WTI crude to \$78.80/b, down \$1.41 from last month's estimate for the year, while it cut its 2025 expectations by \$1.58 to \$79.63/b.” (<https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/oil/091024-us-eia-cuts-2024-crude-outlooks-by-more-than-1b-amid-slowng-economic-activity>; Sept 10, 2024)

⁶⁸ <https://www.cfr.org/global-conflict-tracker/conflict/israeli-palestinian-conflict>

⁶⁹ Ibid.

⁷⁰ <https://www.usatoday.com/story/news/weather/2024/10/01/october-hurricane-forecast-says-kirk-could-kick-off-big-storms/75468124007/>

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Figure 60: Crude Oil vs Retail Gasoline Prices

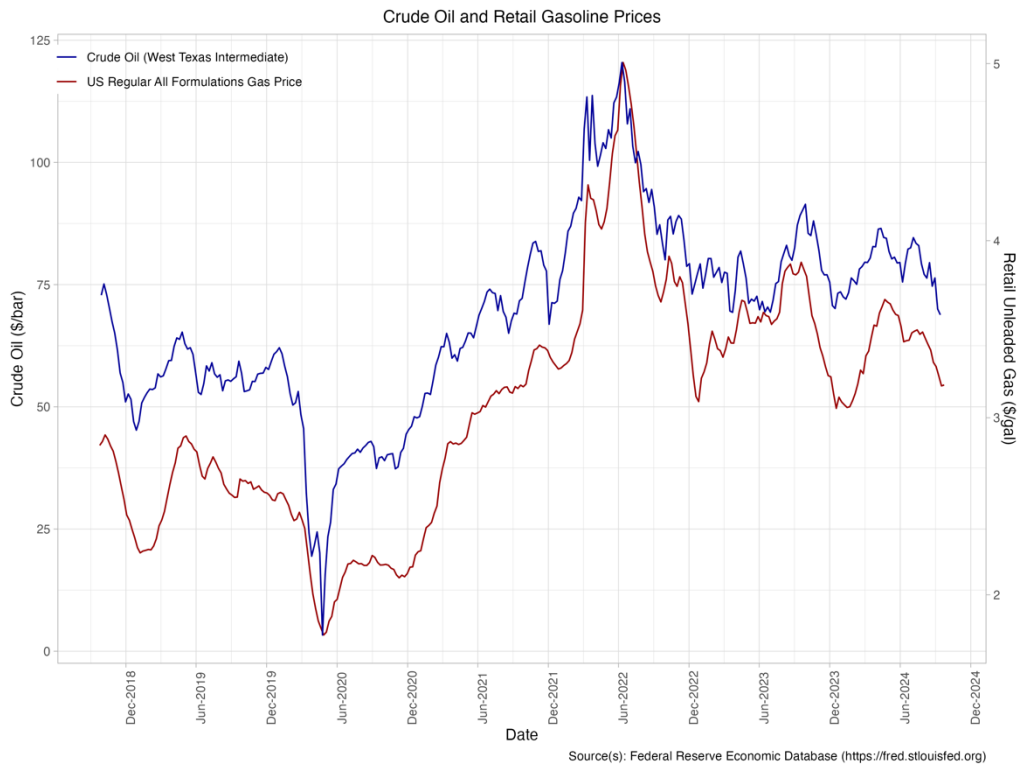
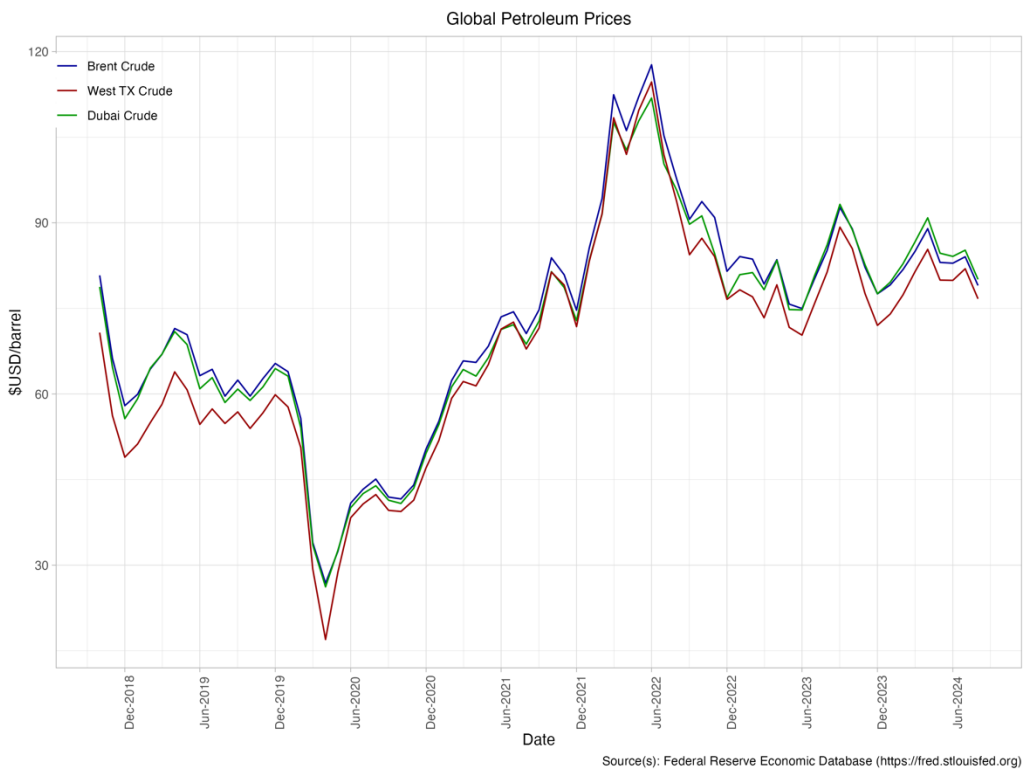


Figure 61: Global crude oil prices

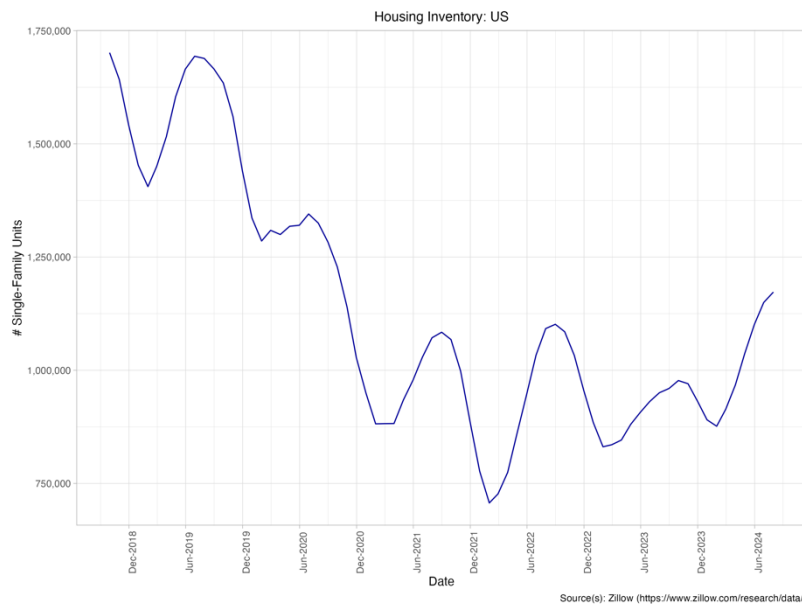


House and Commercial Real Estate Price Indexes

Residential Home Price Analysis

30-year, fixed rate interest rates dropped with the FOMC’s announcement in mid-September, generally reducing pressure on homebuyers, and allowing budgets to breathe. That “breathing room” is welcomed given that the median home price has risen to over \$412,000 in 2Q2024⁷¹; the average sales price during 2Q2024 was over \$501,000⁷², with 12.15M existing homes⁷³, and just over 2M new homes⁷⁴, sold during 2Q2024. See Figure 62 to see that, while inventory of US residences is increasing since YE2023, it is still significantly lower than pre-COVID levels.

Figure 62: US Housing Inventory



Many in the real estate industry⁷⁵ are saying that 30-year rates will stabilize below 6% by YE2024, though that stance seems aggressive given that the next homebuying season is in swing, with year-end closings less than 90 days away. With the labor market “cooling”⁷⁶, and businesses still conserving cash, employment related moves seem to be difficult to justify, despite “pent up” demand that remains since this past summer.

⁷¹ <https://fred.stlouisfed.org/series/MSPUS>

⁷² <https://fred.stlouisfed.org/series/ASPU>

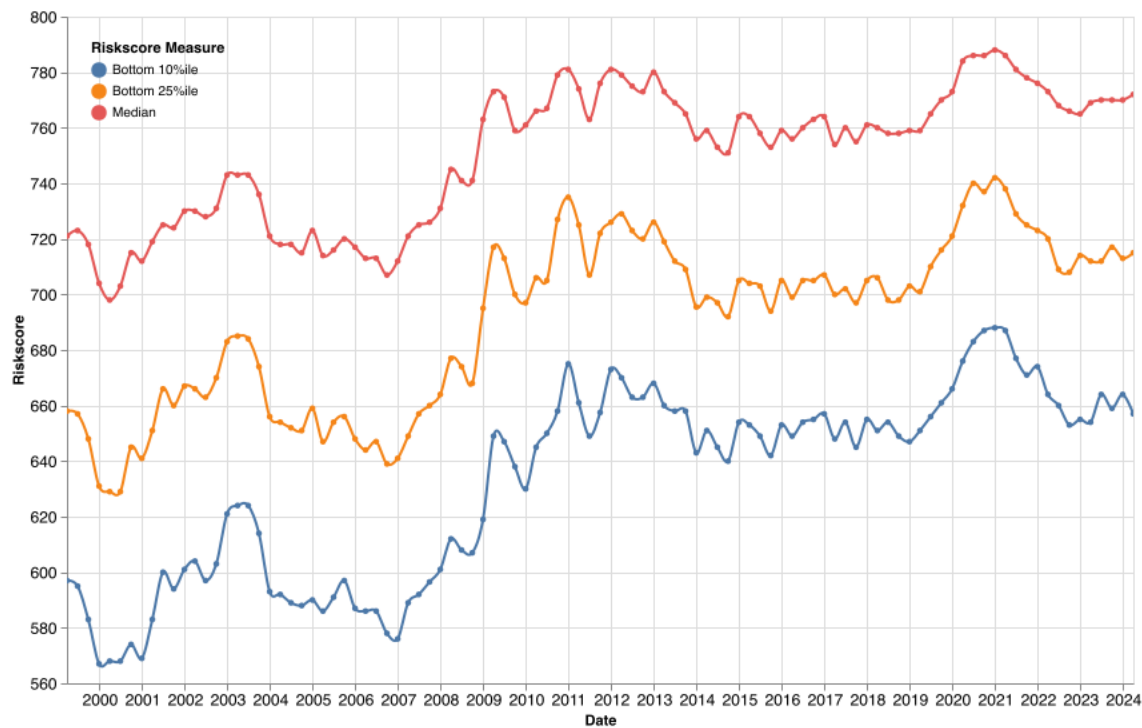
⁷³ <https://fred.stlouisfed.org/series/EXHOSLUSM495S>

⁷⁴ <https://fred.stlouisfed.org/series/HSN1F>

⁷⁵ See <https://www.redfin.com/news/housing-market-update-mortgage-rates-housing-payments-fall/?lctg=> ; <https://www.realtor.com/news/trends/mortgage-rates-experts-predict-fed-rate-cut/>; and <https://money.usnews.com/loans/mortgages/mortgage-rate-forecast>

⁷⁶ <https://www.reuters.com/business/jackson-hole-live-fed-chair-jerome-powell-2024-08-23/>

Figure 63: Median, Lowest 25th Percentile, and Lowest 10th Percentile of Credit Score for New Mortgages

Source: NY Federal Reserve Bank (<https://www.newyorkfed.org/microeconomics/hhdc>)

To give a sense of how lenders may have been tightening on credit requirements, consider Figure 63. We observe that credit requirements for new mortgages are notably higher than pre-COVID levels (for the best mortgage rates), and (unsurprisingly) substantially higher than 2007 levels.

Commercial Real Estate Analysis

Commercial real estate (CRE) can be classified as (1) multi-tenant rented residential space (i.e., apartments, condominiums, etc.), (2) office space, (3) industrial use space, and (4) retail space, with subclasses defined within each class. The CRE mortgage delinquency rate climbed from 1.83% in 1Q2024 to 2.01% in 2Q2024. The serious delinquency rate, which includes all loans that are not current on payments, rose from 1.57% in 1Q2024 to 1.75% in 2Q2024⁷⁷. In contrast, S&P Global Market Intelligence reported that the delinquency rate for CRE loans across US banks rose from 1.24% in 1Q2024 to 1.40% during 2Q2024.

While there are continuing issues throughout the CRE space, office space remains the point of significant concern. Office space accounts for just over 15% of outstanding commercial mortgage debt, particularly those with mortgages held by banks and those that participate in CMBS⁷⁸. (The aforementioned two groups increased the percentage of holdings that were delinquent.). “Work from Home” (WFH) policies are still strong negotiating points with employees, despite firms continuing to try to take stronger stances for employees returning to the office (RTO)⁷⁹.

⁷⁷ <https://www.trepp.com/trepp-talk/bank-cre-loan-performance-q2-2024-delinquencies-critized-loan-rates-q2-2024>

⁷⁸ <https://www.mpamag.com/us/specialty/commercial/rising-office-loan-defaults-push-commercial-mortgage-delinquencies-higher/505119>

⁷⁹ <https://www.cnbc.com/2024/09/18/amazon-rto-mandate-workers-must-come-back-5-days-a-week.html>

Generally, problems with properties that have higher vacancy rates and lower property values are now anticipated by lenders. Furthermore, the assessment of property values will remain murky without benchmarking transactions. This quandary sets up banks with significant office portfolios to allocate loss reserves appropriately, thereby preventing them (banks) from otherwise putting capital to work.

Figure 64: Residential Home Price Index as a function of the Commercial Real Estate Index



Source: Authors' calculation

Other Commentary

- “For delinquencies, Trepp focuses on loans that are 30 or more days delinquent. The current CMBS delinquency report provides data through September 2024. ... The delinquency rates on CMBS loans on lodging, office and retail properties all rose significantly this month. The delinquency rate on retail property made the biggest jump, rising 86 basis points to 7.07 percent. The delinquency rate on office properties remained the highest of those Trepp tracks. It rose 39 basis points to 8.36 percent. The delinquency rate on lodging properties rose 32 basis points to 6.23 percent.” (<https://yieldpro.com/2024/09/multifamily-cmbs-delinquency-rate-edges-higher/>; Sept 30, 2024)
- “Mortgage-rate locks rose 68% from a month earlier in the days after the Fed announced its interest-rate cut, ... Many house hunters had been waiting for the Fed’s cut before locking in a mortgage rate. ... Improving affordability is also, of course, a major factor bringing buyers back. The median monthly housing payment is down 4.4% year over year, the biggest decline in more than four years. It has dropped to its lowest level since January (with the exception of the prior 4-week period), thanks to mortgage rates dropping to their lowest level since February 2023 last week. (Home prices are still increasing nationwide, rising 3.9% year over year.)” (<https://www.redfin.com/news/housing-market-update-homebuyers-are-back-mortgage-rate-locks/?lctg=> ; Sept 26, 2024)
- “The decline in mortgage rates in July gave a slight nudge upward to home sales with total (existing + new) home sales for July rising 2.6% over the month to 4.7 million. Both existing and new home sales rose over the month of July. Pending home sales (a leading indicator of upcoming home sales) declined 5.5% month-over-month in July with all four U.S. regions

declining in transactions monthly. Affordability challenges continue to impact the market as the pending home sales index level of 70.2 is the lowest reading since the index began tracking in 2001.” (<https://www.freddiemac.com/research/forecast/20240923-us-economy-continues-expand>; Sept 23, 2024)

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 4, the average gains for the DWCF increased by almost 70% in 3Q2024 over 2Q2024, but it is still much lower (almost half, in fact) than 4Q2023 and 1Q2024 growth rates. It is expected to rise notably with the loosened rates that are expected for the rest of 2024 and early 2025.

Table 4: Approximate Quarterly Milestones for the Dow-Jones Total Market Index

Period	Index Range ⁸⁰	Trading Days	Avg points/day
3Q2023 (7/1/2023-9/30/2023)	44411.47 → 42788.69	63	-25.8
4Q2023 (10/1/2023-12/31/2023)	42788.69 → 47787.47	61	+81.9
1Q2024 (1/1/2024-3/31/2024)	47787.47 → 52402.86	61	+75.7
2Q2024 (4/1/2024-6/30/2024)	52402.86 → 53905.94	63	+23.9
3Q2024 (7/1/2024-9/30/2024)	53905.94 → 56496.47	64	+40.5

We see the Standard & Poor’s 500 Index (“SP500”) in Table 5; the S&P 500 is an index of 500 very large, publicly traded companies in the U.S. The performance of the S&P 500 mirrors that of the DWCF, with the returns of the two indexes appearing quite comparable.

Table 5: Approximate Quarterly Milestones for the Standard and Poor’s 500 (“SP500”) Index

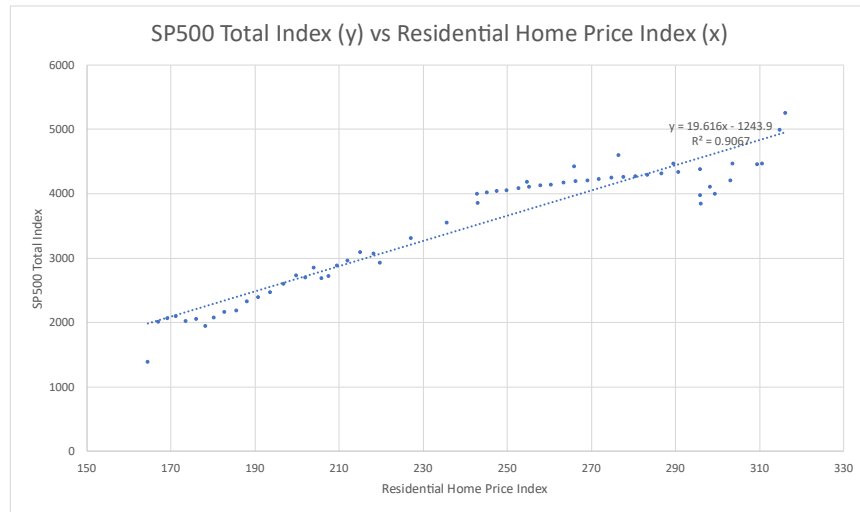
Period	Index Range ⁸¹	Trading Days	Avg points/day
3Q2023 (7/1/2023-9/30/2023)	4450.38 → 4288.05	63	-2.58
4Q2023 (10/1/2023-12/31/2023)	4288.05 → 4769.83	61	+7.90
1Q2024 (1/1/2024-3/31/2024)	4769.83 → 5254.35	61	+7.94
2Q2024 (4/1/2024-6/30/2024)	5254.35 → 5459.65	63	+3.26
3Q2024 (7/1/2024-9/30/2024)	5459.65 → 5708.75	64	+3.89

The VIX was up at the end of 3Q2024 to 16.3 (from 12.44 at the end of 2Q2024), with its quarterly average coming in at 17.07 (vs 13.98). Despite the current global conflicts, and the upcoming 2024 U.S. Presidential election between two polarizing figures, the market continues to move along comfortably with minimal hiccups.

⁸⁰ Index values found at <https://www.marketwatch.com/investing/index/dwcf>

⁸¹ Index values found at <https://www.marketwatch.com/investing/index/spx>

Figure 65: SP500 as a function of the Residential Home Price Index



Source: Authors' calculation

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 3Q2015 and 2Q2024, inclusive.

Table 4: Regression Aggregate Errors for 3Q2015 through 2Q2024

Variable	Min Abs. Error	Average Error	Max Abs. Error
Real GDP Growth	814.8%	**	***
Nominal GDP Growth	70.1%	728.5%	***
Real Disposable Income Growth	1000.0%	**	***
Nominal Disposable Income Growth	***	**	***
Inflation	0.0%	**	***
Unemployment Rate	281.2%	***	***
1-month Treasury Yield	141.1%	**	***
3-month Treasury Yield	0.0%	**	***
6-month Treasury Yield	211.1%	**	***
1-year Treasury Yield	950.4%	***	***
3-year Treasury Yield	1.2%	77.4%	***
5-year Treasury Yield	0.1%	13.4%	219.8%
7-year Treasury Yield	0.6%	15.8%	246.1%
10-year Treasury Yield	0.4%	7.3%	77.1%
20-year Treasury Yield	0.3%	12.8%	64.0%
30-year Treasury Yield	0.5%	-2.0%	76.7%
30-year Mortgage Rate	0.9%	-3.3%	26.5%
Moody's AAA Curve	0.1%	-1.9%	33.0%
Moody's BAA Curve	11.2%	-32.9%	71.1%
BBB Corporate Yield	0.1%	4.4%	38.0%
Prime Rate	7.3%	-572.8%	***
US Average Retail Gasoline Price	***	**	***
Cost of Federal Funds	81.5%	**	***
Dow Jones Total Stock Market Index	159.6%	800.0%	***
S&P 500 Stock Price Index	0.4%	-35.2%	249.5%
Commercial Real Estate Price Index	34.7%	46.0%	502.7%
Residential Home Price Index	75.6%	274.0%	486.9%
Market Volatility Index	***	**	***

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

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

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

REGRESSION FOR REAL GDP GROWTH	
	<i>Dependent variable (+/- SE):</i>
	Real GDP growth
Constant	-116.749 (+/- 19.333) p = 0.00004***
Moody's AAA Curve	-48.792 (+/- 8.209) p = 0.00004***
Moody's BAA Curve	19.459 (+/- 3.534) p = 0.0001***
Nominal disposable income growth	0.171 (+/- 0.026) p = 0.00002***
Unemployment Rate	-13.894 (+/- 0.715) p = 0.000***
CPI Inflation Rate	-2.242 (+/- 0.397) p = 0.0001***
BBB corporate yield	-22.577 (+/- 2.932) p = 0.00001***
30-year Mortgage Rate	23.110 (+/- 3.237) p = 0.00001***
Prime Rate	-32.371 (+/- 5.053) p = 0.00002***
Home Price Index	0.407 (+/- 0.085) p = 0.0003***
LN_30-year Treasury Yield	313.021 (+/- 54.036) p = 0.00005***
LN_20-year Treasury Yield	-190.448 (+/- 40.921) p = 0.0004***
10-year Treasury Yield	200.108 (+/- 16.043) p = 0.000***
LN_10-year Treasury Yield	-489.444 (+/- 32.220) p = 0.000***
LN_7-year Treasury Yield	149.324 (+/- 22.302) p = 0.00002***
3-month Treasury Yield	-22.544 (+/- 6.307) p = 0.004***
LN_5-year Treasury Yield	137.505 (+/- 21.735) p = 0.00002***

6-month Treasury Yield	58.649 (+/- 11.769) p = 0.0003***
LN_6-month Treasury Yield	-27.711 (+/- 4.379) p = 0.00002***
LN_3-year Treasury Yield	-99.921 (+/- 10.150) p = 0.00000***
LN_1-year Treasury Yield	32.888 (+/- 5.169) p = 0.00002***
3-year Treasury Yield_2	9.545 (+/- 1.207) p = 0.00001***
6-month Treasury Yield_2	-2.648 (+/- 0.588) p = 0.0005***
5-year Treasury Yield_2	-24.096 (+/- 2.224) p = 0.00000***
1-month Treasury Yield_2	-1.110 (+/- 0.306) p = 0.003***
Market Volatility Index_2	-0.003 (+/- 0.0005) p = 0.00001***
Observations	40
R ²	0.992
Adjusted R ²	0.979
Residual Std. Error	1.082 (df = 14)
F Statistic	72.956*** (df = 25; 14)
Note:	* p ** p *** p<0.01

REGRESSION FOR NOMINAL GDP GROWTH	
	<i>Dependent variable (+/- SE):</i>
	Nominal GDP growth
Constant	107.798 (+/- 30.755) p = 0.002***
Real disposable income growth	0.099 (+/- 0.031) p = 0.005***
Unemployment Rate	-8.476 (+/- 0.651) p = 0.000***
BBB corporate yield	-7.456 (+/- 1.553) p = 0.0001***
30-year Mortgage Rate	7.016 (+/- 1.736) p = 0.001***
Home Price Index	0.090 (+/- 0.030) p = 0.006***
30-year Treasury Yield	44.140 (+/- 8.646) p = 0.00005***
20-year Treasury Yield	-718.816 (+/- 85.061) p = 0.00000***
LN_20-year Treasury Yield	807.360 (+/- 99.092) p = 0.00000***
10-year Treasury Yield	506.589 (+/- 57.932) p = 0.000***
LN_10-year Treasury Yield	-594.641 (+/- 37.228) p = 0.000***
LN_7-year Treasury Yield	122.349 (+/- 17.958) p = 0.00000***
LN_6-month Treasury Yield	-4.857 (+/- 0.843) p = 0.00001***
LN_3-year Treasury Yield	-26.959 (+/- 5.837) p = 0.0002***
1-year Treasury Yield_2	5.264 (+/- 0.761) p = 0.00000***
6-month Treasury Yield_2	-4.017 (+/- 0.599) p = 0.00000***
10-year Treasury Yield_2	-59.622 (+/- 8.643) p = 0.00000***
20-year Treasury Yield_2	66.942 (+/- 9.688)

	p = 0.00000***
Observations	40
R ²	0.982
Adjusted R ²	0.969
Residual Std. Error	1.496 (df = 22)
F Statistic	72.075*** (df = 17; 22)
Note:	* ** *** p<0.01

REGRESSION FOR REAL DISPOSABLE INCOME GROWTH	
	<i>Dependent variable (+/- SE):</i>
	Real disposable income growth
Constant	816.556 (+/- 114.177) p = 0.00000***
Moody's BAA Curve	68.961 (+/- 11.321) p = 0.00001***
Real GDP growth	-15.705 (+/- 2.569) p = 0.00001***
Nominal GDP growth	15.927 (+/- 2.626) p = 0.00001***
Prime Rate	127.595 (+/- 19.187) p = 0.00001***
Home Price Index	-3.451 (+/- 0.455) p = 0.00000***
30-year Treasury Yield	505.382 (+/- 133.916) p = 0.002***
LN_30-year Treasury Yield	-2,975.660 (+/- 481.887) p = 0.00001***
20-year Treasury Yield	354.380 (+/- 64.779) p = 0.00003***
10-year Treasury Yield	-432.410 (+/- 85.551) p = 0.0001***
LN_10-year Treasury Yield	1,281.574 (+/- 201.378) p = 0.00001***
1-month Treasury Yield	-189.919 (+/- 31.509) p = 0.00001***
LN_1-month Treasury Yield	-23.464 (+/- 6.957) p = 0.004***
3-month Treasury Yield	290.967 (+/- 44.882) p = 0.00001***
5-year Treasury Yield	-135.523 (+/- 26.291) p = 0.00005***
6-month Treasury Yield	-227.951 (+/- 40.108) p = 0.00002***
LN_6-month Treasury Yield	177.802 (+/- 30.644) p = 0.00002***
LN_1-year Treasury Yield	-164.650 (+/- 29.401)

	p = 0.00002***
3-year Treasury Yield_2	19.336 (+/- 3.387)
	p = 0.00002***
1-month Treasury Yield_2	7.284 (+/- 1.678)
	p = 0.0004***
Observations	40
R ²	0.850
Adjusted R ²	0.707
Residual Std. Error	6.939 (df = 20)
F Statistic	5.960*** (df = 19; 20)
Note:	* ** *** p<0.01

REGRESSION FOR NOMINAL DISPOSABLE INCOME GROWTH

	<i>Dependent variable (+/- SE):</i>
	Nominal disposable income growth
Constant	1,178.072 (+/- 135.713) p = 0.00000***
Moody's BAA Curve	78.431 (+/- 8.351) p = 0.00000***
Real GDP growth	-19.691 (+/- 1.975) p = 0.00000***
Nominal GDP growth	20.069 (+/- 2.014) p = 0.00000***
Prime Rate	151.004 (+/- 14.659) p = 0.00000***
Home Price Index	-3.720 (+/- 0.328) p = 0.000***
Commercial Real Estate Price Index	-0.762 (+/- 0.186) p = 0.001***
LN_30-year Treasury Yield	-3,028.751 (+/- 283.717) p = 0.000***
20-year Treasury Yield	991.363 (+/- 119.192) p = 0.00000***
10-year Treasury Yield	-416.576 (+/- 71.158) p = 0.00003***
LN_10-year Treasury Yield	1,399.840 (+/- 144.011) p = 0.00000***
1-month Treasury Yield	-207.700 (+/- 23.540) p = 0.00000***
LN_1-month Treasury Yield	-20.395 (+/- 4.922) p = 0.001***
LN_7-year Treasury Yield	-314.480 (+/- 98.123) p = 0.006***
3-month Treasury Yield	252.920 (+/- 38.295) p = 0.00001***
5-year Treasury Yield	-431.261 (+/- 73.137) p = 0.00003***
LN_5-year Treasury Yield	262.146 (+/- 86.667) p = 0.009***
6-month Treasury Yield	-173.256 (+/- 37.824)

	p = 0.0004***
LN_6-month Treasury Yield	178.165 (+/- 22.354)
	p = 0.00000***
LN_1-year Treasury Yield	-157.053 (+/- 20.998)
	p = 0.00001***
5-year Treasury Yield_2	59.446 (+/- 10.370)
	p = 0.00004***
1-month Treasury Yield_2	11.053 (+/- 1.324)
	p = 0.00000***
20-year Treasury Yield_2	-81.385 (+/- 14.478)
	p = 0.00004***
30-year Treasury Yield_2	55.227 (+/- 12.126)
	p = 0.0004***
Observations	40
R ²	0.941
Adjusted R ²	0.855
Residual Std. Error	4.848 (df = 16)
F Statistic	11.036*** (df = 23; 16)
Note:	* p ** p *** p<0.01

REGRESSION FOR CPI INFLATION RATE

	<i>Dependent variable (+/- SE):</i>
	CPI Inflation Rate
Constant	33.327 (+/- 3.069) p = 0.0002***
SP500 Stock Price Index	-0.001 (+/- 0.0001) p = 0.0001***
Moody's AAA Curve	-8.392 (+/- 0.180) p = 0.00000***
Moody's BAA Curve	4.302 (+/- 0.139) p = 0.00000***
Real GDP growth	-0.586 (+/- 0.037) p = 0.00002***
Nominal GDP growth	0.536 (+/- 0.036) p = 0.00003***
Real disposable income growth	-1.531 (+/- 0.018) p = 0.000***
Nominal disposable income growth	1.399 (+/- 0.017) p = 0.000***
Unemployment Rate	0.478 (+/- 0.021) p = 0.00001***
BBB corporate yield	1.021 (+/- 0.050) p = 0.00001***
Prime Rate	8.029 (+/- 0.225) p = 0.00000***
Dow Total Stock Market Index	-0.0001 (+/- 0.00001) p = 0.0002***
Home Price Index	-0.174 (+/- 0.005) p = 0.00000***
LN_Market Volatility Index	0.458 (+/- 0.042) p = 0.0002***
US Avg Retail Gasoline Price (\$-gal; all grades, all formulations)	1.214 (+/- 0.053) p = 0.00001***
30-year Treasury Yield	45.741 (+/- 5.986) p = 0.001***
LN_30-year Treasury Yield	-165.886 (+/- 8.245) p = 0.00001***
20-year Treasury Yield	19.461 (+/- 0.972)

	p = 0.00001***
LN_10-year Treasury Yield	31.655 (+/- 0.831)
	p = 0.00000***
7-year Treasury Yield	-54.489 (+/- 3.132)
	p = 0.00002***
LN_7-year Treasury Yield	99.226 (+/- 4.992)
	p = 0.00001***
3-month Treasury Yield	5.030 (+/- 0.251)
	p = 0.00001***
5-year Treasury Yield	41.065 (+/- 2.224)
	p = 0.00001***
LN_5-year Treasury Yield	-79.989 (+/- 4.276)
	p = 0.00001***
6-month Treasury Yield	-16.008 (+/- 0.413)
	p = 0.00000***
LN_6-month Treasury Yield	6.300 (+/- 0.218)
	p = 0.00000***
3-year Treasury Yield	-20.124 (+/- 1.050)
	p = 0.00001***
LN_3-year Treasury Yield	19.395 (+/- 1.076)
	p = 0.00001***
LN_1-year Treasury Yield	-4.394 (+/- 0.236)
	p = 0.00001***
1-year Treasury Yield_2	-1.571 (+/- 0.040)
	p = 0.00000***
3-year Treasury Yield_2	4.341 (+/- 0.158)
	p = 0.00001***
3-month Treasury Yield_2	1.604 (+/- 0.044)
	p = 0.00000***
7-year Treasury Yield_2	-1.550 (+/- 0.314)
	p = 0.005***
1-month Treasury Yield_2	-0.160 (+/- 0.028)
	p = 0.003***
30-year Treasury Yield_2	-2.070 (+/- 0.481)
	p = 0.008***
Observations	40
R ²	1.000
Adjusted R ²	1.000
Residual Std. Error	0.024 (df = 5)

F Statistic	15,505.030*** (df = 34; 5)
Note:	* p ** p *** p<0.01

Unemployment Rate

REGRESSION FOR UNEMPLOYMENT RATE

	<i>Dependent variable (+/- SE):</i>
	Unemployment Rate
Constant	36.546 (+/- 1.798) p = 0.0003***
US Fed Reserve O-N Loan Rate	-1.754 (+/- 0.057) p = 0.0001***
Moody's AAA Curve	-1.116 (+/- 0.045) p = 0.0002***
Moody's BAA Curve	3.167 (+/- 0.095) p = 0.0001***
Real GDP growth	-0.887 (+/- 0.035) p = 0.0002***
Nominal GDP growth	0.823 (+/- 0.035) p = 0.0002***
Real disposable income growth	0.199 (+/- 0.005) p = 0.00004***
Nominal disposable income growth	-0.203 (+/- 0.006) p = 0.0001***
BBB corporate yield	-0.722 (+/- 0.041) p = 0.0004***
30-year Mortgage Rate	0.771 (+/- 0.032) p = 0.0002***
Prime Rate	4.376 (+/- 0.220) p = 0.0003***
Dow Total Stock Market Index	-0.0001 (+/- 0.00000) p = 0.0004***
Home Price Index	-0.075 (+/- 0.004) p = 0.0005***
Commercial Real Estate Price Index	-0.039 (+/- 0.001) p = 0.0001***
Market Volatility Index	-0.033 (+/- 0.001) p = 0.0001***
LN_Market Volatility Index	0.237 (+/- 0.017) p = 0.001***
US Avg Retail Gasoline Price (\$-gal; all grades, all formulations)	-0.386 (+/- 0.010) p = 0.00005***

30-year Treasury Yield	19.388 (+/- 0.849) p = 0.0002***
LN_30-year Treasury Yield	-113.532 (+/- 5.249) p = 0.0003***
20-year Treasury Yield	2.943 (+/- 0.216) p = 0.001***
LN_20-year Treasury Yield	24.398 (+/- 1.650) p = 0.001***
10-year Treasury Yield	-2.784 (+/- 0.352) p = 0.005***
LN_10-year Treasury Yield	20.614 (+/- 1.570) p = 0.001***
1-month Treasury Yield	-4.189 (+/- 0.192) p = 0.0003***
LN_1-month Treasury Yield	-1.424 (+/- 0.037) p = 0.00004***
7-year Treasury Yield	3.128 (+/- 0.287) p = 0.002***
3-month Treasury Yield	10.446 (+/- 0.427) p = 0.0002***
5-year Treasury Yield	-7.798 (+/- 0.385) p = 0.0003***
LN_5-year Treasury Yield	4.260 (+/- 0.117) p = 0.00005***
6-month Treasury Yield	-8.370 (+/- 0.425) p = 0.0003***
LN_6-month Treasury Yield	6.881 (+/- 0.295) p = 0.0002***
3-year Treasury Yield	-4.711 (+/- 0.090) p = 0.00002***
1-year Treasury Yield	2.300 (+/- 0.079) p = 0.0001***
LN_1-year Treasury Yield	-6.255 (+/- 0.256) p = 0.0002***
1-year Treasury Yield_2	0.466 (+/- 0.017) p = 0.0002***
6-month Treasury Yield_2	-0.183 (+/- 0.028) p = 0.008***
5-year Treasury Yield_2	0.495 (+/- 0.070)

	p = 0.006***
Observations	40
R ²	1.000
Adjusted R ²	1.000
Residual Std. Error	0.005 (df = 3)
F Statistic	118,046.800*** (df = 36; 3)
Note:	* ** *** p<0.01

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

REGRESSION FOR 1-MONTH TREASURY YIELD	
	<i>Dependent variable (+/- SE):</i>
	1-month Treasury Yield
Constant	-1.158 (+/- 0.926) p = 0.222
Moody's AAA Curve	-5.731 (+/- 0.790) p = 0.00000***
Moody's BAA Curve	2.190 (+/- 0.317) p = 0.00000***
Real GDP growth	0.041 (+/- 0.008) p = 0.00005***
CPI Inflation Rate	-0.116 (+/- 0.033) p = 0.002***
BBB corporate yield	-1.426 (+/- 0.310) p = 0.0001***
30-year Mortgage Rate	1.546 (+/- 0.283) p = 0.00001***
Dow Total Stock Market Index	0.0001 (+/- 0.00001) p = 0.002***
LN_30-year Treasury Yield	18.650 (+/- 3.019) p = 0.00001***
20-year Treasury Yield	3.111 (+/- 0.778) p = 0.0005***
LN_20-year Treasury Yield	-20.595 (+/- 2.934) p = 0.00000***
LN_7-year Treasury Yield	4.917 (+/- 0.542) p = 0.000***
Market Volatility Index_2	0.0003 (+/- 0.0001) p = 0.00004***
Observations	40
R ²	0.984
Adjusted R ²	0.977
Residual Std. Error	0.281 (df = 27)
F Statistic	137.361*** (df = 12; 27)
Note:	* p ** p *** p<0.01

REGRESSION FOR 3-MONTH TREASURY YIELD	
	<i>Dependent variable (+/- SE):</i>
	3-month Treasury Yield
Constant	-18.482 (+/- 3.345) p = 0.00001***
Moody's AAA Curve	-1.990 (+/- 0.502) p = 0.0005***
Real GDP growth	0.270 (+/- 0.047) p = 0.00001***
Nominal GDP growth	-0.238 (+/- 0.043) p = 0.00001***
Dow Total Stock Market Index	0.0001 (+/- 0.00002) p = 0.004***
Commercial Real Estate Price Index	0.024 (+/- 0.004) p = 0.00000***
LN_30-year Treasury Yield	20.825 (+/- 3.509) p = 0.00001***
20-year Treasury Yield	15.074 (+/- 2.880) p = 0.00002***
LN_20-year Treasury Yield	-39.015 (+/- 5.789) p = 0.00000***
LN_7-year Treasury Yield	4.169 (+/- 0.579) p = 0.00000***
20-year Treasury Yield_2	-1.114 (+/- 0.281) p = 0.0005***
Market Volatility Index_2	0.0002 (+/- 0.0001) p = 0.003***
Observations	40
R ²	0.982
Adjusted R ²	0.976
Residual Std. Error	0.284 (df = 28)
F Statistic	142.907*** (df = 11; 28)
<i>Note:</i>	* p ** p *** p<0.01

REGRESSION FOR 6-MONTH TREASURY YIELD	
	<i>Dependent variable (+/- SE):</i>
	6-month Treasury Yield
Constant	-4.683 (+/- 1.833) p = 0.018**
Moody's AAA Curve	-4.268 (+/- 0.704) p = 0.00001***
Moody's BAA Curve	1.616 (+/- 0.287) p = 0.00001***
Real GDP growth	0.108 (+/- 0.032) p = 0.003***
Nominal GDP growth	-0.145 (+/- 0.027) p = 0.00002***
Unemployment Rate	-0.562 (+/- 0.095) p = 0.00001***
BBB corporate yield	-1.217 (+/- 0.229) p = 0.00002***
30-year Mortgage Rate	1.328 (+/- 0.188) p = 0.00000***
LN_30-year Treasury Yield	7.144 (+/- 2.521) p = 0.009***
10-year Treasury Yield	30.973 (+/- 8.182) p = 0.001***
LN_10-year Treasury Yield	-33.195 (+/- 7.753) p = 0.0003***
7-year Treasury Yield	-19.343 (+/- 5.731) p = 0.003***
LN_7-year Treasury Yield	17.004 (+/- 4.395) p = 0.001***
7-year Treasury Yield_2	2.535 (+/- 0.730) p = 0.002***
10-year Treasury Yield_2	-3.326 (+/- 0.929) p = 0.002***
Observations	40
R ²	0.991
Adjusted R ²	0.986
Residual Std. Error	0.220 (df = 25)
F Statistic	193.730*** (df = 14; 25)

Note:

* p ** p *** p<0.01

REGRESSION FOR 1-YEAR TREASURY YIELD	
	<i>Dependent variable (+/- SE):</i>
	1-year Treasury Yield
Constant	-8.059 (+/- 1.610) p = 0.00003***
Moody's AAA Curve	-3.339 (+/- 0.607) p = 0.00001***
Moody's BAA Curve	1.725 (+/- 0.252) p = 0.00000***
Unemployment Rate	-0.324 (+/- 0.050) p = 0.00000***
BBB corporate yield	-1.134 (+/- 0.226) p = 0.00003***
30-year Mortgage Rate	1.138 (+/- 0.196) p = 0.00001***
LN_30-year Treasury Yield	5.929 (+/- 1.973) p = 0.006***
20-year Treasury Yield	17.584 (+/- 2.281) p = 0.00000***
LN_20-year Treasury Yield	-36.114 (+/- 3.788) p = 0.000***
LN_10-year Treasury Yield	6.712 (+/- 0.895) p = 0.00000***
20-year Treasury Yield_2	-1.167 (+/- 0.198) p = 0.00001***
Observations	40
R ²	0.988
Adjusted R ²	0.983
Residual Std. Error	0.226 (df = 29)
F Statistic	231.889*** (df = 10; 29)
Note:	* p ** p *** p<0.01

REGRESSION FOR 3-YEAR TREASURY YIELD	
	<i>Dependent variable (+/- SE):</i>
	3-year Treasury Yield
Constant	-9.939 (+/- 1.404) p = 0.00000***
Real GDP growth	-0.029 (+/- 0.005) p = 0.00001***
Unemployment Rate	-0.446 (+/- 0.042) p = 0.000***
20-year Treasury Yield	17.369 (+/- 1.934) p = 0.000***
LN_20-year Treasury Yield	-24.129 (+/- 2.561) p = 0.000***
20-year Treasury Yield_2	-1.270 (+/- 0.173) p = 0.00000***
Observations	40
R ²	0.976
Adjusted R ²	0.973
Residual Std. Error	0.227 (df = 34)
F Statistic	282.183*** (df = 5; 34)
<i>Note:</i>	* p ** p *** p<0.01

REGRESSION FOR 5-YEAR TREASURY YIELD	
	<i>Dependent variable (+/- SE):</i>
	5-year Treasury Yield
Constant	-11.804 (+/- 2.121) p = 0.00001***
Real GDP growth	-0.026 (+/- 0.006) p = 0.0001***
Unemployment Rate	-0.377 (+/- 0.042) p = 0.000***
30-year Treasury Yield	20.845 (+/- 3.106) p = 0.00000***
LN_30-year Treasury Yield	-30.133 (+/- 4.327) p = 0.00000***
30-year Treasury Yield_2	-1.520 (+/- 0.267) p = 0.00001***
Observations	40
R ²	0.966
Adjusted R ²	0.961
Residual Std. Error	0.235 (df = 34)
F Statistic	191.453*** (df = 5; 34)
Note:	* p ** p *** p<0.01

REGRESSION FOR 7-YEAR TREASURY YIELD

	<i>Dependent variable (+/- SE):</i>
	7-year Treasury Yield
Constant	1.785 (+/- 0.599) p = 0.006***
Unemployment Rate	-0.068 (+/- 0.023) p = 0.006***
BBB corporate yield	0.263 (+/- 0.069) p = 0.001***
Prime Rate	0.469 (+/- 0.078) p = 0.00001***
Dow Total Stock Market Index	0.00004 (+/- 0.00001) p = 0.003***
Commercial Real Estate Price Index	-0.015 (+/- 0.002) p = 0.00000***
US Avg Retail Gasoline Price (\$-gal; all grades, all formulations)	0.265 (+/- 0.093) p = 0.009***
6-month Treasury Yield_2	0.150 (+/- 0.052) p = 0.008***
3-month Treasury Yield_2	-0.303 (+/- 0.079) p = 0.001***
1-month Treasury Yield_2	0.131 (+/- 0.045) p = 0.007***
Observations	40
R ²	0.979
Adjusted R ²	0.973
Residual Std. Error	0.177 (df = 30)
F Statistic	155.158*** (df = 9; 30)
Note:	* p ** p *** p<0.01

REGRESSION FOR 10-YEAR TREASURY YIELD	
	<i>Dependent variable (+/- SE):</i>
	10-year Treasury Yield
Constant	3.071 (+/- 0.337) p = 0.000***
Unemployment Rate	-0.130 (+/- 0.027) p = 0.00004***
Home Price Index	-0.010 (+/- 0.001) p = 0.000***
1-month Treasury Yield	-2.798 (+/- 0.331) p = 0.000***
6-month Treasury Yield	3.804 (+/- 0.472) p = 0.000***
LN_6-month Treasury Yield	-0.512 (+/- 0.101) p = 0.00002***
6-month Treasury Yield_2	-0.330 (+/- 0.069) p = 0.00004***
1-month Treasury Yield_2	0.333 (+/- 0.052) p = 0.00000***
Observations	40
R ²	0.958
Adjusted R ²	0.948
Residual Std. Error	0.223 (df = 32)
F Statistic	103.524*** (df = 7; 32)
<i>Note:</i>	* p ** p *** p<0.01

REGRESSION FOR 20-YEAR TREASURY YIELD	
	<i>Dependent variable (+/- SE):</i>
	20-year Treasury Yield
Constant	1.249 (+/- 0.408) p = 0.005***
Prime Rate	0.440 (+/- 0.133) p = 0.003***
Home Price Index	-0.004 (+/- 0.001) p = 0.0001***
6-month Treasury Yield	-0.392 (+/- 0.124) p = 0.004***
LN_3-year Treasury Yield	0.718 (+/- 0.081) p = 0.000***
LN_1-year Treasury Yield	-0.365 (+/- 0.060) p = 0.00000***
3-year Treasury Yield_2	0.115 (+/- 0.021) p = 0.00001***
Observations	40
R ²	0.976
Adjusted R ²	0.972
Residual Std. Error	0.152 (df = 33)
F Statistic	228.229*** (df = 6; 33)
Note:	* ** *** p<0.01

REGRESSION FOR 30-YEAR TREASURY YIELD	
	<i>Dependent variable (+/- SE):</i>
	30-year Treasury Yield
Constant	1.703 (+/- 0.333) p = 0.00003***
CPI Inflation Rate	0.040 (+/- 0.011) p = 0.001***
Prime Rate	0.717 (+/- 0.128) p = 0.00001***
Home Price Index	-0.009 (+/- 0.001) p = 0.000***
LN_1-month Treasury Yield	-0.179 (+/- 0.056) p = 0.004***
3-month Treasury Yield	0.929 (+/- 0.146) p = 0.00000***
LN_5-year Treasury Yield	0.909 (+/- 0.081) p = 0.000***
6-month Treasury Yield	-1.836 (+/- 0.262) p = 0.00000***
LN_6-month Treasury Yield	0.993 (+/- 0.183) p = 0.00001***
LN_1-year Treasury Yield	-1.040 (+/- 0.169) p = 0.00001***
1-year Treasury Yield_2	0.066 (+/- 0.016) p = 0.0004***
5-year Treasury Yield_2	0.086 (+/- 0.015) p = 0.00001***
Market Volatility Index_2	0.0001 (+/- 0.00002) p = 0.007***
Observations	40
R ²	0.992
Adjusted R ²	0.988
Residual Std. Error	0.085 (df = 27)
F Statistic	280.115*** (df = 12; 27)
Note:	* ** * p<0.01

30-year Mortgage Rate

REGRESSION FOR 30-YEAR MORTGATE RATE	
	<i>Dependent variable (+/- SE):</i>
	30-year Mortgage Rate
Constant	1.935 (+/- 0.299) p = 0.00000***
US Avg Retail Gasoline Price (\$-gal; all grades, all formulations)	0.414 (+/- 0.111) p = 0.001***
6-month Treasury Yield	-4.347 (+/- 0.680) p = 0.00000***
1-year Treasury Yield	4.708 (+/- 0.699) p = 0.00000***
1-year Treasury Yield_2	-0.450 (+/- 0.133) p = 0.002***
6-month Treasury Yield_2	0.506 (+/- 0.118) p = 0.0002***
Observations	40
R ²	0.956
Adjusted R ²	0.950
Residual Std. Error	0.299 (df = 34)
F Statistic	148.629*** (df = 5; 34)
<i>Note:</i>	* ** *** p<0.01

Moody's AAA & BAA Rates

REGRESSION FOR MOODY'S AAA CURVE	
	<i>Dependent variable (+/- SE):</i>
	Moody's AAA Curve
Constant	2.564 (+/- 0.438) p = 0.00001***
SP500 Stock Price Index	-0.0003 (+/- 0.00004) p = 0.000***
US Fed Reserve O-N Loan Rate	0.632 (+/- 0.145) p = 0.0002***
Prime Rate	0.506 (+/- 0.145) p = 0.002***
LN_1-month Treasury Yield	-0.343 (+/- 0.092) p = 0.001***
6-month Treasury Yield	-1.388 (+/- 0.293) p = 0.00005***
LN_6-month Treasury Yield	1.153 (+/- 0.332) p = 0.002***
LN_3-year Treasury Yield	0.716 (+/- 0.116) p = 0.00000***
LN_1-year Treasury Yield	-1.086 (+/- 0.330) p = 0.003***
3-year Treasury Yield_2	0.162 (+/- 0.024) p = 0.00000***
Observations	40
R ²	0.971
Adjusted R ²	0.963
Residual Std. Error	0.149 (df = 30)
F Statistic	112.987*** (df = 9; 30)
Note:	* ** *** p<0.01

REGRESSION FOR MOODY'S BAA CURVE	
	<i>Dependent variable (+/- SE):</i>
	Moody's BAA Curve
Constant	5.069 (+/- 0.183) p = 0.000***
Dow Total Stock Market Index	-0.00005 (+/- 0.00001) p = 0.000***
3-month Treasury Yield	-0.691 (+/- 0.116) p = 0.00000***
3-year Treasury Yield	0.785 (+/- 0.092) p = 0.000***
3-month Treasury Yield_2	0.117 (+/- 0.016) p = 0.000***
Observations	40
R ²	0.926
Adjusted R ²	0.917
Residual Std. Error	0.235 (df = 35)
F Statistic	109.398*** (df = 4; 35)
<i>Note:</i>	* p ** p *** p<0.01

BBB Corporate Yield

REGRESSION FOR BBB CORPORATE YIELD	
	<i>Dependent variable (+/- SE):</i>
	BBB corporate yield
Constant	4.967 (+/- 0.589) p = 0.000***
US Fed Reserve O-N Loan Rate	-2.229 (+/- 0.191) p = 0.000***
Unemployment Rate	-0.141 (+/- 0.033) p = 0.0002***
Dow Total Stock Market Index	-0.00004 (+/- 0.00001) p = 0.00000***
LN_30-year Treasury Yield	-3.266 (+/- 0.616) p = 0.00001***
7-year Treasury Yield	3.064 (+/- 0.394) p = 0.000***
6-month Treasury Yield	1.236 (+/- 0.188) p = 0.00000***
3-month Treasury Yield_2	0.258 (+/- 0.024) p = 0.000***
7-year Treasury Yield_2	-0.390 (+/- 0.062) p = 0.00000***
Observations	40
R ²	0.977
Adjusted R ²	0.971
Residual Std. Error	0.185 (df = 31)
F Statistic	163.442*** (df = 8; 31)
Note:	* ** *** p<0.01

Prime Rate

REGRESSION FOR PRIME RATE	
	<i>Dependent variable (+/- SE):</i>
	Prime Rate
Constant	-14.961 (+/- 2.174) p = 0.00000***
Moody's AAA Curve	-1.101 (+/- 0.340) p = 0.004***
Real GDP growth	0.191 (+/- 0.032) p = 0.00001***
Nominal GDP growth	-0.173 (+/- 0.029) p = 0.00001***
Dow Total Stock Market Index	0.0001 (+/- 0.00001) p = 0.0001***
Commercial Real Estate Price Index	0.019 (+/- 0.003) p = 0.00000***
30-year Treasury Yield	-9.694 (+/- 2.022) p = 0.00005***
LN_30-year Treasury Yield	37.986 (+/- 5.222) p = 0.00000***
20-year Treasury Yield	22.427 (+/- 2.160) p = 0.000***
LN_20-year Treasury Yield	-49.805 (+/- 4.623) p = 0.000***
LN_7-year Treasury Yield	3.044 (+/- 0.395) p = 0.00000***
20-year Treasury Yield_2	-1.164 (+/- 0.180) p = 0.00000***
Observations	40
R ²	0.992
Adjusted R ²	0.989
Residual Std. Error	0.194 (df = 28)
F Statistic	318.464*** (df = 11; 28)
Note:	* p ** p *** 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	40.066 (+/- 0.735) p = 0.00000***
SP500 Stock Price Index	0.001 (+/- 0.00004) p = 0.00001***
Moody's BAA Curve	3.198 (+/- 0.047) p = 0.00000***
Real GDP growth	-0.953 (+/- 0.014) p = 0.00000***
Nominal GDP growth	0.910 (+/- 0.013) p = 0.00000***
Real disposable income growth	0.178 (+/- 0.008) p = 0.00002***
Nominal disposable income growth	-0.182 (+/- 0.007) p = 0.00002***
Unemployment Rate	-0.746 (+/- 0.019) p = 0.00001***
BBB corporate yield	-0.571 (+/- 0.015) p = 0.00001***
Prime Rate	2.349 (+/- 0.073) p = 0.00001***
Home Price Index	-0.108 (+/- 0.002) p = 0.00001***
Commercial Real Estate Price Index	-0.039 (+/- 0.001) p = 0.00001***
Market Volatility Index	-0.062 (+/- 0.001) p = 0.00001***
LN_Market Volatility Index	0.810 (+/- 0.026) p = 0.00001***
LN_30-year Treasury Yield	-76.150 (+/- 1.371) p = 0.00000***
20-year Treasury Yield	26.098 (+/- 0.566) p = 0.00001***
LN_20-year Treasury Yield	-11.976 (+/- 1.287) p = 0.001***

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10-year Treasury Yield	-9.807 (+/- 0.497) p = 0.00004***
LN_10-year Treasury Yield	33.910 (+/- 1.101) p = 0.00001***
1-month Treasury Yield	-7.653 (+/- 0.126) p = 0.00000***
LN_1-month Treasury Yield	-1.093 (+/- 0.015) p = 0.00000***
LN_7-year Treasury Yield	-23.861 (+/- 0.433) p = 0.00000***
3-month Treasury Yield	7.391 (+/- 0.160) p = 0.00001***
5-year Treasury Yield	-4.873 (+/- 0.311) p = 0.0001***
LN_5-year Treasury Yield	23.327 (+/- 0.652) p = 0.00001***
LN_6-month Treasury Yield	5.929 (+/- 0.072) p = 0.00000***
3-year Treasury Yield	-1.481 (+/- 0.239) p = 0.004***
LN_3-year Treasury Yield	-5.016 (+/- 0.258) p = 0.00005***
LN_1-year Treasury Yield	-5.397 (+/- 0.068) p = 0.00000***
1-year Treasury Yield_2	0.855 (+/- 0.023) p = 0.00001***
6-month Treasury Yield_2	-0.555 (+/- 0.028) p = 0.00004***
5-year Treasury Yield_2	-2.314 (+/- 0.041) p = 0.00000***
3-month Treasury Yield_2	0.106 (+/- 0.023) p = 0.010***
7-year Treasury Yield_2	2.293 (+/- 0.042) p = 0.00000***
1-month Treasury Yield_2	0.060 (+/- 0.011) p = 0.007***
30-year Treasury Yield_2	0.160 (+/- 0.029) p = 0.006***

Observations

40

R ²	1.000
Adjusted R ²	1.000
Residual Std. Error	0.008 (df = 4)
F Statistic	6,845.256*** (df = 35; 4)
<hr/>	
Note:	* p ** p *** p<0.01

US Federal Reserve Overnight Lending Rate

REGRESSION FOR US FED RESERVE O-N LOAN RATE	
	<i>Dependent variable (+/- SE):</i>
	US Fed Reserve O-N Loan Rate
Constant	-16.212 (+/- 3.579) p = 0.0002***
Moody's AAA Curve	-2.264 (+/- 0.537) p = 0.0003***
Real GDP growth	0.282 (+/- 0.050) p = 0.00001***
Nominal GDP growth	-0.248 (+/- 0.046) p = 0.00001***
Dow Total Stock Market Index	0.0001 (+/- 0.00002) p = 0.008***
Commercial Real Estate Price Index	0.024 (+/- 0.004) p = 0.00000***
LN_30-year Treasury Yield	22.630 (+/- 3.755) p = 0.00001***
20-year Treasury Yield	12.731 (+/- 3.082) p = 0.0003***
LN_20-year Treasury Yield	-37.334 (+/- 6.195) p = 0.00001***
LN_7-year Treasury Yield	4.148 (+/- 0.620) p = 0.00000***
20-year Treasury Yield_2	-0.888 (+/- 0.301) p = 0.007***
Market Volatility Index_2	0.0002 (+/- 0.0001) p = 0.003***
Observations	40
R ²	0.979
Adjusted R ²	0.970
Residual Std. Error	0.304 (df = 28)
F Statistic	116.662*** (df = 11; 28)
Note:	* p*** p*** p<0.01

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

REGRESSION FOR DOW TOTAL STOCK MARKET INDEX	
	<i>Dependent variable (+/- SE):</i>
	Dow Total Stock Market Index
Constant	124,522.900 (+/- 11,693.260) p = 0.000***
Nominal disposable income growth	-126.959 (+/- 18.837) p = 0.00000***
Prime Rate	13,508.860 (+/- 1,748.452) p = 0.00000***
30-year Treasury Yield	-214,926.700 (+/- 17,724.780) p = 0.000***
10-year Treasury Yield	203,396.100 (+/- 13,786.550) p = 0.000***
LN_1-month Treasury Yield	-4,207.375 (+/- 1,309.316) p = 0.005***
3-month Treasury Yield	44,230.910 (+/- 9,984.723) p = 0.0003***
5-year Treasury Yield	-61,450.830 (+/- 6,687.976) p = 0.000***
6-month Treasury Yield	-97,767.810 (+/- 17,138.690) p = 0.00001***
LN_6-month Treasury Yield	20,894.690 (+/- 4,449.242) p = 0.0002***
1-year Treasury Yield	46,314.400 (+/- 12,946.530) p = 0.002***
LN_1-year Treasury Yield	-19,326.550 (+/- 3,830.834) p = 0.00005***
1-year Treasury Yield_2	-6,734.752 (+/- 2,209.071) p = 0.006***
6-month Treasury Yield_2	9,868.560 (+/- 2,670.080) p = 0.002***
5-year Treasury Yield_2	15,019.220 (+/- 1,504.459) p = 0.000***
3-month Treasury Yield_2	-3,838.963 (+/- 1,230.871) p = 0.005***
10-year Treasury Yield_2	-38,448.230 (+/- 3,414.152) p = 0.000***

30-year Treasury Yield_2	32,746.830 (+/- 3,570.893) p = 0.000 ***
Observations	40
R ²	0.989
Adjusted R ²	0.981
Residual Std. Error	1,384.443 (df = 22)
F Statistic	119.147 *** (df = 17; 22)
Note:	* ** p *** p<0.01

REGRESSION FOR SP500 STOCK PRICE INDEX

	<i>Dependent variable (+/- SE):</i>
	SP500 Stock Price Index
Constant	13,362.300 (+/- 1,566.531) p = 0.00000***
Real GDP growth	-21.451 (+/- 4.763) p = 0.0003***
Nominal disposable income growth	-10.520 (+/- 1.923) p = 0.00003***
BBB corporate yield	401.218 (+/- 60.682) p = 0.00001***
Prime Rate	967.456 (+/- 142.482) p = 0.00001***
US Avg Retail Gasoline Price (\$-gal; all grades, all formulations)	283.033 (+/- 91.805) p = 0.006***
30-year Treasury Yield	-14,830.050 (+/- 1,980.078) p = 0.00000***
20-year Treasury Yield	-9,953.524 (+/- 2,055.171) p = 0.0001***
LN_20-year Treasury Yield	31,175.860 (+/- 5,236.789) p = 0.00001***
10-year Treasury Yield	18,104.180 (+/- 3,320.953) p = 0.00003***
LN_10-year Treasury Yield	-16,792.670 (+/- 2,938.404) p = 0.00002***
7-year Treasury Yield	-3,825.277 (+/- 1,294.836) p = 0.008***
LN_7-year Treasury Yield	5,591.392 (+/- 1,414.946) p = 0.001***
3-month Treasury Yield	2,755.231 (+/- 464.952) p = 0.00001***
5-year Treasury Yield	-6,593.238 (+/- 1,045.558) p = 0.00001***
6-month Treasury Yield	-3,857.680 (+/- 536.110) p = 0.00000***
LN_6-month Treasury Yield	498.119 (+/- 64.336) p = 0.00000***
5-year Treasury Yield_2	1,519.782 (+/- 226.780)

	p = 0.00001***
10-year Treasury Yield_2	-1,825.939 (+/- 566.943)
	p = 0.005***
30-year Treasury Yield_2	1,923.863 (+/- 395.840)
	p = 0.0001***
Observations	40
R ²	0.994
Adjusted R ²	0.988
Residual Std. Error	110.384 (df = 20)
F Statistic	167.958*** (df = 19; 20)
Note:	* ** *** p<0.01

House and Commercial Real Estate Price Indexes

REGRESSION FOR HOME PRICE INDEX	
	<i>Dependent variable (+/- SE):</i>
	Home Price Index
Constant	270.121 (+/- 8.496) p = 0.000***
Moody's AAA Curve	27.053 (+/- 3.627) p = 0.00001***
Real GDP growth	-5.652 (+/- 0.284) p = 0.000***
Nominal GDP growth	5.698 (+/- 0.263) p = 0.000***
Real disposable income growth	-0.328 (+/- 0.024) p = 0.000***
Unemployment Rate	6.606 (+/- 0.843) p = 0.00001***
BBB corporate yield	21.805 (+/- 1.778) p = 0.000***
30-year Mortgage Rate	-18.065 (+/- 1.626) p = 0.000***
Prime Rate	38.620 (+/- 1.751) p = 0.000***
LN_30-year Treasury Yield	-564.848 (+/- 17.696) p = 0.000***
20-year Treasury Yield	63.194 (+/- 19.115) p = 0.005***
LN_20-year Treasury Yield	247.653 (+/- 50.814) p = 0.0003***
10-year Treasury Yield	-77.145 (+/- 15.606) p = 0.0002***
LN_10-year Treasury Yield	300.564 (+/- 34.552) p = 0.00000***
1-month Treasury Yield	-19.862 (+/- 2.930) p = 0.00001***
7-year Treasury Yield	-108.990 (+/- 10.842) p = 0.00000***
3-month Treasury Yield	52.184 (+/- 5.370) p = 0.00000***

LN_5-year Treasury Yield	-93.107 (+/- 14.355) p = 0.00002***
6-month Treasury Yield	-48.304 (+/- 8.406) p = 0.00004***
LN_6-month Treasury Yield	43.797 (+/- 1.918) p = 0.000***
LN_3-year Treasury Yield	54.342 (+/- 8.485) p = 0.00002***
1-year Treasury Yield	-42.030 (+/- 7.719) p = 0.0001***
LN_1-year Treasury Yield	-40.109 (+/- 3.002) p = 0.000***
5-year Treasury Yield_2	17.183 (+/- 1.235) p = 0.000***
3-month Treasury Yield_2	3.868 (+/- 0.290) p = 0.000***
Observations	40
R ²	1.000
Adjusted R ²	1.000
Residual Std. Error	1.041 (df = 15)
F Statistic	3,842.922*** (df = 24; 15)
Note:	* p ** p *** p<0.01

REGRESSION FOR COMMERCIAL REAL ESTATE PRICE INDEX	
	<i>Dependent variable (+/- SE):</i>
	Commercial Real Estate Price Index
Constant	380.528 (+/- 19.282) p = 0.000***
US Fed Reserve O-N Loan Rate	-17.764 (+/- 4.587) p = 0.001***
Real GDP growth	-4.912 (+/- 1.030) p = 0.0001***
Nominal GDP growth	3.857 (+/- 0.974) p = 0.0005***
Unemployment Rate	-10.505 (+/- 1.618) p = 0.00000***
Prime Rate	36.705 (+/- 5.419) p = 0.00000***
LN_30-year Treasury Yield	-393.765 (+/- 43.614) p = 0.000***
LN_20-year Treasury Yield	211.497 (+/- 41.911) p = 0.00003***
5-year Treasury Yield	-31.378 (+/- 9.212) p = 0.003***
1-year Treasury Yield_2	17.867 (+/- 3.964) p = 0.0002***
3-year Treasury Yield_2	-15.167 (+/- 3.569) p = 0.0003***
6-month Treasury Yield_2	-9.501 (+/- 2.830) p = 0.003***
10-year Treasury Yield_2	14.829 (+/- 3.228) p = 0.0001***
Observations	40
R ²	0.985
Adjusted R ²	0.979
Residual Std. Error	5.856 (df = 27)
F Statistic	152.149*** (df = 12; 27)
Note:	* p** p*** p<0.01

Market Volatility Index

REGRESSION FOR MARKET VOLATILITY INDEX	
	<i>Dependent variable (+/- SE):</i>
	Market Volatility Index
Constant	302.691 (+/- 41.736) p = 0.00000***
Moody's BAA Curve	19.802 (+/- 6.177) p = 0.004***
Real GDP growth	-5.970 (+/- 1.348) p = 0.0002***
Nominal GDP growth	5.423 (+/- 1.273) p = 0.0003***
Unemployment Rate	-6.128 (+/- 1.812) p = 0.003***
Dow Total Stock Market Index	-0.002 (+/- 0.0004) p = 0.00001***
Commercial Real Estate Price Index	-0.295 (+/- 0.103) p = 0.009***
30-year Treasury Yield	196.298 (+/- 29.988) p = 0.00000***
LN_30-year Treasury Yield	-929.292 (+/- 131.080) p = 0.00000***
LN_10-year Treasury Yield	269.944 (+/- 51.386) p = 0.00003***
1-month Treasury Yield	-52.167 (+/- 12.921) p = 0.0005***
LN_1-month Treasury Yield	-18.141 (+/- 4.533) p = 0.001***
3-month Treasury Yield	77.370 (+/- 16.587) p = 0.0001***
LN_6-month Treasury Yield	72.308 (+/- 14.429) p = 0.00005***
3-year Treasury Yield	-34.779 (+/- 10.488) p = 0.003***
LN_1-year Treasury Yield	-73.843 (+/- 13.228) p = 0.00001***
Observations	40

R ²	0.886
Adjusted R ²	0.814
Residual Std. Error	5.598 (df = 24)
F Statistic	12.392 ^{***} (df = 15; 24)
<hr/>	
<i>Note:</i>	* p ** p *** 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 “2024 Stress Test Scenarios” (found at <https://www.federalreserve.gov/publications/files/2024-stress-test-scenarios-20240215.pdf>) are listed. Please note that shaded attributes are not discussed within this report.

Table 16: Data Values and Referenced Sources

Attribute	Referenced Source ⁸²
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 ⁸³

⁸² Per <https://www.federalreserve.gov/newsevents/pressreleases/files/bcreg20190213a1.pdf>

⁸³ 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) ⁸⁴ .
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) ⁸⁵ .
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.

⁸⁴ 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

⁸⁵ 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/2024-Table_2A_Historic_Domestic.csv and https://www.federalreserve.gov/supervisionreg/files/2024-Table_2B_Historic_International.csv (shown below, as of April 2024) by clicking the links marked “2024 Historical Domestic (CSV)” and “2024 Historical International (CSV)”⁸⁶.

Board of Governors of the Federal Reserve System

The Federal Reserve, the central bank of the United States, provides the nation with a safe, flexible, and stable monetary and financial system.

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Stress Tests

Dodd-Frank Act Stress Tests 2024

Annual Large Bank Capital Requirements

Supervisory Stress Test Historical Exercises

CCAR Historical Exercises (2011-2021)

Dodd-Frank Act Stress Tests 2024

Scenarios

- 2024 Stress Test Scenarios (PDF)
- Federal Reserve Board releases the hypothetical scenarios for its annual stress test
- Scenario Data
 - 2024 Severely Adverse Market Shocks (Excel)
 - 2024 Historic Domestic (CSV)
 - 2024 Historic International (CSV)
 - 2024 Supervisory Baseline Domestic (CSV)
 - 2024 Supervisory Baseline International (CSV)
 - 2024 Supervisory Severely Adverse Domestic (CSV)
 - 2024 Supervisory Severely Adverse International (CSV)
 - Domestic Data Definitions (PDF)
 - International Data Definitions (PDF)

Since the CCAR dataset is only released annually (through 4Q2023 as of this writing), and Capitytics provides quarterly updates to its forecasts, the CCAR dataset is supplemented by the data sources

⁸⁶ Again, due to the requirements of this client, international data elements are not being discussed in this document.

shown below on a quarterly basis. All datasets discussed herein are supplemented with data through (including) 3Q2024.

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/2024-Table_2A_Historic_Domestic.csv and https://www.federalreserve.gov/supervisionreg/files/2024-Table_2B_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) 3Q2024.

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's⁸⁷ "forecast" package⁸⁸; specifically, the "ets" function (see p.39 of <https://cran.r-project.org/web/packages/forecast/forecast.pdf>)⁸⁹ is designed to automatically determine the best fitting representation out of the "Generic 'ETS' Methodology" (discussed later in this section), including optimal parameters thereto, given a sequence of values. In our work, we have restricted our study to only "additive" forms (i.e., we set "additive.only=TRUE" in our calls), and our optimization criteria is set to the mean of absolute residuals (i.e., "opt.crit=mae"). Therefore, calls to generate our estimates through this procedure look something like the following command, where "s" is an appropriately populated array, vector, time series, or similar object.

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

The results of this call are shown above each dataset, including the representation type returned (as described later this section), the initial values that are used by the software, the optimal smoothing parameters estimated, and the $n+1^{\text{st}}$ forecasted value given the first n values of the metric's sequence (the "fitted" values)⁹⁰, 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

⁸⁷ As of this writing, v.4.1.2 of the "R" language is available at <https://cran.r-project.org/>.

⁸⁸ As of this writing, v.8.16 of the forecast package is available at <https://CRAN.R-project.org/package=forecast>.

⁸⁹ 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.

⁹⁰ 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)⁹¹.
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 values⁹²;
 - 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

⁹¹ It bears noting that a lower value for the “score” indicates better accuracy of an algorithm.

⁹² 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 slopes⁹³.

5. In some cases, we may find variables with extremely tight cross-connections that can be justified as part of their nature (treasury bill yield rates, for example, with a magnitude or correlation greater than ~0.95). In these cases, we are able to additionally enhance our forecast by building a forecast that expresses one variable (the “dependent” variable, $y(t)$) in terms of another (the “independent” variable, $x(t)$) with a coefficient of determination (R^2), such that

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

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

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

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

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

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

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

⁹³ 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	N	Seasonal 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 6: Correlation Factors found as of 3Q2024

Variable 1	Variable 2	Correlation
S&P 500 Stock Price Index	Annualized US Inflation Rate (all items, all urban areas)	0.607471
S&P 500 Stock Price Index	Dow-Jones Total Stock Market Index	0.980644
S&P 500 Stock Price Index	US Nat'l Residential Home Price Index	0.958461
S&P 500 Stock Price Index	US Nat'l Commercial Real Estate Index	0.907123
S&P 500 Stock Price Index	Average Retail Gasoline Price (all grades)	0.656242
Cost of Federal Funds	Moody's AAA Yield	0.77012
Cost of Federal Funds	Moody's BAA Yield	0.714009
Cost of Federal Funds	BofA BBB Corporate Yield	0.744721
Cost of Federal Funds	US 30-year Fixed Interest Mortgage Rate	0.870979
Cost of Federal Funds	US Prime Rate	0.99639
Cost of Federal Funds	10-year Treasury Yield	0.833096
Cost of Federal Funds	1-month Treasury Yield	0.990506
Cost of Federal Funds	7-year Treasury Yield	0.770915
Cost of Federal Funds	3-month Treasury Yield	0.995459
Cost of Federal Funds	5-year Treasury Yield	0.908841
Cost of Federal Funds	6-month Treasury Yield	0.988291
Cost of Federal Funds	3-year Treasury Yield	0.92172
Cost of Federal Funds	1-year Treasury Yield	0.979594
Moody's AAA Yield	Moody's BAA Yield	0.979289
Moody's AAA Yield	BofA BBB Corporate Yield	0.947951
Moody's AAA Yield	US 30-year Fixed Interest Mortgage Rate	0.963651
Moody's AAA Yield	US Prime Rate	0.747005
Moody's AAA Yield	Dow-Jones Total Stock Market Index	-0.727412
Moody's AAA Yield	US Nat'l Residential Home Price Index	-0.758297
Moody's AAA Yield	US Nat'l Commercial Real Estate Index	-0.824167
Moody's AAA Yield	Average Retail Gasoline Price (all grades)	-0.703802
Moody's AAA Yield	30-year Treasury Yield	0.968405
Moody's AAA Yield	20-year Treasury Yield	0.968346
Moody's AAA Yield	10-year Treasury Yield	0.9834
Moody's AAA Yield	7-year Treasury Yield	0.859408
Moody's AAA Yield	3-month Treasury Yield	0.763528
Moody's AAA Yield	5-year Treasury Yield	0.937785
Moody's AAA Yield	3-year Treasury Yield	0.626818
Moody's BAA Yield	BofA BBB Corporate Yield	0.983581
Moody's BAA Yield	US 30-year Fixed Interest Mortgage Rate	0.937184
Moody's BAA Yield	US Prime Rate	0.690303
Moody's BAA Yield	Dow-Jones Total Stock Market Index	-0.745096
Moody's BAA Yield	US Nat'l Residential Home Price Index	-0.747168
Moody's BAA Yield	US Nat'l Commercial Real Estate Index	-0.801405
Moody's BAA Yield	Average Retail Gasoline Price (all grades)	-0.668062
Moody's BAA Yield	30-year Treasury Yield	0.86967
Moody's BAA Yield	20-year Treasury Yield	0.878247
Moody's BAA Yield	10-year Treasury Yield	0.946838
Moody's BAA Yield	7-year Treasury Yield	0.742923
Moody's BAA Yield	3-month Treasury Yield	0.705343
Moody's BAA Yield	5-year Treasury Yield	0.887357
Real GDP Growth Rate	Nominal GDP Growth Rate	0.958419
Real Disposable Income Growth Rate	Nominal Disposable Income Growth Rate	0.972239
US Nat'l Unemployment Rate	1-year Treasury Yield	-0.604469

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BofA BBB Corporate Yield	US 30-year Fixed Interest Mortgage Rate	0.934995
BofA BBB Corporate Yield	US Prime Rate	0.723385
BofA BBB Corporate Yield	Dow-Jones Total Stock Market Index	-0.663589
BofA BBB Corporate Yield	US Nat'l Residential Home Price Index	-0.658754
BofA BBB Corporate Yield	US Nat'l Commercial Real Estate Index	-0.703872
BofA BBB Corporate Yield	30-year Treasury Yield	0.774142
BofA BBB Corporate Yield	20-year Treasury Yield	0.811024
BofA BBB Corporate Yield	10-year Treasury Yield	0.925548
BofA BBB Corporate Yield	7-year Treasury Yield	0.737539
BofA BBB Corporate Yield	3-month Treasury Yield	0.738054
BofA BBB Corporate Yield	5-year Treasury Yield	0.884862
US 30-year Fixed Interest Mortgage Rate	US Prime Rate	0.853197
US 30-year Fixed Interest Mortgage Rate	US Nat'l Commercial Real Estate Index	-0.672628
US 30-year Fixed Interest Mortgage Rate	Average Retail Gasoline Price (all grades)	-0.602667
US 30-year Fixed Interest Mortgage Rate	30-year Treasury Yield	0.876457
US 30-year Fixed Interest Mortgage Rate	20-year Treasury Yield	0.921951
US 30-year Fixed Interest Mortgage Rate	10-year Treasury Yield	0.983434
US 30-year Fixed Interest Mortgage Rate	1-month Treasury Yield	0.73548
US 30-year Fixed Interest Mortgage Rate	7-year Treasury Yield	0.956396
US 30-year Fixed Interest Mortgage Rate	3-month Treasury Yield	0.874642
US 30-year Fixed Interest Mortgage Rate	5-year Treasury Yield	0.978659
US 30-year Fixed Interest Mortgage Rate	6-month Treasury Yield	0.758794
US 30-year Fixed Interest Mortgage Rate	3-year Treasury Yield	0.877103
US 30-year Fixed Interest Mortgage Rate	1-year Treasury Yield	0.783628
US Prime Rate	10-year Treasury Yield	0.811509
US Prime Rate	1-month Treasury Yield	0.990164
US Prime Rate	7-year Treasury Yield	0.755848
US Prime Rate	3-month Treasury Yield	0.99246
US Prime Rate	5-year Treasury Yield	0.891917
US Prime Rate	6-month Treasury Yield	0.987338
US Prime Rate	3-year Treasury Yield	0.91217
US Prime Rate	1-year Treasury Yield	0.976862
Dow-Jones Total Stock Market Index	US Nat'l Residential Home Price Index	0.928898
Dow-Jones Total Stock Market Index	US Nat'l Commercial Real Estate Index	0.915773
Dow-Jones Total Stock Market Index	Average Retail Gasoline Price (all grades)	0.607533
Dow-Jones Total Stock Market Index	10-year Treasury Yield	-0.650456
US Nat'l Residential Home Price Index	US Nat'l Commercial Real Estate Index	0.966185
US Nat'l Residential Home Price Index	Average Retail Gasoline Price (all grades)	0.71461
US Nat'l Residential Home Price Index	10-year Treasury Yield	-0.679293
US Nat'l Commercial Real Estate Index	Average Retail Gasoline Price (all grades)	0.743098
US Nat'l Commercial Real Estate Index	10-year Treasury Yield	-0.758602
US Nat'l Commercial Real Estate Index	5-year Treasury Yield	-0.655657
Average Retail Gasoline Price (all grades)	10-year Treasury Yield	-0.680005
Average Retail Gasoline Price (all grades)	5-year Treasury Yield	-0.65059
30-year Treasury Yield	20-year Treasury Yield	0.990338
30-year Treasury Yield	10-year Treasury Yield	0.956658
30-year Treasury Yield	7-year Treasury Yield	0.886319
30-year Treasury Yield	5-year Treasury Yield	0.797911
30-year Treasury Yield	3-year Treasury Yield	0.658302
20-year Treasury Yield	10-year Treasury Yield	0.982987
20-year Treasury Yield	7-year Treasury Yield	0.927373
20-year Treasury Yield	5-year Treasury Yield	0.853938
20-year Treasury Yield	3-year Treasury Yield	0.728106
10-year Treasury Yield	1-month Treasury Yield	0.629779
10-year Treasury Yield	7-year Treasury Yield	0.975792
10-year Treasury Yield	3-month Treasury Yield	0.833597
10-year Treasury Yield	5-year Treasury Yield	0.97895
10-year Treasury Yield	6-month Treasury Yield	0.652408
10-year Treasury Yield	3-year Treasury Yield	0.826497
10-year Treasury Yield	1-year Treasury Yield	0.684188
1-month Treasury Yield	7-year Treasury Yield	0.753376
1-month Treasury Yield	3-month Treasury Yield	0.995903
1-month Treasury Yield	5-year Treasury Yield	0.830784

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1-month Treasury Yield	6-month Treasury Yield	0.990941
1-month Treasury Yield	3-year Treasury Yield	0.916735
1-month Treasury Yield	1-year Treasury Yield	0.981106
7-year Treasury Yield	3-month Treasury Yield	0.765124
7-year Treasury Yield	5-year Treasury Yield	0.984797
7-year Treasury Yield	6-month Treasury Yield	0.777649
7-year Treasury Yield	3-year Treasury Yield	0.923367
7-year Treasury Yield	1-year Treasury Yield	0.807337
3-month Treasury Yield	5-year Treasury Yield	0.913998
3-month Treasury Yield	6-month Treasury Yield	0.997308
3-month Treasury Yield	3-year Treasury Yield	0.930175
3-month Treasury Yield	1-year Treasury Yield	0.99011
5-year Treasury Yield	6-month Treasury Yield	0.858716
5-year Treasury Yield	3-year Treasury Yield	0.973948
5-year Treasury Yield	1-year Treasury Yield	0.886176
6-month Treasury Yield	3-year Treasury Yield	0.943434
6-month Treasury Yield	1-year Treasury Yield	0.996887
3-year Treasury Yield	1-year Treasury Yield	0.963281

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