Macroeconomic Forecasts, 4Q2023 Domestic Metrics



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## Summary

The term 'soft landing' has been used<sup>1</sup> recently to describe the current state of the economy. Janet Yellen, former Federal Reserve Chair and current Secretary of the Treasury, used the term to describe the economy's position relative to a near-miss on an economic recession; a soft landing is capturing the image of the economy falling into a swimming pool of foam blocks rather than falling off a cliff onto the jagged rocks below.

The macroeconomic elements that may have suggested that the economy is 'falling' have included:

- Higher-than-usual inflation, primarily observed in the housing market and for food
- Supply-chain issues, resulting in backlogs of unfilled orders and long waiting times for goods (and services)
- A mismatch between employers and employees within the labor market
- Stock-market returns

The movements of these indicators (and macroeconomic elements derived from these indicators, such as real wages and interest rates), have caused concern with consumers and businesses (which reveal themselves with lower confidence ratings.) Many of the economic indicators suggest that the economy is sound. However, consumers continue to have doubts about the economy's strength.

 $<sup>^{1}\</sup> https://www.forbes.com/sites/mollybohannon/2024/01/05/soft-landing-achieved-janet-yellen-says-goal-reached-after-recession-fears-but-some-still-skeptical/?sh=6b6c5132371f$ 

## Macroeconomic Indicators

#### Inflation

The primary concerns of the economy (dating back to 1Q2022) are related to inflation and the policy responses to inflation. Consumers are acutely aware of the prices changes in three areas: energy<sup>2</sup>, food<sup>3</sup>, and housing<sup>4</sup>. We have entered a period of dis-inflation (where price increases are becoming smaller). The rate of inflation fell to 3.7% annually. The Federal Reserve Bank has indicated that it is halting interest-rate hikes and may be considering decreasing rates in 2024<sup>5</sup>.





#### Inflation: Fuel

Because fuel, food, and housing are the biggest components in consumer's budgets, it is critical to understand the inflationary aspects of these areas. Table 1 and Figure 2 identify the trends of fuel prices in the US.

Table 1 (and Figure 2) highlight current fuel prices and the movement of fuel prices since 2010. Fuel prices as of January 8, 2024, are 6% lower than the prices from January 2023. We're seeing price decreases in the last month and the last week. These changes are consistent with downward trend in over-all prices across the economy.

<sup>&</sup>lt;sup>2</sup> https://www.bloomberg.com/news/articles/2022-06-09/gasoline-food-and-power-inflation-slam-us-households-and-it-could-get-worse <sup>3</sup> ibid

<sup>&</sup>lt;sup>4</sup> https://money.com/housing-market-cooldown-signs-predictions/?ref=/housing-market-correction-federal-reserve/

<sup>&</sup>lt;sup>5</sup> https://www.usatoday.com/story/money/2023/12/13/fed-interest-rate-hike-live-updates/71896343007/

	Regular	Mid- Grade	Premium	Diesel	E85
Current Avg.	\$3.078	\$3.537	\$3.874	\$3.947	\$2.403
Yesterday Avg.	\$3.077	\$3.530	\$3.868	\$3.946	\$2.401
Week Ago Avg.	\$3.104	\$3.554	\$3.894	\$3.977	\$2.431
Month Ago Avg.	\$3.167	\$3.633	\$3.969	\$4.129	\$2.565
Year Ago Avg.	\$3.280	\$3.696	\$4.020	\$4.653	\$2.709

Table 1: Average Gas Prices (per Gallon) in US, as of January 8, 2024

Source: https://gasprices.aaa.com

#### Figure 2: US National Energy Price Inflation, 2010-Present



#### Inflation: Food

We are seeing the overall price of food decreasing for food at home as well as restaurant meals. This is a divergence from the previous trend, where prices for food at home were falling while restaurant meals were spiking. The drop in food prices is consistent with the overall drop in inflation.

Figure 3: US National Food Price Inflation (at Home), 2010-Present



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

Figure 4: US National Food Price: Average Price Per 1 Dozen Eggs (US Cities 2010 – Present)





Figure 5: US National Food Price Inflation: Year-over-Year Change in Price of 1 Dozen Eggs

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





Average Price of 1 Gallon Milk



#### Figure 7: US National Price Inflation: Year-over-Year Change in Price of 1 Gallon Milk

Figure 8: US National Prepared Food Price Inflation (Away from Home), 2010-Present



The decrease in food inflation does not mean that food has become cheaper. In fact, the prices of food (groceries) – eggs and milk, for example – has increased from pre-pandemic levels. However, the prices of these food staples have fallen the last 6 months. Although the price of eggs and milk have not hit pre-pandemic levels, they are trending in that direction.

#### 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. The last spike was not as high as the 2022 increase but was still considerably larger than the pre-pandemic median-sales price. 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.

Overall, an increase in mortgage rates and an increase in the median price per square foot of residential housing is making it much more difficult for families to own a home. The trend towards rental properties is likely contributing to the overall inflationary pressure for rental prices. Median prices of homes have recently started to trend downward (consistent with the decrease in the 30-year fixed mortgage rate).



#### Figure 9: US National Residential Housing Inventory, February 2018-November 2022



Figure 10: US National Home Price Inflation Case-Shiller, 2009-Present







Figure 12: US National Home Price Inflation (Redfin), Feb 2018-Nov 2022

Figure 13: US National New Home Construction Permits, January 2015-Present



Figure 14: 30-year Fixed Mortgage Rate



Figure 15: US National Residential Median Price per Square Foot, July 2016-Present



Figure 16: US National Residential Rental Prices, 2010-Present



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

#### Inflation: Summary

Consumers are aware of the inflationary trends of the US – but may not be believing that the current trends are "here to stay". The overall inflation rate hit nearly 10% in the summer of 2022. The inflationary expectations (University of Michigan) suggest that consumers have anticipated that inflation will start to increase. We believe that this is reflective of "the other shoe is going to fall" syndrome. This is probably less reflective of an awareness of how food prices and housing prices have fallen and more of an increase in anxiety as the public becomes more aware of the discussion surrounding the "soft landing", and how the Federal Reserve Bank might start decreasing interest rates (having signaled that it could lower interest rates up to three times in 2024)<sup>6</sup>.

<sup>&</sup>lt;sup>6</sup> https://www.bankrate.com/banking/federal-reserve/when-will-fed-cut-rates/





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



#### Figure 18: US National Consumer Confidence





Figure 20: 36-month ARIMA Model for US Inflation



Forecasts from ARIMA(1,0,36) with non-zero mean

Source: Authors' calculations based on CPI

Our forecast inflation levels have continued to prove quite accurate. Our forecast from 3Q2023, suggested that inflation would tick up by 25-50bps, but we saw the actual inflation level fall by approximately 25 bps (see panel 1 and 2, Figure 19). Our current forecast, using both a 24-period and 36-period ARIMA model suggest that inflation will level off at 3% by the end of 2Q2024.

Figure 21: Effective Federal Funds Rate, 2010-Present



#### Macroeconomic Indicators: Other

Real GDP of the United States is still growing, although we did experience two periods of negative quarter-over-quarter growth for the real GDP during 1Q2022 and 2Q2022 (see Figure 22 and Figure 23). Although the definition of a recession isn't technically tied to this metric, it is important to note that the US real GDP did "freeze" at the beginning of last year. Although we've suggested that the economy has been operating in a growth recession, we are less certain that this is still the case. The current GDP growth is slightly under 2.5% annually. The combination of steady or falling real wages, and stagnant GDP growth, is consistent with a growth recession.

Figure 22: Y/Y Change in Real GDP





Figure 23: Q/Q % Change in Real GDP

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

#### Inflations & Real Wages

Figure 24 and Figure 25 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 are noticing that real wages have fallen since the beginning of the pandemic.



#### Figure 24: Real Compensation of Employees

*Figure 25: Real Hourly Wages (Nationwide)* 



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



Figure 26: Real Hourly Wages (Nationwide)

#### Unemployment and Labor Force Participation

Although the current unemployment rate (3.7%) is nearly as low as the month before the start of the pandemic (3.5%, March 2020, per Figure 27), the employment situation is still unstable and is a continued cause for concern. The labor force participation rate (Figure 28) has not reached pre-pandemic levels. The labor force participation rate is ticking up a little bit, but not at the magnitude needed to fulfill the job vacancies.

The labor market participants have continued to be stubborn; we are seeing some movements in the labor force participation, but the gains are marginal.

At the current rate of entry into the labor market, the economy is still experiencing the lack of more than 6 million workers.



#### Figure 27: US National Unemployment Rate



Figure 28: US National Labor Force Participation Rate





Figure 30: Employment Level (Nationwide)



Figure 31: US National Unemployment Rate



## Disruptive ("Black Swan") Events

The past five years have seen several unusual events that had a substantial impact on the national and/or global events that warrant mentioning. We mention them from the perspective of considering whether any of these types of events could occur again in the near future, and planning for their potential impact on the economy and or business operations would seem prudent.

- 1. Biological Events: The world has seen a number of new "Influenza-Like Illnesses" (ILI), with the latest now directly affecting virtually every country on the global in a crippling fashion.
  - A. SARS (2002 & 2004)
  - B. "Swine flu" (H1N1, 2009)
  - C. "Avian flu" (H5N1 in 1997; H7N9 in 2013; H5N6 in 2014; H5N8 in 2016)

D. COVID-19 (2019-2022), with several different strains (most recently, "JN.1") While questions during the handling of the COVID-19 emergency have shone a light on the globe's ability to address a new pathogen under pressure, any answer is still a function of the contagiousness of the pathogen. Depending on how quickly a new pathogen spreads, along with its incubation period and symptoms, could mean the difference between survival and massive devastation.

- 2. Disinformation Campaigns: A staple of international conflicts (both military and otherwise), organized campaigns based on disinformation or propaganda have been around for hundreds of years. Most recently, the US has made allegations against foreign governments that there has been interference in federal elections (and caused social unrest) by using freely available social networks<sup>7</sup>. It is expected that the same types of propaganda that was made noteworthy in 2016 will continue to be seen in future elections at all levels of government, and as part of other key events.
- 3. Disruptive Malware and Ransomware: Malware has been an issue for computers for decades, dating back to the initial hypothesized versions of "worms" in US universities of the 1960s and 1970s (as "thought exercises"). More recently, however, sophisticated attacks on businesses 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."<sup>8</sup> There is currently 1 attack every 11 seconds (during 2020, according to the FBI), with an average cost of about \$4.5M per breach globally (as of YE 2023)<sup>9</sup>. And, just to add an interesting twist, ransomware is now even offered as a *service* in which a criminal may sell a *license* to a (software) ransomware variant to another criminal, who will then infect a system and demand a fee for the decryption key. As our society becomes more dependent on automated systems, disruptions to those systems will have an increasing impact on us.
- 4. Societal Unrest, including Domestic Social Changes and Terrorism: During 2020 and 2021, 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

<sup>7</sup> See https://www.nytimes.com/2024/01/09/business/media/election-disinformation-2024.html

<sup>&</sup>lt;sup>8</sup> See https://us.norton.com/internetsecurity-malware-ransomware-5-dos-and-donts.html

<sup>&</sup>lt;sup>9</sup> https://www.statista.com/statistics/387861/cost-data-breach-by-industry

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.<sup>10</sup>

- 5. Unanticipated Changes in Leadership: President Biden is currently 81 years old (the oldest seated President of the United States). While he is now expected to run for President again in 2024<sup>11</sup>, his age is a recurring topic of conversation. It is not clear at this time what differences in policy may come to light between Mr. Biden and Ms. Harris if such a transition were to occur, or how effective Ms. Harris may be at leading domestically or internationally. It has been reported that Ms. Harris is a strong advocate of diversity<sup>12</sup> and wage protection<sup>13</sup>, but we are most concerned about how she will be perceived on the international stage in negotiations with, e.g., Saudi Arabia, and countries in the Far East.
- 6. Supply Chain Disruptions: The 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 food. The Suez itself accounts for 10-15% of all goods<sup>14</sup>. Notice that the Suez, the Panama Canal, the Strait of Hormuz, and the Malacca Strait are the four most noteworthy trade chokepoints. If closed, the Panama Canal would impact 5% of global trade (and 60% of US imports and exports); closing the Strait of Hormuz would affect 25% of seaborne oil and a third of global liquified natural gas; and the Malacca Strait carries 40% of all global trade (including 16M barrels of oil per day globally).<sup>15</sup> We note that the area surrounding the Panama Canal is currently experiencing a drought which is impacting commerce and logistics through the Canal<sup>16</sup>.
- 7. Cryptocurrencies: With the increasing visibility of distributed cryptocurrencies, several countries are currently investigating the benefits of implementing their own cryptocurrencies based on their own hard currencies. Over the past few years, several Caribbean countries have launched successful cryptocurrencies, including the Bahamas, Grenada, and St. Kitt's & Nevis<sup>17</sup>. Ecuador, Senegal, and China have canceled or withdrawn their currencies<sup>18</sup>. Along these lines, on January 10, 2024, the SEC approved the listing and trading of a number of spot bitcoin exchange-traded product (ETP) shares<sup>19</sup>.
- 8. Global unrest: As we have now seen, Russia's invasion of the Ukraine has led to a dramatic impact on the energy and grain sectors globally. Though the west has not agreed to purchase Russian oil with a price cap, Russia is now refusing to sell its resources for anything other than a market price. The resulting rising energy prices can only drain the level of wealth of (primarily)

<sup>&</sup>lt;sup>10</sup> See https://www.justice.gov/usao-dc/36-months-jan-6-attack-capitol-0 and https://time.com/6328179/political-violence-jan-6-extremism/ <sup>11</sup> https://joebiden.com/

<sup>&</sup>lt;sup>12</sup> See, e.g., https://www.huffpost.com/entry/kamala-harris-vice-president-nominee-dnc\_n\_5f36f56bc5b69fa9e2fb7862

<sup>&</sup>lt;sup>13</sup> See, e.g., https://www.shrm.org/resourcesandtools/hr-topics/benefits/pages/where-kamala-harris-stands-on-workers-pay-and-benefits.aspx <sup>14</sup> See https://www.businessinsider.com/toilet-paper-coffee-products-delayed-suez-canal-blockage-impact-2021-3

<sup>&</sup>lt;sup>15</sup> See https://www.dw.com/en/suez-canal-blockage-4-of-the-biggest-trade-chokepoints/a-57020755

<sup>&</sup>lt;sup>16</sup> https://www.nytimes.com/2023/11/01/business/economy/panama-canal-drought-shipping.html

<sup>&</sup>lt;sup>17</sup> https://www.atlanticcouncil.org/cbdctracker/

<sup>18</sup> Ibid.

<sup>&</sup>lt;sup>19</sup> 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

Europe, and raise prices globally. The impact of the Israel-Palestine conflict has also been speculated as impacting global economies<sup>20</sup>.

<sup>&</sup>lt;sup>20</sup> https://www.bloomberg.com/news/features/2023-10-12/israel-hamas-war-impact-could-tip-global-economy-into-recession

## Data Analysis

As part of the Dodd-Frank Act, larger banking institutions in the United States are required to use government specified variables, and approved proprietary processes, to determine if they are adequately prepared for unexpected "systemic failures". Some banking institutions are also incorporating portions or components of their forecasting processes to estimate future profitability; in order to do so, however, realistic forecasts (as opposed to extremes) are required. While arguments could be made about the variables included in this study, as stated in Jiang, et al., "... a conclusion that can be made for ... US data is that there is little to no improvement in forecast accuracy when the number of predictors is expanded beyond 20-40 variables."

Capitalytics provides the results of a rigorous analysis of every variable that is included in our quarterly macroeconomic study. These variables include the following<sup>21</sup>:

- 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)

<sup>&</sup>lt;sup>21</sup> 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 164 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 <sup>22</sup>	
1-month, 3-year, and 5-year		1-year Treasury yield	
Treasury yield			
3-month, 6-month and 7-year		2 year Tracey my dald*	
Treasury yield	depends on	3-year Treasury yield	
20-year and 30-year Treasury		7-year Treasury yield <sup>*</sup>	
yield, and Moody's AAA yield			
30-year Mortgage rate		3-year Treasury yield <sup>*</sup>	
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.

<sup>&</sup>lt;sup>22</sup> 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

Real GDP increased to an annualized rate of 4.9% in 3Q2023<sup>23</sup>, growing dramatically from annualized rates of 2.2% in 1Q2023 and 2.1% in 2Q2023<sup>24</sup> (from \$22.1T in 1Q2023 -- in 2017 US\$ -- to \$22.2T, and now to \$22.5T). Per the BEA, the increase during 3Q2023 was due to an increase in consumer spending, private inventory investment, and government spending<sup>25</sup>. Nominal GDP rose by an annualized rate of 8.3% (almost \$550B).<sup>26</sup>

We have previously noted that GDP is impacted by personal consumption, retail sales, government spending, international trade, and interest rates. We will consider these items individually.

Overall real disposable personal income was essentially flat between 2Q2023 and 3Q2023 (now \$16.8T in 2017 US\$)<sup>27</sup>. In contrast, nominal disposable personal income growth went from 15.4% (annualized) during 1Q2023, to 5.8% during 2Q2023, to 2.9% during 3Q2023<sup>28</sup>; nominal personal income has increased by 3.5% during 3Q2023 an annualized basis<sup>29</sup>.

Inflation, and the residual concerns about its looming presence, is noteworthy in both of these sets of figures. Peaking in 2Q2022 at 9.7%, annualized inflation rose to 3.6% in 3Q2023 (from 2.7% in 2Q2023); based on recently monthly data, we expect inflation to drop further during 4Q2023<sup>30</sup>. Annualized core inflation (i.e., excluding food and energy prices) has dramatically dropped from 4.7% in 2Q2023 to 2.8% in 3Q2023; based on recent monthly values, it may rise slightly during 4Q2023<sup>31</sup>.

During this past June, The Federal Reserve Bank of Cleveland anticipated inflation to be approximately 1.4% by mid-2024, and it is now expected to be 3.1% by YE 2024<sup>32</sup>. *We agree that inflation will drop to between 3.0% and 3.25% (annualized) by YE2024.* 

- 2. Nominal advance retail sales rose in 3Q2023 from just under \$600B per quarter to \$608B. While growth was dramatic since emerging from the COVID-lockdown driven recession in 2Q2020, that same growth came to a screeching halt in 2Q2022 at \$595B, only growing about 1% overall in the past year.<sup>33</sup> October 2023's nominal retail trade data is down less than 1% M/M.<sup>34</sup>
- 3. Government spending experienced some noteworthy shocks during the COVID pandemic, settling to \$8.3T in 1Q2022 (in current-day US\$). Since then, it has grown to \$10T in 3Q2023. Its

<sup>&</sup>lt;sup>23</sup> https://www.bea.gov/news/2023/gross-domestic-product-third-estimate-corporate-profits-revised-estimate-and-gdp

<sup>&</sup>lt;sup>24</sup> https://fred.stlouisfed.org/series/GDPC1

 $<sup>^{25}\</sup> https://www.bea.gov/news/2023/gross-domestic-product-third-estimate-corporate-profits-revised-estimate-and-gdp$ 

<sup>26</sup> Ibid.

<sup>&</sup>lt;sup>27</sup> https://fred.stlouisfed.org/series/DSPIC96

<sup>&</sup>lt;sup>28</sup> https://fred.stlouisfed.org/series/DSPI

<sup>&</sup>lt;sup>29</sup> https://fred.stlouisfed.org/series/PI

<sup>&</sup>lt;sup>30</sup> https://fred.stlouisfed.org/series/CPIAUCSL

<sup>&</sup>lt;sup>31</sup> https://fred.stlouisfed.org/series/CPILFESL

<sup>&</sup>lt;sup>32</sup> https://fred.stlouisfed.org/series/EXPINF1YR

<sup>33</sup> https://fred.stlouisfed.org/series/RSXFS

<sup>&</sup>lt;sup>34</sup> https://fred.stlouisfed.org/series/MRTSSM44000USS

(annualized) compounded growth rate, though, is now (for 3Q2023) 27.3%, the highest level since 1Q2021<sup>35</sup>.

4. The quarterly (nominal) trade deficit dropped from \$203.5B to \$184.7B during 3Q2023, an annualized decrease of 32.5%.<sup>36</sup> It peaked at \$102.5B in March 2022, and has since recovered to its previous value of between \$60B-\$70B per month. Differing rates of inflation globally will affect this value, along with changing imports and exports. During 3Q2023, US exports increased by more than \$15B over imports, and services increased by \$4B in the net.<sup>37</sup>

# We feel that interest rates could be increased by as much as 50bp before YE2024, and there may be as many as two rate decreases before YE2024, but the most likely case is a 25bp drop around mid-year 2024.

Given these changes, we expect global GDP strength to improve with *annualized US GDP to increase to as high as 3% by YE2024*.

#### Other Commentary

- "We expect a slowdown in the first half of 2024, but no recession. Despite the slowdown, 2024 growth should still be a moderate 1.7%. Both consumer and business spending are expected to slow into next year, but not so much as to cause a recession. The economy's resilience may be due in part to personal income growing at 4.1% this year after taxes and inflation, which is supporting consumer spending." (https://www.kiplinger.com/economic-forecasts/gdp; Dec. 22, 2023)
- "The depreciation will be reinforced by a relative slowing of both US real economic growth and inflation as well as the overhang of a current-account deficit which, as a share of US GDP, is unsustainably high. The yen is expected to appreciate against the US dollar more strongly than many of its peers during 2024, in tandem with the forecast divergence of monetary policy." (https://www.spglobal.com/marketintelligence/en/mi/research-analysis/top-10-economic-predictions-for-2024.html; Dec. 19, 2023)
- "GDP growth in the United States is projected at 2.4% in 2023, before slowing to 1.5% in 2024, and then picking up slightly to 1.7% in 2025 as monetary policy is expected to ease. In the euro area, which had been relatively hard hit by Russia's war of aggression against Ukraine and the energy price shock, GDP growth is projected at 0.6% in 2023, before rising to 0.9% in 2024 and 1.5% in 2025. China is expected to grow at a 5.2% rate this year, before growth drops to 4.7% in 2024 and 4.2% in 2025 on the back of ongoing stresses in the real estate sector and continued high household saving rates." (https://www.oecd.org/newsroom/economic-outlook-a-mild-slowdown-in-2024-and-slightly-improved-growth-in-2025.htm; Nov. 29, 2023)
- "The U.S. recorded 2.2% GDP growth in the first quarter of 2023 and 2.1% growth in the second quarter. As for its latest projections, the Fed expects the economy to roughly maintain that growth pace in the second half of 2023, forecasting full-year GDP growth of 2.1%. The Fed predicts GDP growth will slow to just 1.5% in 2024, a modest but positive pace." (https://www.usatoday.com/money/blueprint/investing/economic-outlook-2024/; Nov. 15, 2023)

<sup>&</sup>lt;sup>35</sup> https://fred.stlouisfed.org/series/W068RCQ027SBEA

<sup>&</sup>lt;sup>36</sup> https://fred.stlouisfed.org/series/BOPGSTB

<sup>37</sup> https://www.bea.gov/news/2023/us-international-transactions-3rd-quarter-2023

### Employment

#### Analysis

The civilian unemployment rate rose to 3.7% in 3Q2023<sup>38</sup>, with total nonfarm payroll employment increasing by roughly 1.3M workers per quarter since the end of 2020<sup>39</sup> (see Figure 32 and Figure 33). Hiring in October dropped in health care and social assistance, finance and insurance (-168,000), and real estate and rental and leasing, but job openings increased in information technology<sup>40</sup>. 8.7M job openings were recorded by the Bureau of Labor Statistics in October, a drop of about 617,000 (-0.3% M/M) openings. (See

Figure 34.) New hires were flat at 5.9M people (3.7% of the workforce) in October 2023, and there were approximately 5.7M separations (3.6% of the workforce), including quits, layoffs, and discharges<sup>41</sup>. Trends appear to show these figures are approximately neutral through 4Q2023.

We have pointed out that, despite maintained disposable spending, the public appears to be starting to respond to the obvious day-to-day indicators of inflation, including the stated intentions of the Fed' to slow down the economy by raising the cost of money. Inkeeping with those messages, per Figure 35 and Figure 36, the US has seen an increase in the level of civilian employment by approximately 180,000 workers per month since March of 2022<sup>42</sup>. The employment-population ratio has shown minimal change since YE2022 (per Figure 37).

Considering the Fed's position that the economy's driving parameters should be adjusted to continue to gradually slow spending, with the expectation of hiring to slow in conjunction with controlling inflation, we continue to expect layoffs to slowly increase (and hiring rates to drop) over the next 12 months as more of the population adapts to increasing financial pressure.

The wage increases for the various sectors are shown in Figure 39.

Figure 32: US Unemployment Rate per County (September 2023 and December 2023, respectively)



<sup>&</sup>lt;sup>38</sup> https://www.bls.gov/news.release/pdf/empsit.pdf

<sup>39</sup> https://fred.stlouisfed.org/series/UNRATE

<sup>&</sup>lt;sup>40</sup> https://www.bls.gov/news.release/jolts.nr0.htm

<sup>&</sup>lt;sup>41</sup> Ibid.

<sup>&</sup>lt;sup>42</sup> https://fred.stlouisfed.org/series/CE16OV

#### Figure 33: US Unemployment Rate











Figure 36: US Labor Force



Figure 37: US Employment to Population Ratio (%)



*Figure 38: Hourly Wages per Industry* 



#### *Figure 39: Real Hourly Wages per Industry*



#### Other Commentary

- "There will be no fooling California fast-food workers come April 1. That's the day they can honestly believe the minimum wage in the Golden State will jump to \$20 an hour from \$16, and only in that sector. ... Beyond increasing prices [to offset mandated wage increases], California's fast-food restaurant operators are exploring other measures to counterbalance the wage hike, such as automating certain tasks as a way to increase workers' efficiency and productivity and potentially eliminate some jobs altogether." (https://www.cnbc.com/2023/12/29/mcdonaldschipotle-prepare-for-fast-food-worker-battles-in-2024.html; Dec. 29, 2023)
- "[Federal Reserve officials] see growth [in the US economy] accelerating to 1.8% in 2025 and 1.9% in 2026. They see the unemployment rate rising to 4.1% at the end of 2024 from 3.8% at the end of 2023." (https://www.wsj.com/livecoverage/fed-meeting-fomc-interest-rate-december-2023/card/fed-expects-weaker-growth-higher-unemployment-in-2024-EsG2bxZbohNnNmTV56bN; Dec. 15, 2023)
- "Job gains rose to 199,000 in November as 30,000 autoworkers returned to work after settling their strike. Job gains over the next several months should settle in around 150,000, similar to October's employment growth. As the economy slows in the first half of next year, monthly gains should continue to weaken, dropping to 100,000 or so. (https://www.kiplinger.com/economic-forecasts/jobs; Dec. 8, 2023)
- "Employers added a seasonally adjusted 199,000 jobs last month, the Labor Department reported Friday, slower than earlier in the year but consistent with gains before the pandemic. When excluding the effects of auto-worker strikes in recent months, November's job gain was roughly 169,000, slightly cooler than 180,000 in October. Most recent hiring occurred in two big sectors: healthcare and the government ... Other data in the report showed the labor market

remains strong. The unemployment rate fell to 3.7%. It had climbed to 3.9% in October from 3.4% in April ..." (https://www.wsj.com/economy/jobs/jobs-report-november-2023-us-economy-59125cde; Dec. 8, 2023)

#### 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 40 and Figure 41), the Governors have shifted their opinions (between their September and December 2023 meetings) as shown in Table 2.

Year	September 2023 median	September 2023 range	December 2023 median	December 2023 range
2024	4.75%-5.0%	4.25%-6.25%	4.5%-4.75%	3.75%-5.5%
			( $\downarrow$ 25bp from Sept.)	( $\downarrow$ 50-75bp from Sept.)
2025	3.5%-3.75%	2.25%-5.75%	3.5%-3.75%	2.25%-5.5%
			(level from Sept.)	( $\downarrow$ 25bp from Sept.)
2026	2.5%-2.75%	2.25%-5.0%	2.75%-3.0%	2.25%-5.0%
			(↑ 25bp from Sept.)	(level from Sept.)

#### Table 2: Changes in FOMC Board of Governors' "Dot Plots" (Sept 2023 vs Dec 2023)


Figure 40: FOMC "Dot Plot" from September 2023 Board of Governors' Meeting





Source: https://www.federalreserve.gov/monetarypolicy/files/fomcprojtabl20231213.pdf

The conveyed messages of the "dot plots" is not only that rates will (indeed) be "higher, for longer", but there has been very slight tightening of beliefs by the Governors since their September meeting. Note that the range of expected rates by the Governors for 2024 have narrowed very slightly. We interpret the continued spread of values expressed by the FOMC as meaning that there is still a notable amount

of uncertainty in the markets and many factors that could swing the outcome at this time. These factors include, but are not limited to,

- the Ukraine invasion that is now going on 18 months -- longer than most experts imagined (and which we've already mentioned had a significant impact on food and energy prices);
- the upcoming 2024 Presidential election, which is already provoking questions about candidates on both sides of the aisle;
- a sagging labor force participation rate (which can only hamper domestic productivity measures); and
- an emerging mismatch in supply and demand for commercial real estate, that is currently causing some owners to relinquish their collateral properties to banks.

In Figure 42, we see the historical and projected relationship between the effective overnight lending rate and the 3-year T-bill yield.





Source: Authors' calculation

## Other Commentary

• "The Fed simultaneously released its quarterly longer-run projections for interest rates, and median staff forecasts were for rates to settle at 4.6% at the end of next year and 3.6% at the end of 2025; Goldman Sachs economists projected the Fed would share 2024 and 2025 rate forecasts of 4.9% and 3.6%, respectively."

(https://www.forbes.com/sites/dereksaul/2023/12/13/fed-keeps-interest-rates-flat-again-but-barely-budges-on-2024-rate-cut-forecasts/; Dec. 13, 2023)

"The Federal Reserve's newly released Summary of Economic Projections raised the possibility
of three interest rate cuts next year. But the majority of bond investors expect the Fed to start
cutting short-term interest rates by March, and then continue with regular cuts at almost every
meeting after that, for a total of six cuts in 2024. This seems overly optimistic. ... we expect the
Fed to cut rates at its May 1 meeting, and possibly at the June 12 meeting, but then stand pat
during the July and September meetings before cutting again on Nov. 7, after the election."
(https://www.kiplinger.com/economic-forecasts/interest-rates; Dec. 13, 2023)

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

# Analysis

The US Treasury yield curve is still exhibiting the pronounced inversion that has been seen for more than a year (Figure 43), with yields as of this writing at a low for 5-year maturities. Given this inversion, we interpret the markets as feeling that a near-term recession is still very possible. As of this writing, we are actually seeing rates dropping after a 2-month maturity period (5.59%), a very slight inversion around 4-month yields (5.41%), and then monotonically decreasing rates until a 5-year maturity (3.84%). Yields then rise to a 20-year maturity (4.2%), with 30-year yields at 4.03%.

There are now two key questions:

- Are there any relevant interpretations of the current yield curve to give insight into how it will change?
- What impact will the curve have on others in the monetary ecosystem?

Historically, yield curves are expected to be monotonically increasing as maturity periods increase. This shape indicates an increasing yield as a reward for an investor's money being committed for a longer period and exposed to more risk during that period. Many feel that inversions during which rates drop and then (possibly) increase as maturity windows increase are precursors to recessions; since rates drop over time, investors may need to "reset" their expectations if they want to leave their money committed for that period.

We are now seeing a 45- to 60-month period (on the maturity axis) of declining returns prior to returns growing, and then another slight inversion after the 240-month mark. The fact that investors can assume a risk-free rate for 48 months that is greater than that of 240 months is extremely disturbing. More disturbing is the slope of the yield curve between the 4-month and 60-month yields – almost -3 bp of return per month of maturity (changing from 5.41% to 3.84%) – as compared to the difference between 1 month and 4-month windows (-6.3 bp return per month of maturity, from 5.6% to 5.41%).

# Based on the current situation, we do not expect the yield curve's shape to change substantially until at least 2H2024, or, more likely, at the point that interest rates begin to drop.

Figure 44 through Figure 52 illustrate the most significant correlations between Treasury yield rates.

# Other Commentary

- "Many investors have interpreted recent economic data, including the November U.S. personal consumption expenditure price index, as a sign that the Fed would be able to stick to its monetary policy expectations for next year. ... But uncertainty lingers over when the central bank will start cutting rates, although traders are pricing in a more than 70% chance of cuts at the March meeting, according to CME Group's FedWatch tool."
   (https://www.cnbc.com/2023/12/27/us-treasury-yields-investors-weigh-2024-interest-rate-outlook.html; Dec. 27, 2023)
- "[Doug Kass, a hedge fund manager, and formerly director of research for Leon Cooperman's Omega Advisors] isn't convinced that the economy will experience a soft landing easing

inflation and no recession. If he's right, economic worry could offset the Fed's efforts, pushing up the yields used to set mortgage rates. ... 'There is neither a soft landing nor a hard landing just very sluggish real growth in the U.S. economy,' says Kass. 'The U.S. federal debt problem is no longer shrugged off by investors — it looms larger in late 2024 and slowly becomes a serious systemic problem in the years ahead.' " (https://www.thestreet.com/investing/veteran-fundmanager-makes-bold-interest-rate-prediction-for-2024; Dec. 27. 2024)

 "A ... Reuters poll of economists taken last week found the Fed will keep rates unchanged until at least July and then cut by 100 basis points in the second half of next year, later and less than currently being priced in by markets. ... A strong three-quarters majority, 23 of 31, who answered an additional question said the risk of a correction to the 10-year note yield over the next three months was high or very high." (https://www.reuters.com/markets/rates-bonds/usbond-yields-almost-fully-priced-2024-rate-cuts-strategists-2023-12-12/; Dec. 12, 2023)



#### Figure 43: Treasury Yield Curves as a function of maturity

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



Figure 44: 1-month Treasury yield rates, as a function of 1-year Treasury yield rates

Source: Authors' calculation

Figure 45: 3-month Treasury yields, as a function of 3-year Treasury yields





Figure 46: 6-month Treasury yields, as a function of 3-year Treasury yields







*Figure 48: 5-year Treasury yields, as a function of 1-year Treasury yields* 







*Figure 50: 10-year Treasury yields, as a function of 5-year Treasury yields* 







Figure 52: 30-year Treasury yields, as a function of 7-year Treasury yields

# 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, interest rates are driven by traditional economic supply-and-demand forces. Since our last report (and as of this writing), mortgage rates are essentially at 6.60%<sup>43</sup>, the lowest since May 2023. Again, we are envisioning the net change of overnight borrowing rates during 2024 as being 50 bp. As inflation starts to recede, and overnight lending rates drop, mortgage rates should fall. Hence, if there are no surprises with regard to inflation, *we anticipate 30-year fixed mortgage rates fall to between 6% and 6.50% by the summer of 2024, and rates will stay at approximately that level through YE2024*.

<sup>&</sup>lt;sup>43</sup> https://fred.stlouisfed.org/series/MORTGAGE30US





# Other Commentary

- "'The 30-year fixed-rate mortgage remained below 7% for the second week in a row, a welcome downward trend after 17 consecutive weeks above 7%,' said Sam Khater, chief economist at Freddie Mac, in a press statement. ... [W]hile this promising downward rate trend bodes well for a stalled housing market, experts acknowledge that still-high rates and home prices will continue to create challenging conditions for many buyers and sellers in 2024." (https://www.forbes.com/advisor/mortgages/mortgage-interest-rates-forecast/; Dec. 29, 2023)
- "Now that inflation is easing, mortgage rates are expected to decline throughout 2024. But the wheels of progress turn slowly: Realtor.com experts are forecasting that rates will be 6.8% on average for 2024 and 6.5% by the year's end. ... As for home prices, Realtor.com expects the typical monthly purchase cost for the median priced home listing to drop slightly from this year's \$2,240 to \$2,200, amounting to about 35% of the average U.S. household income. Demand will probably remain low, and inventory will still be limited as would-be sellers hold back." (https://money.com/mortgage-rates-home-prices-predictions-2024/; Dec. 29, 2023)
- "Residential construction rose for a second consecutive month. Total housing starts rose 1.9% to
  1.372 million annualized units in October. Single-family starts increased 0.2%, while multifamily
  starts rose 6.3% during the month. Regionally, starts increased in the Midwest and West, but
  declined in the Northeast and South. Building permits rose 1.1%, driven by a 2.2% increase in
  multifamily permits, while single-family permits rose 0.5%. Despite rising in October, multifamily
  developers look to be hitting the brakes amid more restrictive credit conditions and softer
  demand for apartments." (https://www.kiplinger.com/economic-forecasts/housing; Dec. 11,
  2023)

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

# Analysis

AAA bond rates tend to track with mid-duration Treasury yields, with rates for bonds with lower grades tending to be higher (in conjunction with their risk ratings). On a quarterly basis, Moody's Seasoned AAA Corporate Bond yield was 4.60% in 2Q2023, 4.91% in 3Q2023, and 5.21% in 3Q2023, a nearly perfect straight line of increases in quarterly average yields, though monthly yields have been a bit "bumpier" with, e.g., a 5.61% peak in October 2023 and substantial declines (to 4.74%) by YE2023. Moody's BAA yields were 5.68%, 5.97%, and 6.19%, respectively, on a quarterly basis, but have been similarly volatile on a monthly basis, mirroring the AAA bonds' yields with approximately 1% greater yield.

The quarterly averages for the 1-year and 7-year Treasury yields were 4.95% and 3.65% (respectively) in 2Q2023, 5.39% and 4.25% in 3Q2023, and 5.23% and 4.47% in 4Q2023. We present these numbers, and comparable numbers for the more familiar 10-year/2-year yield spread, in Table 3<sup>44</sup>.

Instrument	2Q2023	3Q2023	∆(2Q->3Q)	4Q2023	∆(3Q->4Q)
Moody's AAA Bonds	4.60%	4.91%	+31bp	5.21%	+30bp
Moody's BAA Bonds	5.68%	5.97%	+29bp	6.19%	+22bp
BAA-AAA Yield Spread	+108bp	+106bp	-2bp	+98bp	-8bp
1-year Treasury Yield	4.95%	5.39%	+45bp	5.23%	-16bp
7-year Treasury Yield	3.65%	4.25%	+61bp	4.47%	+22bp
2-year Treasury Yield	4.26%	4.92%	+66bp	4.81%	-11bp
10-year Treasury Yield	3.60%	4.15%	+55bp	4.45%	+30bp
10 yr-2 yr Yield Spread	-66bp	-77bp	-10bp	-36bp	+41bp

Table 3: Comparison between Moody's Bond Yields and Treasury Yields

4Q2023 has seen notably increasing yields for AAA & BAA bonds, as well as government bonds. However, we are seeing slightly decreasing gains for BAA bonds over AAA bonds, resulting in the decreased spread between the two (8 bp narrowing over 4Q2023 versus 2 bp narrowing in 3Q2023). Comparing this to the 10/2 yield spread in Table 2, and we see that shorter maturity T-bills are also retreating Q/Q, whereas longer term bonds are attempting to gradually reassert themselves. Following on our previous conversation, however, yields for corporate bonds are still under pressure from government bond yields; stated alternatively, the premium that corporate bonds are offering over risk-free rates are continuing to be miniscule. (See Figure 54.) We see short term yields falling relative to corporate yields, but they are still slim given the risk that is assumed as we work down the grade of debt. As interest rates remain higher ("... for longer") than in previous years, the ability of faltering enterprises to raise capital and live up to obligations (i.e., repaying maturing debt) will become increasingly challenging, with many expecting defaults to rise to multiples of previous years<sup>45</sup>.

 <sup>&</sup>lt;sup>44</sup> 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
 <sup>45</sup> See https://www.fitchratings.com/research/corporate-finance/default-rates-to-rise-in-us-europe-as-weaker-growth-offsets-rate-cuts-27-12-2023



Figure 54: Moody's Seasoned AAA & BAA Corporate Bond Yields (less Fed' Funds Rate) versus 2-Year Treasury Yield

See Figure 55 for how Moody's AAA yields have historically tracked with the 7-year Treasury yield.



Figure 55: Moody's AAA-grade investment yields, as a function of 7-year Treasury yields



Figure 56: Moody's BAA-grade investment yields, as a function of BofA BBB yields

## Other Commentary

- "In the US, Fitch forecasts 2024 default rates of 3.5%-4.0% for leveraged loans, and 5.0%-5.5% for U.S. HY. The higher default rate expectations for 2024 reflect ongoing macroeconomic headwinds, including the impact of still high interest rates and a slowdown in the U.S. economy in 2024 relative to 2023. However, Fitch does not forecast a recession for the U.S. in 2024." (https://www.fitchratings.com/research/corporate-finance/default-rates-to-rise-in-us-europe-as-weaker-growth-offsets-rate-cuts-27-12-2023; Dec. 27, 2023)
- "With Treasury and corporate yields signaling higher for even longer rates ahead, we expect the U.S. trailing-12-month speculative-grade corporate default rate to reach 5% (86 defaults) by September 2024, from 4.1% in September 2023. ... The proportion of 'CCC/C' ratings to the total is historically large, with many firms already seeing negative cash flow and large maturities due in 2025. This signals a high level of sensitivity to a drop in growth or a further rise in interest rates, which could push the default rate [from an optimistic scenario of 3.5%] to our pessimistic scenario of 7%." (https://www.spglobal.com/ratings/en/research/articles/231116-default-transition-and-recovery-higher-rates-for-even-longer-could-push-the-u-s-speculative-grade-corporat-12916045; Nov. 16, 2023)

# 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 loans<sup>46</sup>. The Prime Rate is currently (as of this writing) 8.50%<sup>47</sup>.

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 at least 25 bp before YE2024, that will cause the Prime Rate to drop to about 8.25% by YE2024.* 



Figure 57: Prime Rate as a function of 1-year Treasury yields

Source: Authors' calculation

# US Average Retail Gasoline Price

#### Analysis

The US average retail gasoline price for regular unleaded gasoline is approximately \$3.08/gallon<sup>48</sup> at the time of this writing, about 3.2% less than it was one year ago. Further, retail gasoline is down by less than 1% in the past month<sup>49</sup>.

The price of Brent crude spiked at \$95/barrel, but has now retreated to \$77/barrel, despite the Israel-Hamas conflict that has been active for the past three months. (See Figure 58 and Figure 59.) Oil prices have been expected to increase more significantly than they have due to the rising danger posed to oil tankers in the Red Sea transporting oil from the Middle East to Europe and other Western-allied nations; Iran, Russia, and China would (to varying degrees) all like to disrupt the flow of energy related materials to allied nations<sup>50</sup>.

<sup>&</sup>lt;sup>46</sup> https://www.investopedia.com/terms/p/primerate.asp

<sup>&</sup>lt;sup>47</sup> https://fred.stlouisfed.org/series/DPRIME

<sup>48</sup> https://gasprices.aaa.com/

<sup>49</sup> Ibid.

<sup>&</sup>lt;sup>50</sup> https://oilprice.com/Energy/Energy-General/Why-Oil-Traders-Shouldnt-Discard-Israel-Hamas-War-Risk.html

However, US and non-OPEC oil production is projected to increase during 2024, driving prices down in spite of rising US demand.<sup>51</sup> EIA forecasts the price of crude to increase by about 10% before the end of 1Y2024, with various banks predicting up to 20% increases, again, due to robust expected domestic employment.<sup>52</sup> There is some concern that interest in EV automobiles may have plateaued in the US (driven by tightening requirements for US government tax credits<sup>53</sup>), meaning that an uptick in demand of ICE vehicles would drive demand for petroleum through at least 2030. We also note that, while the 2023 hurricane season was more active than average, there was a minimal disruption in US oil production in the Gulf of Mexico during 2023.

Natural gas has been in strong supply, both in the US and in Europe. The US experienced record natural gas production through 2023, which curbed prices significantly<sup>54</sup>; despite stockpiling, production was driven by the concerns of a repeat of the winter of 2023 in Europe<sup>55</sup>, which was expected to be harsh and compounded by the Russian attack of Ukraine. Over the past year, energy supplies for Europe have been a key point of concern given the Russia-Ukraine conflict, which is still ongoing<sup>56</sup>. Ukraine has been a storage point for natural gas imports for Europe during this year, due to available capacity and lower costs (which are mitigated by the risk of loss due to Russian attacks)<sup>57</sup>.

# Other Commentary

- "Record-high natural gas production, flat demand, and high inventories resulted in U.S. benchmark natural gas prices averaging \$2.57 per million British thermal units (MMBtu) in 2023, down by around 62% compared to the 2022 average, the U.S. Energy Information Administration (EIA) said ..." (https://oilprice.com/Latest-Energy-News/World-News/Average-US-Natural-Gas-Prices-Plunged-by-62-in-2023.html; Jan 4, 2024)
- "The other three big Wall Street banks have set their 2024 Brent price projections at between \$83 per barrel and \$90. JP Morgan has the lowest price forecast after Citi, at \$83 per barrel of Brent, while Bank of America is the most bullish, expecting Brent to average \$90 per barrel next year. Morgan Stanley sits in the middle with a price forecast of \$85 per barrel."
   (https://oilprice.com/Energy/Oil-Prices/Oil-Prices-Poised-to-Bounce-Back-in-2024.html; Dec. 18, 2024)
- "World consumption [of petroleum] will rise by 1.1 million barrels per day(bpd) in 2024, the Paris-based IEA said in a monthly report, up 130,000 bpd from its previous forecast, citing an improvement in the outlook for the United States and lower oil prices." (https://www.reuters.com/business/energy/iea-raises-2024-oil-demand-growth-forecastdespite-economic-gloom-2023-12-14/; Dec. 14, 2023)

<sup>56</sup> https://oilprice.com/Latest-Energy-News/World-News/Freezing-Weather-To-Test-Europes-Natural-Gas-Supply-Resilience.html

<sup>&</sup>lt;sup>51</sup> https://oilprice.com/Energy/Oil-Prices/Oil-Prices-Poised-to-Bounce-Back-in-2024.html , https://oilprice.com/Energy/Crude-Oil/The-11-States-Leading-Americas-Oil-Production-Boom.html , and https://www.cnn.com/2023/12/18/business/oil-price-forecast-goldman-sachs/index.html <sup>52</sup> https://www.eia.gov/outlooks/steo/ and https://oilprice.com/Energy/Oil-Prices/Oil-Prices-Poised-to-Bounce-Back-in-2024.html

 <sup>&</sup>lt;sup>53</sup> https://www.kiplinger.com/taxes/ev-tax-credit-changes-new-years-day and https://oilprice.com/Latest-Energy-News/World-News/New-Rules-for-EVs-Only-13-Models-Eligible-for-US-for-7500-Tax-Credit.html

<sup>&</sup>lt;sup>54</sup> https://oilprice.com/Latest-Energy-News/World-News/Average-US-Natural-Gas-Prices-Plunged-by-62-in-2023.html

<sup>&</sup>lt;sup>55</sup> https://www.offshore-technology.com/news/us-gas-production-is-to-reach-record-levels-in-2023/

<sup>&</sup>lt;sup>57</sup> https://oilprice.com/Latest-Energy-News/World-News/Ukraines-Strategic-Gas-Storage-Capacity-Eases-Europes-Winter-Worries.html

#### Figure 58: Crude Oil vs Retail Gasoline Prices



Figure 59: Global crude oil prices



# House and Commercial Real Estate Price Indexes

#### Analysis

Residential home prices rebounded in many major markets, on both a consistent month-over-month, and a year-to-date basis; while all 20 of the markets in S&P CoreLogic Case-Shiller indexes have risen in price during 2023 (through October 2023), 13 metropolitan areas have risen over the preceding three months, and 11 metropolitan areas rose over the preceding one month<sup>58</sup>. Dallas, Denver, Portland, Washington DC, and several west-coast cities were those showing falling prices, with Portland showing the largest retreat of -0.86% M/M. (Redfin reported that Y/Y median sale prices were down in 3 out of the 50 markets that they monitor, and pending sales increased in only 14 of those markets.<sup>59</sup>) However, it is worth noting that mortgage rates were at a peak of 7.76% at the end of October, and have retreated by over 100bp since that time (its lowest level since May 2023, but roughly neutral for 2023 overall)<sup>60</sup>, implying that buyers may be more capable of meeting sellers (i.e., able to afford more expensive homes) since that time.

The Mortgage Bankers Association reports that mortgage purchase applications (as of December 15, 2023) are up 7% M/M and down 18% Y/Y<sup>61</sup>. Redfin reports that the supply of homes on the market is approximately 3.6 months' worth, up very slightly Y/Y, but also still shy of a neutral market (leaning towards a "seller's market"); the median number of days on the market is down slightly at 39 days<sup>62</sup>.

Regarding the residential rental market, an influx of new supply during 2024 is expected to help keep overall rental rates at levels comparable to 2023<sup>63</sup>. According to CBRE, there are "440,000 new [apartments] expected in 2024 and more than 900,000 currently under construction", noting that "[m]arkets with the largest supply pipelines (e.g., Austin, Dallas, Nashville and Atlanta) have the highest job growth projections."<sup>64</sup> However, CBRE also notes (along with other sources<sup>65</sup>), that the opportunities in the space are softening for the same reasons as the overall CRE space: increased interest rates and uncertain demand; multifamily construction starts are down 70% from their peak only 18 months ago<sup>66</sup>.

While prospects for new apartment projects that are well underway appear good contingent on location, overall Commercial Real Estate is a more significant issue. As loans backed by these commercial properties come due (and cannot be affordably refinanced with heightened rates), struggling office buildings, shopping malls, and pre-existing multi-dwelling units (MDUs) are at risk of defaulting. Trepp is estimating over \$500B in maturing CRE debt for each year from 2025 through 2028 (inclusive), with almost \$3T of CRE debt being currently shouldered by banks and thrifts<sup>67</sup>.

<sup>&</sup>lt;sup>58</sup> https://www.spglobal.com/spdji/en/documents/indexnews/announcements/20231226-1469868/1469868\_cshomeprice-release-1226.pdf and https://www.spglobal.com/spdji/en/index-family/indicators/sp-corelogic-case-shiller/#indices

<sup>&</sup>lt;sup>59</sup> https://www.redfin.com/news/housing-market-update-demand-improving-new-listings-rising/

<sup>&</sup>lt;sup>60</sup> https://fred.stlouisfed.org/series/MORTGAGE30US

 $<sup>^{61}\</sup> https://www.mba.org/news-and-research/newsroom/news/2023/12/20/mortgage-applications-decrease-in-latest-mba-weekly-survey-applications-de$ 

<sup>&</sup>lt;sup>62</sup> https://www.redfin.com/news/housing-market-update-demand-improving-new-listings-rising/

 $<sup>^{63}\</sup> https://www.housingwire.com/articles/rent-growth-to-slow-further-in-2024-as-more-inventory-arrives/$ 

<sup>&</sup>lt;sup>64</sup> https://www.cbre.com/insights/books/us-real-estate-market-outlook-2024/multifamily and https://www.wsj.com/real-estate/apartment-rent-relief-is-expected-to-continue-in-2024-9acf43d1

<sup>&</sup>lt;sup>65</sup> See, e.g., https://www.rentcafe.com/blog/rental-market/market-snapshots/new-apartment-construction/

<sup>66</sup> https://www.cbre.com/insights/books/us-real-estate-market-outlook-2024/multifamily

<sup>67</sup> https://www.trepp.com/hubfs/The%20Year%20End%202023.pdf

Vacancy of office space in the US was recently reported to be almost 20%, the highest rate since 1979 – with Moody's reporting that the highest vacancy rates being in three Texas cities: Houston, Dallas, and Austin. Florida markets have seen the most significant reversals in recent years.<sup>68</sup> Despite this issue, and with rental rates at over \$37/square foot nationally (-0.9% chg Y/Y), almost 100M square feet of new office space is currently under construction in the US. Manhattan is the clear leader in newly built square footage, and due loans for 2024.<sup>69</sup>

Retail space has been discussed in our previous reports as a declining asset, though many retailers are hoping for Artificial Intelligence-driven tools and services to be their savior. Per Forbes, "AI technologies and solutions will drive innovation faster, improve the shopper journey, deepen loyalty, and elevate the overall brand. Retailers have already jumped into using AI to foster more profound levels of personalization in marketing efforts. Micro-segmentation and building robust communities are two ways marketers build brand assets to grow customer loyalty."<sup>70</sup> Even though some private equity firms are also seeing opportunities in acquiring retail going concerns,<sup>71</sup> retail is expected to see declines during 2024.<sup>72</sup>

# Other Commentary

- "For most of the pandemic, landlords reaped huge profits from the double-digit rent increases they charged tenants. When rents were on a tear, owners also benefited from soaring values as investors spent record amounts on apartment buildings. ... But that bull run for owners fizzled out last year as rents moderated. Investor appetite also has waned as higher interest rates have driven down values of all types of commercial property." (https://www.wsj.com/realestate/apartment-rent-relief-is-expected-to-continue-in-2024-9acf43d1; Jan. 2, 2025)
- "For 2024, our baseline forecast is for rent growth of 2.5% for the year, remaining slightly below the long-term annual average from 2000 to 2022 of 2.9%, according to RealPage. We expect the vacancy rate to remain relatively stable in 2024 despite what we believe will be the peak year for deliveries this cycle. For 2024, we forecast the vacancy rate to be 5.7%, 40 bps higher than the 2000-through-2022 RealPage average of 5.3%."

(https://mf.freddiemac.com/research/outlook/20231219-2024-multifamily-outlook; Dec. 19, 2023)

- "'CRE is the largest loan category among almost one-half of U.S. banks, and more than onequarter of U.S. banks have CRE loan portfolios that are large relative to the capital they hold,' the Financial Stability Oversight Council said in its annual report." (https://www.cfodive.com/news/us-regulators-flag-commercial-real-estate-leading-risk-2024-Fed-SEC/702880/; Dec. 18, 2023)
- "[Multifamily construction s]tarts have declined as construction costs have skyrocketed. The National Multifamily Housing Council, in a recent survey of the 30 leading multifamily developers, showed that 79% of respondents had experienced delays in construction starts in September. This was mostly because of the lack of available construction financing. ... Nearly three-quarters cited permitting processes for delays and 61% noted that projects were no longer economically feasible. ... The survey also showed that 48% of respondents had

<sup>&</sup>lt;sup>68</sup> https://www.wsj.com/real-estate/commercial/offices-around-america-hit-a-new-vacancy-record-166d98a5

<sup>&</sup>lt;sup>69</sup> https://www.commercialedge.com/blog/national-office-report/

<sup>&</sup>lt;sup>70</sup> https://www.forbes.com/sites/shelleykohan/2024/01/05/the-5-biggest-retail-trends-for-2024/?sh=36fba42f68b3

 $<sup>^{71}\,</sup>https://www.wsj.com/real-estate/commercial/investor-appetite-for-retail-real-estate-is-heating-up-again-f293601find the state of the state o$ 

<sup>72</sup> https://www.commercialsearch.com/news/what-to-expect-for-cre-in-2024/

experienced a repricing of the development costs over the last three months, making projects more costly. (https://www.trepp.com/trepptalk/multifamily-construction-starts-down-60-percent-in-3q; Oct. 27, 2023)

 "The wave of commercial real estate loan maturities continues to increase insize as \$2.81 trillion of loans likely will face their maturity through 2028, according to analysis by Trepp Inc." (https://www.trepp.com/hubfs/The%20Year%20End%202023.pdf)

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, stocks have declined during 3Q2023 (likely due to the expected and implemented interest rate changes), and then risen notably during 4Q2023, marking more than twice the average point increase per day during 4Q2023 as compared to the index' performance in 4Q2022.

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

Period	Index Range <sup>73</sup>	Trading Days	Avg points/day
4Q2022 (10/1/2022-12/31/2022)	36097.99 → 38520.60	61	39.7
1Q2023 (1/1/2023-3/31/2023)	38520.60 → 41136.55	62	42.2
2Q2023 (4/1/2023-6/30/2023)	41136.55 → 44411.47	61	53.7
3Q2022 (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

We note in Table 5 that the Standard & Poor's 500 Index ("SP500") is an index of 500 very large, publicly traded companies in the U.S. Again, the index' performance in 4Q2023 was markedly better than in 4Q2022. *We feel that the overall performance of equities (as shown in these indexes) will continue until rate drops are imminent (which we currently expect to be around the end of 2Q2023).* 

Table 5: Approximate Quarterly Milestones for the Standard and Poor's 500 ("SP500") Index

Period	Index Range <sup>74</sup>	Trading Days	Avg points/day
4Q2022 (10/1/2022-12/31/2022)	3585.62 → 3839.50	61	4.16
1Q2023 (1/1/2023-3/31/2023)	3839.50 → 4109.31	62	4.35
2Q2023 (4/1/2023-6/30/2023)	4109.31 → 4450.38	61	5.59
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

However, we do wish to again point out the (lack of) changes in the VIX' level: its quarterly average has gone from 20.7 in 1Q2023, to 16.4 in 2Q2023, to 15.0 in 3Q2023, to 15.3 in 4Q2023<sup>75</sup>. The crux of these numbers is the perception of *decreasing* future market volatility. The market seems to be responding well to the drop in the VIX, despite the lingering Russia-Ukraine conflict, Israel-Hamas conflict, volatile

<sup>&</sup>lt;sup>73</sup> Index values found at https://www.marketwatch.com/investing/index/dwcf

<sup>&</sup>lt;sup>74</sup> Index values found at https://www.marketwatch.com/investing/index/spx

<sup>&</sup>lt;sup>75</sup> See https://fred.stlouisfed.org/series/VIXCLS

corporate debt levels, currently ongoing quantitative tightening efforts, and upcoming 2024 US Presidential election.

### Other Commentary

- "In contrast with the major firms' capital markets assumptions released toward the end of 2022, when declining equity prices and higher interest rates buoyed the prospects for both stocks and bonds, the 2023 equity market rally diminished most firms' return assumptions for U.S. stocks. Meanwhile, last year's continued interest-rate hikes have contributed to higher forward-looking return prospects for bonds and cash. And firms' outlooks for non-U.S. stocks, a persistent bright spot in my annual compendium, continued to be more robust than their expectations for companies domiciled stateside, thanks largely to foreign stocks' valuation advantage." (https://www.morningstar.com/portfolios/experts-forecast-stock-bond-returns-2024-edition; Jan. 5, 2024)
- "The S&P 500 generated an impressive 26.29% total return in 2023, rebounding from an 18.11% setback in 2022. Heading into 2024, investors are optimistic the same macroeconomic tailwinds that fueled the stock market's 2023 rally will propel the S&P 500 to new all-time highs in 2024.
   ... Falling interest rates and earnings growth could be a bullish combination for stocks. However, some analysts are concerned about bloated valuations in the technology sector, and the 2024 U.S. presidential election could create some major volatility in the market." (https://www.forbes.com/advisor/investing/stock-market-forecast-2024/; Jan. 5, 2024)

# **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 4Q2014 and 3Q2023, inclusive.

Variable	Min Abs. Error	Average Error	Max Abs. Error
Real GDP Growth	30.00%	**	***
Nominal GDP Growth	209.68%	**	***
Real Disposable Income Growth	***	***	***
Nominal Disposable Income Growth	0.49%	59.48%	856.85%
Inflation	0.00%	**	***
Unemployment Rate	11.93%	-1.54%	147.93%
1-month Treasury Yield	0.50%	116.97%	***
3-month Treasury Yield	0.00%	**	***
6-month Treasury Yield	69.71%	**	***
1-year Treasury Yield	1.97%	-16.41%	839.79%
3-year Treasury Yield	3.99%	139.20%	935.92%
5-year Treasury Yield	0.47%	-4.46%	277.30%
7-year Treasury Yield	0.16%	0.44%	210.58%
10-year Treasury Yield	0.67%	1.42%	159.54%
20-year Treasury Yield	0.08%	2.74%	69.75%
30-year Treasury Yield	0.23%	0.61%	50.37%
30-year Mortgage Rate	0.77%	-26.62%	65.06%
Moody's AAA Curve	0.61%	-17.11%	48.56%
Moody's BAA Curve	5.44%	29.71%	68.12%
BBB Corporate Yield	1.61%	-14.04%	59.53%
Prime Rate	0.83%	-162.15%	322.15%
US Average Retail Gasoline Price	586.70%	**	***
Cost of Federal Funds	0.18%	**	***
Dow Jones Total Stock Market Index	219.02%	***	***
S&P 500 Stock Price Index	5.53%	-182.51%	553.41%
Commercial Real Estate Price Index	0.12%	-1.22%	11.57%
Residential Home Price Index	4.61%	-60.70%	169.38%
Market Volatility Index	547.85%	***	***

#### Table 4: Regression Aggregate Errors for 4Q2014 through 3Q2023

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

 $\ast\ast\ast$  The indicated value has a percentage error greater than 1000%.

REGRESSION FOR REAL GDP GROWTH		
	Dependent variable (+/- SE):	
	Real GDP growth	
Constant	6.381 (+/- 6.793)	
	p = 0.357	
Moody's BAA Curve	10.826 (+/- 2.980)	
	p = 0.002***	
Unemployment Rate	5.886 (+/- 0.353)	
	p = 0.000***	
BBB corporate yield	-12.566 (+/- 3.178)	
	p = 0.001***	
10-year Treasury Yield	40.223 (+/- 12.123)	
	p = 0.003***	
LN_10-year Treasury Yield	-133.493 (+/- 22.297)	
	p = 0.00001 <sup>***</sup>	
LN_1-month Treasury Yield	5.163 (+/- 0.979)	
	p = 0.00002 <sup>***</sup>	
7-year Treasury Yield	-133.428 (+/- 18.369)	
	p = 0.00000 <sup>***</sup>	
LN_7-year Treasury Yield	263.166 (+/- 30.691)	
	p = 0.000***	
5-year Treasury Yield	62.485 (+/- 8.734)	
	p = 0.00000 <sup>***</sup>	
LN_5-year Treasury Yield	-89.294 (+/- 13.454)	
	p = 0.00000 <sup>***</sup>	
LN_6-month Treasury Yield	-15.285 (+/- 3.619)	
	p = 0.0003***	
LN_1-year Treasury Yield	13.794 (+/- 3.617)	
	p = 0.001***	
7-year Treasury Yield_2	2.679 (+/- 0.815)	
	p = 0.003***	
Observations	40	
R <sup>2</sup>	0.976	
Adjusted R <sup>2</sup>	0.964	
Residual Std. Error	1.462 (df = 26)	
F Statistic	81.305 <sup>***</sup> (df = 13; 26)	

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

Note:

\*p\*\*p\*\*\*p<0.01

	Dependent variable (+/- SE).	
	Nominal GDP growth	
Constant	230.182 (+/- 42.665)	
	p = 0.0002 <sup>***</sup>	
SP500 Stock Price Index	-0.017 (+/- 0.003)	
	p = 0.00003 <sup>***</sup>	
Moody's BAA Curve	29.200 (+/- 4.856)	
	p = 0.00005 <sup>***</sup>	
Real disposable income growth	-0.214 (+/- 0.021)	
	p = 0.00000***	
BBB corporate yield	-27.794 (+/- 4.843)	
	p = 0.0001***	
Prime Rate	32.275 (+/- 8.475)	
	p = 0.003 <sup>***</sup>	
Market Volatility Index	-0.392 (+/- 0.079)	
	p = 0.0003 <sup>***</sup>	
LN_Market Volatility Index	13.018 (+/- 2.716)	
	p = 0.0004***	
US Avg Retail Gasoline Price (\$-gal; all grades, all formulations)	11.299 (+/- 1.698)	
	p = 0.00002***	
30-year Treasury Yield	-272.258 (+/- 34.900)	
	p = 0.00001***	
LN_20-year Treasury Yield	302.041 (+/- 74.458)	
	p = 0.002 <sup>***</sup>	
10-year Treasury Yield	235.541 (+/- 18.531)	
	p = 0.000 <sup>***</sup>	
LN_10-year Treasury Yield	-474.002 (+/- 31.636)	
	p = 0.000***	
1-month Treasury Yield	-53.543 (+/- 8.336)	
	p = 0.00003 <sup>***</sup>	
LN_1-month Treasury Yield	15.625 (+/- 1.113)	
	p = 0.000 <sup>***</sup>	
7-year Treasury Yield	-881.617 (+/- 62.435)	
	p = 0.000***	
LN_7-year Treasury Yield	1,079.126 (+/- 68.561)	
	p = 0.000***	
5-year Treasury Yield	566.920 (+/- 49.542)	

REGRESSION FOR NOMINAL GDP GROWTH

	p = 0.00000 <sup>***</sup>
LN_5-year Treasury Yield	-544.627 (+/- 43.027)
	p = 0.000***
LN_6-month Treasury Yield	-37.133 (+/- 3.698)
	p = 0.00000***
LN_1-year Treasury Yield	32.268 (+/- 3.726)
	p = 0.00000***
6-month Treasury Yield_2	11.457 (+/- 1.520)
	p = 0.00001***
5-year Treasury Yield_2	-69.103 (+/- 7.790)
	p = 0.00000***
3-month Treasury Yield_2	-6.328 (+/- 1.247)
	p = 0.0003***
7-year Treasury Yield_2	84.849 (+/- 8.581)
	p = 0.00000***
20-year Treasury Yield_2	-22.575 (+/- 3.946)
	p = 0.0001***
30-year Treasury Yield_2	40.609 (+/- 5.646)
	p = 0.00001***
Observations	40
R <sup>2</sup>	0.993
Adjusted R <sup>2</sup>	0.980
Residual Std. Error	1.258 (df = 13)
F Statistic	72.822 <sup>***</sup> (df = 26; 13)
Note:	*p**p***p<0.01

	Dependent variable (+/- SE):	
	Real disposable income growth	
Constant	268.913 (+/- 208.565)	
	p = 0.230	
US Fed Reserve O-N Loan Rate	535.376 (+/- 71.616)	
	p = 0.00004***	
Moody's AAA Curve	-147.305 (+/- 18.190)	
	p = 0.00003***	
Nominal GDP growth	3.562 (+/- 0.561)	
	p = 0.0002***	
Unemployment Rate	-30.866 (+/- 4.575)	
	p = 0.0001***	
CPI Inflation Rate	-4.096 (+/- 1.220)	
	p = 0.009 <sup>***</sup>	
30-year Mortgate Rate	123.303 (+/- 16.704)	
	p = 0.00005 <sup>***</sup>	
Prime Rate	-440.261 (+/- 60.968)	
	p = 0.00005 <sup>***</sup>	
Dow Total Stock Market Index	-0.006 (+/- 0.001)	
	p = 0.0002***	
Home Price Index	3.667 (+/- 0.570)	
	p = 0.0002***	
Commercial Real Estate Price Index	-3.102 (+/- 0.385)	
	p = 0.00003***	
Market Volatility Index	-2.080 (+/- 0.378)	
	p = 0.0004***	
LN_Market Volatility Index	47.762 (+/- 10.556)	
	p = 0.002***	
US Avg Retail Gasoline Price (\$-gal; all grades, all formulations)	) 36.914 (+/- 6.738)	
	p = 0.0004***	
30-year Treasury Yield	3,172.801 (+/- 415.852)	
	p = 0.00004***	
LN_30-year Treasury Yield	-5,690.109 (+/- 689.238)	
	p = 0.00002***	
20-year Treasury Yield	-520.568 (+/- 93.678)	
	p = 0.0004***	
LN_10-year Treasury Yield	1,253.257 (+/- 139.408)	

## REGRESSION FOR REAL DISPOSABLE INCOME GROWTH

	p = 0.00001***	
LN_7-year Treasury Yield	441.657 (+/- 127.469)	
	p = 0.008***	
3-month Treasury Yield	-200.284 (+/- 29.065)	
	p = 0.0001***	
5-year Treasury Yield	-629.870 (+/- 100.792)	
	p = 0.0002***	
LN_6-month Treasury Yield	-84.409 (+/- 16.320)	
	p = 0.001***	
3-year Treasury Yield	900.988 (+/- 98.457)	
	p = 0.00001***	
LN_3-year Treasury Yield	-503.053 (+/- 52.193)	
	p = 0.00001***	
LN_1-year Treasury Yield	102.064 (+/- 20.108)	
	p = 0.001***	
3-year Treasury Yield_2	-153.308 (+/- 18.883)	
	p = 0.00002***	
6-month Treasury Yield_2	99.518 (+/- 10.934)	
	p = 0.00001***	
5-year Treasury Yield_2	74.052 (+/- 19.317)	
	p = 0.005***	
3-month Treasury Yield_2	-61.022 (+/- 7.292)	
	p = 0.00002***	
10-year Treasury Yield_2	-59.103 (+/- 11.277)	
	p = 0.001***	
30-year Treasury Yield_2	-158.879 (+/- 29.880)	
	p = 0.0005***	
Observations	40	
R <sup>2</sup>	0.979	
Adjusted R <sup>2</sup>	0.908	
Residual Std. Error	3.841 (df = 9)	
F Statistic	13.809 <sup>***</sup> (df = 30; 9)	
Note:	*p**p***p<0.01	

	Dependent variable (+/- SE):
	Nominal disposable income growth
Constant	11.020 (+/- 5.894)
	p = 0.070*
Unemployment Rate	-1.203 (+/- 1.099)
	p = 0.281
Observations	40
R <sup>2</sup>	0.031
Adjusted R <sup>2</sup>	0.005
Residual Std. Error	12.341 (df = 38)
F Statistic	1.199 (df = 1; 38)
Note:	*p**p***p<0.01

REGRESSION FOR NOMINAL DISPOSABLE INCOME GROWTH

	Dependent variable (+/- SE):
	CPI Inflation Rate
Constant	-95.162 (+/- 2.330)
	p = 0.00000 <sup>***</sup>
SP500 Stock Price Index	-0.009 (+/- 0.0003)
	p = 0.00000 <sup>***</sup>
US Fed Reserve O-N Loan Rate	-39.700 (+/- 0.937)
	p = 0.00000***
Real GDP growth	0.769 (+/- 0.025)
	p = 0.00000 <sup>***</sup>
Nominal GDP growth	-0.836 (+/- 0.025)
	p = 0.00000 <sup>***</sup>
Real disposable income growth	-0.749 (+/- 0.020)
	p = 0.00000***
Nominal disposable income growth	0.745 (+/- 0.019)
	p = 0.00000 <sup>***</sup>
Unemployment Rate	1.662 (+/- 0.068)
	p = 0.00001***
BBB corporate yield	-2.914 (+/- 0.094)
	p = 0.00000 <sup>***</sup>
Prime Rate	15.014 (+/- 0.534)
	p = 0.00001***
Dow Total Stock Market Index	0.0003 (+/- 0.00002)
	p = 0.00001***
Home Price Index	0.176 (+/- 0.006)
	p = 0.00000 <sup>***</sup>
Commercial Real Estate Price Index	0.121 (+/- 0.004)
	p = 0.00000***
Market Volatility Index	0.173 (+/- 0.007)
	p = 0.00001***
LN_Market Volatility Index	-4.674 (+/- 0.181)
	p = 0.00001***
US Avg Retail Gasoline Price (\$-gal; all grades, all formulations)	0.531 (+/- 0.054)
	p = 0.0002***
LN_30-year Treasury Yield	97.131 (+/- 2.514)
	p = 0.00000***
LN_20-year Treasury Yield	-48.218 (+/- 2.020)

# REGRESSION FOR CPI INFLATION RATE

	p = 0.00001***
10-year Treasury Yield	6.887 (+/- 0.432)
	p = 0.00002***
LN_10-year Treasury Yield	-48.403 (+/- 1.136)
	p = 0.00000***
1-month Treasury Yield	29.550 (+/- 0.602)
	p = 0.00000***
LN_1-month Treasury Yield	0.648 (+/- 0.054)
	p = 0.0001***
LN_7-year Treasury Yield	37.126 (+/- 1.254)
	p = 0.00000 <sup>***</sup>
3-month Treasury Yield	4.476 (+/- 0.464)
	p = 0.0003***
LN_5-year Treasury Yield	-13.677 (+/- 0.933)
	p = 0.00003***
6-month Treasury Yield	-49.176 (+/- 1.012)
	p = 0.00000***
LN_6-month Treasury Yield	-5.311 (+/- 0.219)
	p = 0.00001***
3-year Treasury Yield	-66.837 (+/- 1.930)
	p = 0.00000***
LN_3-year Treasury Yield	26.874 (+/- 0.961)
	p = 0.00001***
1-year Treasury Yield	75.480 (+/- 2.008)
	p = 0.00000***
1-year Treasury Yield_2	-19.944 (+/- 0.599)
	p = 0.00000***
3-year Treasury Yield_2	10.046 (+/- 0.316)
	p = 0.00000***
6-month Treasury Yield_2	11.192 (+/- 0.342)
	p = 0.00000***
5-year Treasury Yield_2	3.825 (+/- 0.147)
	p = 0.00001***
30-year Treasury Yield_2	-1.334 (+/- 0.085)
	p = 0.00002***
Observations	40
R <sup>2</sup>	1.000
Adjusted R <sup>2</sup>	1.000
Residual Std. Error	0.035 (df = 5)

F Statistic	7,292.067 <sup>***</sup> (df = 34; 5)
	* ** ***

Note:

\*p\*\*p\*\*\*\*p<0.01

# Unemployment Rate

	Dependent variable (+/- SE):
	Unemployment Rate
Constant	-0.911 (+/- 0.624)
	p = 0.155
Real GDP growth	0.124 (+/- 0.007)
	p = 0.000***
20-year Treasury Yield	-5.812 (+/- 1.446)
	p = 0.0004 <sup>***</sup>
LN_20-year Treasury Yield	23.700 (+/- 4.840)
	p = 0.00003***
7-year Treasury Yield	13.502 (+/- 1.851)
	p = 0.00000 <sup>***</sup>
LN_7-year Treasury Yield	-35.420 (+/- 4.526)
	p = 0.000 <sup>***</sup>
5-year Treasury Yield	-8.077 (+/- 1.063)
	p = 0.000 <sup>***</sup>
LN_5-year Treasury Yield	18.857 (+/- 2.777)
	p = 0.00000 <sup>***</sup>
LN_3-year Treasury Yield	-2.449 (+/- 0.797)
	p = 0.005 <sup>***</sup>
Observations	40
R <sup>2</sup>	0.980
Adjusted R <sup>2</sup>	0.974
Residual Std. Error	0.288 (df = 31)
F Statistic	185.678 <sup>***</sup> (df = 8; 31)
Note:	*p**p***p<0.01

**REGRESSION FOR UNEMPLOYMENT RATE** 

	Dependent variable (+/- SE):
	1-month Treasury Yield
Constant	6.132 (+/- 0.963)
	p = 0.00000 <sup>***</sup>
Moody's AAA Curve	-2.954 (+/- 0.286)
	p = 0.000 <sup>***</sup>
Real GDP growth	0.251 (+/- 0.027)
	p = 0.000 <sup>***</sup>
Nominal GDP growth	-0.182 (+/- 0.022)
	p = 0.000 <sup>***</sup>
Unemployment Rate	-0.426 (+/- 0.048)
	p = 0.000 <sup>***</sup>
30-year Mortgate Rate	1.268 (+/- 0.117)
	p = 0.000***
30-year Treasury Yield_2	0.360 (+/- 0.061)
	p = 0.00001 <sup>***</sup>
Observations	40
R <sup>2</sup>	0.962
Adjusted R <sup>2</sup>	0.955
Residual Std. Error	0.309 (df = 33)
F Statistic	139.648 <sup>***</sup> (df = 6; 33)
Note:	*p**p***p<0.01

**REGRESSION FOR 1-MONTH TREASURY YIELD** 

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

	Dependent variable (+/- SE):
	3-month Treasury Yield
Constant	-0.404 (+/- 1.454)
	p = 0.784
Moody's AAA Curve	-3.404 (+/- 0.742)
	p = 0.0001***
Real GDP growth	0.242 (+/- 0.032)
	p = 0.00000***
Nominal GDP growth	-0.168 (+/- 0.030)
	p = 0.00001***
Unemployment Rate	-0.428 (+/- 0.078)
	p = 0.00001 <sup>***</sup>
BBB corporate yield	0.831 (+/- 0.291)
	p = 0.008***
Commercial Real Estate Price Index	0.010 (+/- 0.003)
	p = 0.002***
LN_30-year Treasury Yield	10.475 (+/- 2.850)
	p = 0.001***
20-year Treasury Yield	4.626 (+/- 0.641)
	p = 0.00000 <sup>***</sup>
LN_20-year Treasury Yield	-13.394 (+/- 2.438)
	p = 0.00001***
Observations	40
R <sup>2</sup>	0.976
Adjusted R <sup>2</sup>	0.969
Residual Std. Error	0.264 (df = 30)
F Statistic	136.335 <sup>***</sup> (df = 9; 30)
Note:	*p**p***p<0.01

REGRESSION FOR 3-MONTH TREASURY YIELD

	Dependent variable (+/- SE):
	6-month Treasury Yield
Constant	-0.808 (+/- 1.336)
	p = 0.550
Moody's AAA Curve	-3.456 (+/- 0.681)
	p = 0.00002***
Real GDP growth	0.196 (+/- 0.029)
	p = 0.00000 <sup>***</sup>
Nominal GDP growth	-0.123 (+/- 0.028)
	p = 0.0002***
Unemployment Rate	-0.423 (+/- 0.072)
	p = 0.00001***
BBB corporate yield	1.106 (+/- 0.267)
	p = 0.0003***
Commercial Real Estate Price Index	0.010 (+/- 0.003)
	p = 0.002 <sup>***</sup>
LN_30-year Treasury Yield	10.452 (+/- 2.618)
	p = 0.0004***
20-year Treasury Yield	4.378 (+/- 0.588)
	p = 0.00000 <sup>***</sup>
LN_20-year Treasury Yield	-13.112 (+/- 2.240)
	p = 0.00001***
Observations	40
R <sup>2</sup>	0.981
Adjusted R <sup>2</sup>	0.976
Residual Std. Error	0.243 (df = 30)
F Statistic	173.564 <sup>***</sup> (df = 9; 30)
Note:	*p**p***p<0.01

REGRESSION FOR 6-MONTH TREASURY YIELD

	Dependent variable (+/- SE):
	1-year Treasury Yield
Constant	-3.003 (+/- 1.234)
	p = 0.021**
Moody's BAA Curve	-1.449 (+/- 0.470)
	p = 0.005 <sup>***</sup>
Real GDP growth	0.225 (+/- 0.035)
	p = 0.00000 <sup>***</sup>
Nominal GDP growth	-0.168 (+/- 0.031)
	p = 0.00001***
Unemployment Rate	-0.173 (+/- 0.056)
	p = 0.005 <sup>***</sup>
BBB corporate yield	2.048 (+/- 0.384)
	p = 0.00001***
Commercial Real Estate Price Index	0.014 (+/- 0.002)
	p = 0.00000***
Observations	40
R <sup>2</sup>	0.948
Adjusted R <sup>2</sup>	0.938
Residual Std. Error	0.374 (df = 33)
F Statistic	99.482 <sup>***</sup> (df = 6; 33)
Note:	*p**p***p<0.01

**REGRESSION FOR 1-YEAR TREASURY YIELD**
	Pependent variable (+/- SE):
	3-year Treasury Yield
Constant	-1.038 (+/- 0.646)
	p = 0.119
SP500 Stock Price Index	-0.001 (+/- 0.0003)
	p = 0.0005 <sup>***</sup>
Real GDP growth	0.085 (+/- 0.015)
	p = 0.00001 <sup>***</sup>
Real disposable income growth	0.192 (+/- 0.051)
	p = 0.001***
Nominal disposable income growth	-0.184 (+/- 0.049)
	p = 0.001***
Unemployment Rate	-0.442 (+/- 0.057)
	p = 0.000***
Home Price Index	0.035 (+/- 0.007)
	p = 0.00001***
US Avg Retail Gasoline Price (\$-gal; all grades, all formulations)	0.488 (+/- 0.161)
	p = 0.005 <sup>***</sup>
Observations	40
R <sup>2</sup>	0.890
Adjusted R <sup>2</sup>	0.865
Residual Std. Error	0.436 (df = 32)
F Statistic	36.826 <sup>***</sup> (df = 7; 32)
Note:	*p**p***p<0.01

	Dependent variable (+/- SE):
	5-year Treasury Yield
Constant	6.349 (+/- 0.738)
	p = 0.000 <sup>***</sup>
Real GDP growth	0.078 (+/- 0.012)
	p = 0.00000 <sup>***</sup>
Unemployment Rate	-0.497 (+/- 0.050)
	p = 0.000 <sup>***</sup>
CPI Inflation Rate	-0.101 (+/- 0.032)
	p = 0.004 <sup>***</sup>
Home Price Index	0.050 (+/- 0.006)
	p = 0.000 <sup>***</sup>
Commercial Real Estate Price Index	-0.045 (+/- 0.006)
	p = 0.00000 <sup>***</sup>
Observations	40
R <sup>2</sup>	0.855
Adjusted R <sup>2</sup>	0.833
Residual Std. Error	0.406 (df = 34)
F Statistic	39.952 <sup>***</sup> (df = 5; 34)
Note:	*p**p***p<0.01

**REGRESSION FOR 5-YEAR TREASURY YIELD** 

	Dependent variable (+/- SE):
	7-year Treasury Yield
Constant	5.118 (+/- 0.788)
	p = 0.00000 <sup>***</sup>
Nominal GDP growth	0.028 (+/- 0.008)
	p = 0.001***
Unemployment Rate	-0.226 (+/- 0.043)
	p = 0.00001 <sup>***</sup>
Home Price Index	0.021 (+/- 0.006)
	p = 0.003***
Commercial Real Estate Price Index	-0.028 (+/- 0.006)
	p = 0.0001***
US Avg Retail Gasoline Price (\$-gal; all grades, all formulations)	0.337 (+/- 0.121)
	p = 0.009***
1-month Treasury Yield	0.360 (+/- 0.046)
	p = 0.000 <sup>***</sup>
Observations	40
R <sup>2</sup>	0.920
Adjusted R <sup>2</sup>	0.905
Residual Std. Error	0.273 (df = 33)
F Statistic	62.840 <sup>***</sup> (df = 6; 33)
Note:	*p**p***p<0.01

### **REGRESSION FOR 7-YEAR TREASURY YIELD**

	Dependent variable (+/- SE):
	10-year Treasury Yield
Constant	2.447 (+/- 0.391)
	p = 0.00000 <sup>***</sup>
Commercial Real Estate Price Index	-0.010 (+/- 0.001)
	p = 0.00000 <sup>***</sup>
US Avg Retail Gasoline Price (\$-gal; all grades, all formulations)	0.740 (+/- 0.095)
	p = 0.000***
1-month Treasury Yield	0.439 (+/- 0.042)
	p = 0.000***
Observations	40
R <sup>2</sup>	0.849
Adjusted R <sup>2</sup>	0.837
Residual Std. Error	0.327 (df = 36)
F Statistic	67.709 <sup>***</sup> (df = 3; 36)
Note:	*p**p***p<0.01

## REGRESSION FOR 10-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	20-year Treasury Yield
Constant	5.473 (+/- 0.780)
	p = 0.00000 <sup>***</sup>
Prime Rate	-0.595 (+/- 0.186)
	p = 0.003 <sup>***</sup>
Commercial Real Estate Price Index	-0.011 (+/- 0.001)
	p = 0.000 <sup>***</sup>
US Avg Retail Gasoline Price (\$-gal; all grades, all formulations)	0.611 (+/- 0.073)
	p = 0.000 <sup>***</sup>
6-month Treasury Yield	0.709 (+/- 0.154)
	p = 0.0001***
6-month Treasury Yield_2	0.051 (+/- 0.016)
	p = 0.004***
Observations	40
R <sup>2</sup>	0.927
Adjusted R <sup>2</sup>	0.916
Residual Std. Error	0.221 (df = 34)
F Statistic	85.717 <sup>***</sup> (df = 5; 34)
Note:	*p**p***p<0.01

### **REGRESSION FOR 20-YEAR TREASURY YIELD**

	Dependent variable (+/- SE):
	30-year Treasury Yield
Constant	4.325 (+/- 0.346)
	p = 0.000 <sup>***</sup>
Real disposable income growth	-0.090 (+/- 0.028)
	p = 0.004 <sup>***</sup>
Nominal disposable income growth	0.090 (+/- 0.028)
	p = 0.004 <sup>***</sup>
Home Price Index	-0.017 (+/- 0.001)
	p = 0.000***
US Avg Retail Gasoline Price (\$-gal; all grades, all formulations)	0.477 (+/- 0.085)
	p = 0.00001***
3-month Treasury Yield	-1.704 (+/- 0.344)
	p = 0.00003***
6-month Treasury Yield	1.655 (+/- 0.302)
	p = 0.00001***
3-month Treasury Yield_2	0.115 (+/- 0.019)
	p = 0.00000 <sup>***</sup>
Observations	40
R <sup>2</sup>	0.921
Adjusted R <sup>2</sup>	0.904
Residual Std. Error	0.212 (df = 32)
F Statistic	53.582 <sup>***</sup> (df = 7; 32)
Note:	*p**p***p<0.01

#### **REGRESSION FOR 30-YEAR TREASURY YIELD**

# 30-year Mortgage Rate

	Dependent variable (+/- SE):
	30-year Mortgate Rate
Constant	4.147 (+/- 0.505)
	p = 0.000 <sup>***</sup>
Dow Total Stock Market Index	-0.0001 (+/- 0.00001)
	p = 0.00001***
Home Price Index	0.034 (+/- 0.005)
	p = 0.00000 <sup>***</sup>
Commercial Real Estate Price Index	-0.024 (+/- 0.004)
	p = 0.00001***
US Avg Retail Gasoline Price (\$-gal; all grades, all formulations)	0.348 (+/- 0.088)
	p = 0.0004***
1-month Treasury Yield	0.453 (+/- 0.034)
	p = 0.000***
Observations	40
R <sup>2</sup>	0.960
Adjusted R <sup>2</sup>	0.954
Residual Std. Error	0.223 (df = 34)
F Statistic	162.473 <sup>***</sup> (df = 5; 34)
Note:	*p**p***p<0.01

### **REGRESSION FOR 30-YEAR MORTGATE RATE**

## Moody's AAA & BAA Rates

	Dependent variable (+/- SE):
	Moody's AAA Curve
Constant	7.720 (+/- 0.762)
	p = 0.000 <sup>***</sup>
SP500 Stock Price Index	-0.001 (+/- 0.0001)
	p = 0.000 <sup>***</sup>
Real disposable income growth	-0.080 (+/- 0.026)
	p = 0.005 <sup>***</sup>
Nominal disposable income growth	0.076 (+/- 0.026)
	p = 0.007 <sup>***</sup>
Unemployment Rate	-0.064 (+/- 0.023)
	p = 0.010 <sup>***</sup>
Prime Rate	-0.938 (+/- 0.189)
	p = 0.00003 <sup>***</sup>
US Avg Retail Gasoline Price (\$-gal; all grades, all formulations)	0.413 (+/- 0.074)
	p = 0.00001 <sup>***</sup>
6-month Treasury Yield	0.720 (+/- 0.144)
	p = 0.00003 <sup>***</sup>
1-month Treasury Yield_2	0.114 (+/- 0.017)
	p = 0.00000 <sup>***</sup>
Observations	40
R <sup>2</sup>	0.941
Adjusted R <sup>2</sup>	0.926
Residual Std. Error	0.188 (df = 31)
F Statistic	61.919 <sup>***</sup> (df = 8; 31)
Note:	*p**p***p<0.01

#### **REGRESSION FOR MOODY'S AAA CURVE**

	Dependent variable (+/- SE):
	Moody's BAA Curve
Constant	3.700 (+/- 0.417)
	p = 0.000 <sup>***</sup>
SP500 Stock Price Index	-0.001 (+/- 0.0002)
	p = 0.00001***
Home Price Index	0.018 (+/- 0.006)
	p = 0.003 <sup>***</sup>
6-month Treasury Yield	-1.396 (+/- 0.425)
	p = 0.003 <sup>***</sup>
1-year Treasury Yield	2.097 (+/- 0.504)
	p = 0.0003***
LN_1-year Treasury Yield	-0.405 (+/- 0.088)
	p = 0.0001***
Observations	40
R <sup>2</sup>	0.875
Adjusted R <sup>2</sup>	0.856
Residual Std. Error	0.282 (df = 34)
F Statistic	47.434 <sup>***</sup> (df = 5; 34)
Note:	*p**p***p<0.01

**REGRESSION FOR MOODY'S BAA CURVE** 

## BBB Corporate Yield

	Dependent variable (+/- SE):
	BBB corporate yield
Constant	5.913 (+/- 0.657)
	p = 0.000***
SP500 Stock Price Index	-0.001 (+/- 0.0002)
	p = 0.002***
US Fed Reserve O-N Loan Rate	-0.846 (+/- 0.220)
	p = 0.001***
Unemployment Rate	-0.079 (+/- 0.027)
	p = 0.007***
Home Price Index	0.028 (+/- 0.005)
	p = 0.00002 <sup>***</sup>
Commercial Real Estate Price Index	-0.021 (+/- 0.005)
	p = 0.0001 <sup>***</sup>
6-month Treasury Yield	1.297 (+/- 0.254)
	p = 0.00002 <sup>***</sup>
LN_6-month Treasury Yield	-0.584 (+/- 0.158)
	p = 0.001***
LN_1-year Treasury Yield	0.547 (+/- 0.192)
	p = 0.008 <sup>***</sup>
Observations	40
R <sup>2</sup>	0.965
Adjusted R <sup>2</sup>	0.956
Residual Std. Error	0.199 (df = 31)
F Statistic	106.515 <sup>***</sup> (df = 8; 31)
Note:	*p**p***p<0.01

## REGRESSION FOR BBB CORPORATE YIELD

## Prime Rate

	Dependent variable (+/- SE):
	Prime Rate
Constant	2.652 (+/- 1.545)
	p = 0.096*
Moody's AAA Curve	-1.887 (+/- 0.406)
	p = 0.0001***
Real GDP growth	0.281 (+/- 0.032)
	p = 0.000 <sup>***</sup>
Nominal GDP growth	-0.199 (+/- 0.032)
	p = 0.00000 <sup>***</sup>
Unemployment Rate	-0.529 (+/- 0.068)
	p = 0.000 <sup>***</sup>
Commercial Real Estate Price Index	0.011 (+/- 0.003)
	p = 0.003 <sup>***</sup>
LN_30-year Treasury Yield	8.199 (+/- 2.770)
	p = 0.006 <sup>***</sup>
20-year Treasury Yield	5.185 (+/- 0.650)
	p = 0.000 <sup>***</sup>
LN_20-year Treasury Yield	-14.361 (+/- 2.623)
	p = 0.00001 <sup>***</sup>
Observations	40
R <sup>2</sup>	0.967
Adjusted R <sup>2</sup>	0.959
Residual Std. Error	0.285 (df = 31)
F Statistic	114.482 <sup>***</sup> (df = 8; 31)
Note:	*p**p***p<0.01

#### **REGRESSION FOR PRIME RATE**

# US Average Retail Gasoline Price

	Dependent variable (+/- SE):	
	US Avg Retail Gasoline Price (\$-gal; all grades, all formulations)	
Constant	9.230 (+/- 1.406)	
	p = 0.0002***	
SP500 Stock Price Index	0.004 (+/- 0.0002)	
	p = 0.00000***	
Moody's AAA Curve	4.792 (+/- 0.308)	
	p = 0.00000***	
Real GDP growth	-0.289 (+/- 0.018)	
	p = 0.00000***	
Nominal GDP growth	0.237 (+/- 0.017)	
	p = 0.00000***	
Real disposable income growth	0.591 (+/- 0.034)	
	p = 0.00000***	
Nominal disposable income growth	-0.558 (+/- 0.033)	
	p = 0.00000***	
Unemployment Rate	0.298 (+/- 0.042)	
	p = 0.0002***	
CPI Inflation Rate	0.482 (+/- 0.025)	
	p = 0.00000***	
BBB corporate yield	-0.915 (+/- 0.098)	
	p = 0.00002***	
30-year Mortgate Rate	-1.474 (+/- 0.203)	
	p = 0.0001***	
Prime Rate	4.913 (+/- 0.356)	
	p = 0.00000***	
Dow Total Stock Market Index	0.0001 (+/- 0.00001)	
	p = 0.0002***	
Home Price Index	-0.115 (+/- 0.006)	
	p = 0.00000***	
LN_Market Volatility Index	0.406 (+/- 0.049)	
	p = 0.00004***	
30-year Treasury Yield	-33.355 (+/- 2.413)	
	p = 0.00000***	
LN_30-year Treasury Yield	43.082 (+/- 3.868)	
	p = 0.00001***	

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

20-year Treasury Yield	4.952 (+/- 0.614)
	p = 0.00005***
LN_10-year Treasury Yield	-4.798 (+/- 1.225)
	p = 0.005****
1-month Treasury Yield	-10.084 (+/- 0.517)
	p = 0.00000***
LN_1-month Treasury Yield	0.337 (+/- 0.042)
	p = 0.00005***
LN_7-year Treasury Yield	-11.108 (+/- 0.818)
	p = 0.00000 <sup>***</sup>
LN_5-year Treasury Yield	7.584 (+/- 0.452)
	p = 0.00000***
6-month Treasury Yield	16.391 (+/- 0.641)
	p = 0.000****
3-year Treasury Yield	5.657 (+/- 0.427)
	p = 0.00001***
1-year Treasury Yield	-15.873 (+/- 0.659)
	p = 0.000***
1-year Treasury Yield_2	3.011 (+/- 0.157)
	p = 0.00000***
6-month Treasury Yield_2	-3.176 (+/- 0.151)
	p = 0.00000***
3-month Treasury Yield_2	1.020 (+/- 0.047)
	p = 0.00000***
7-year Treasury Yield_2	-1.477 (+/- 0.130)
	p = 0.00001***
10-year Treasury Yield_2	0.944 (+/- 0.129)
	p = 0.0001***
30-year Treasury Yield_2	2.294 (+/- 0.168)
	p = 0.00000***
Observations	40
R <sup>2</sup>	0.999
Adjusted R <sup>2</sup>	0.997
Residual Std. Error	0.033 (df = 8)
F Statistic	444.202 <sup>***</sup> (df = 31; 8)

Note:

\*p\*\*p\*\*\*p<0.01

# US Federal Reserve Overnight Lending Rate

	Dependent variable (+/- SE):
	US Fed Reserve O-N Loan Rate
Constant	-0.235 (+/- 1.587)
	p = 0.884
Moody's AAA Curve	-1.904 (+/- 0.417)
	p = 0.0001 <sup>***</sup>
Real GDP growth	0.281 (+/- 0.033)
	p = 0.000***
Nominal GDP growth	-0.193 (+/- 0.032)
	p = 0.00001 <sup>***</sup>
Unemployment Rate	-0.575 (+/- 0.070)
	p = 0.000***
Commercial Real Estate Price Index	0.010 (+/- 0.003)
	p = 0.005 <sup>***</sup>
LN_30-year Treasury Yield	8.742 (+/- 2.846)
	p = 0.005 <sup>***</sup>
20-year Treasury Yield	5.284 (+/- 0.668)
	p = 0.000 <sup>***</sup>
LN_20-year Treasury Yield	-15.091 (+/- 2.695)
	p = 0.00001***
Observations	40
R <sup>2</sup>	0.966
Adjusted R <sup>2</sup>	0.957
Residual Std. Error	0.293 (df = 31)
F Statistic	110.571 <sup>***</sup> (df = 8; 31)
Note:	*p**p***p<0.01

REGRESSION FOR US FED RESERVE O-N LOAN RATE

	Dependent variable (+/- SE):
	Dow Total Stock Market Index
Constant	104,231.600 (+/- 16,429.870) p = 0.00003***
US Fed Reserve O-N Loan Rate	11,513.450 (+/-3,248.079) n = 0.004***
Real GDP growth	-311.392 (+/- 18.732)
Real disposable income growth	-37.835 (+/- 9.592)
CPI Inflation Rate	p = 0.002 240.572 (+/- 79.733)
BBB corporate yield	p = 0.010 4,827.094 (+/- 940.999) n = 0.0002***
30-year Mortgate Rate	p = 0.0002 -7,116.061 (+/- 1,881.433)
US Avg Retail Gasoline Price (\$-gal; all grades, all formulations)	p = 0.003 5,382.781 (+/- 584.648)
30-year Treasury Yield	p = 0.00000 160,986.100 (+/- 26,004.440) p = 0.00004***
LN_30-year Treasury Yield	-385,574.400 (+/- 39,268.760) p = 0.00000***
20-year Treasury Yield	-127,091.400 (+/- 12,191.990) n = 0.00000***
LN_20-year Treasury Yield	379,131.000 (+/- 29,595.390) n = 0.000***
10-year Treasury Yield	-133,265.900 (+/- 20,007.130)
1-month Treasury Yield	-18,352.090 (+/- 3,185.453)
7-year Treasury Yield	p = 0.0001 -85,706.500 (+/- 9,968.895) p = 0.00001***
LN_7-year Treasury Yield	190,148.400 (+/- 20,597.400) p = 0.00000***
3-month Treasury Yield	21,782.390 (+/- 2,618.685) p = 0.00001 <sup>***</sup>

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

REGRESSION FOR DOW TOTAL STOCK MARKET INDEX

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5-year Treasury Yield	151,116.000 (+/- 14,705.560)
IN 5-year Treasury Vield	p = 0.00000 -151 716 000 (+/- 13 168 210)
	$p = 0.00000^{***}$
LN_6-month Treasury Yield	7,354.005 (+/- 734.301)
	p = 0.00000***
1-year Treasury Yield	-40,461.640 (+/- 4,884.625)
	p = 0.00001***
1-year Treasury Yield_2	14,195.100 (+/- 1,896.234)
	p = 0.00001***
6-month Treasury Yield_2	-7,847.327 (+/- 1,256.730)
	p = 0.00003***
5-year Treasury Yield_2	-19,013.970 (+/- 2,437.903)
	p = 0.00001***
10-year Treasury Yield_2	29,989.170 (+/- 4,034.673)
	p = 0.00001***
30-year Treasury Yield_2	-10,098.020 (+/- 2,238.330)
	p = 0.001***
Market Volatility Index_2	-1.717 (+/- 0.095)
	p = 0.000***
Observations	40
R <sup>2</sup>	0.999
Adjusted R <sup>2</sup>	0.998
Residual Std. Error	408.819 (df = 13)
F Statistic	715.676 <sup>***</sup> (df = 26; 13)
Note:	*p***p<0.01

	Dependent variable (+/- SE):
	SP500 Stock Price Index
Constant	18,545.430 (+/- 1,353.942)
	p = 0.000 <sup>***</sup>
US Fed Reserve O-N Loan Rate	990.295 (+/- 333.246)
	p = 0.008 <sup>***</sup>
Unemployment Rate	-138.960 (+/- 18.652)
	p = 0.00000 <sup>***</sup>
CPI Inflation Rate	78.185 (+/- 10.293)
	p = 0.00000 <sup>***</sup>
30-year Treasury Yield	-12,781.570 (+/- 927.972)
	p = 0.000 <sup>***</sup>
20-year Treasury Yield	-9,493.022 (+/- 1,298.982)
	p = 0.00000 <sup>***</sup>
LN_20-year Treasury Yield	29,140.140 (+/- 3,366.679)
	p = 0.00000 <sup>***</sup>
10-year Treasury Yield	2,268.841 (+/- 661.995)
	p = 0.003***
LN_10-year Treasury Yield	-5,770.802 (+/- 1,372.564)
	p = 0.0004***
1-month Treasury Yield	-2,817.280 (+/- 457.129)
	p = 0.00001***
6-month Treasury Yield	4,831.210 (+/- 771.894)
	p = 0.00001***
3-year Treasury Yield	2,980.365 (+/- 788.982)
	p = 0.002***
LN_3-year Treasury Yield	-1,353.081 (+/- 278.268)
	p = 0.0001***
1-year Treasury Yield	-4,194.904 (+/- 774.011)
	p = 0.00003***
1-year Treasury Yield_2	869.329 (+/- 262.914)
	p = 0.004***
3-year Treasury Yield_2	-510.792 (+/- 165.279)
	p = 0.006***
6-month Treasury Yield_2	-686.600 (+/- 185.780)
	p = 0.002***
1-month Treasury Yield_2	181.718 (+/- 35.171)

REGRESSION FOR SP500 STOCK PRICE INDEX

30-year Treasury Yield_2	p = 0.00005 <sup>***</sup> 1,856.650 (+/- 184.110) p = 0.000 <sup>***</sup>
Observations	40
R <sup>2</sup>	0.997
Adjusted R <sup>2</sup>	0.994
Residual Std. Error	66.970 (df = 21)
F Statistic	386.746 <sup>***</sup> (df = 18; 21)
Note:	*p**p***p<0.01

## House and Commercial Real Estate Price Indexes

	Dependent variable (+/- SE):
	Home Price Index
Constant	385.253 (+/- 16.952)
	p = 0.000***
Real GDP growth	-0.525 (+/- 0.091)
	p = 0.00001***
CPI Inflation Rate	4.064 (+/- 0.404)
	p = 0.000 <sup>***</sup>
BBB corporate yield	14.068 (+/- 3.315)
	p = 0.0004 <sup>***</sup>
30-year Mortgate Rate	-26.989 (+/- 7.161)
	p = 0.002***
30-year Treasury Yield	-227.966 (+/- 13.277)
	p = 0.000***
LN_20-year Treasury Yield	746.961 (+/- 56.339)
	p = 0.000***
10-year Treasury Yield	59.147 (+/- 12.660)
	p = 0.0002***
LN_10-year Treasury Yield	-158.914 (+/- 34.438)
	p = 0.0002***
1-month Treasury Yield	-25.233 (+/- 7.146)
	p = 0.002***
LN_7-year Treasury Yield	-288.575 (+/- 40.937)
	p = 0.00000 <sup>***</sup>
LN_5-year Treasury Yield	141.064 (+/- 23.856)
	p = 0.00001***
6-month Treasury Yield	167.021 (+/- 27.390)
	p = 0.00001***
LN_6-month Treasury Yield	28.682 (+/- 2.993)
	p = 0.000***
1-year Treasury Yield	-238.118 (+/- 30.849)
	p = 0.00000 <sup>***</sup>
1-year Treasury Yield_2	61.465 (+/- 8.442)
	p = 0.00000***
6-month Treasury Yield_2	-57.439 (+/- 9.751)
	p = 0.00001 <sup>***</sup>

REGRESSION FOR HOME PRICE INDEX

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3-month Treasury Yield_2	17.215 (+/- 3.186)
	p = 0.00002***
Observations	40
R <sup>2</sup>	0.997
Adjusted R <sup>2</sup>	0.995
Residual Std. Error	3.187 (df = 22)
F Statistic	506.926 <sup>***</sup> (df = 17; 22)
Note:	<sup>*</sup> p <sup>**</sup> p <sup>***</sup> p<0.01

	Dependent variable (+/- SE):	
	Commercial Real Estate Price Index	
Constant	300.466 (+/- 5.968)	
	p = 0.000***	
CPI Inflation Rate	7.278 (+/- 0.814)	
	p = 0.000***	
3-year Treasury Yield_2	21.598 (+/- 1.611)	
	p = 0.000***	
7-year Treasury Yield_2	-23.419 (+/- 2.081)	
	p = 0.000 <sup>***</sup>	
Observations	40	
R <sup>2</sup>	0.912	
Adjusted R <sup>2</sup>	0.905	
Residual Std. Error	14.051 (df = 36)	
F Statistic	124.145 <sup>***</sup> (df = 3; 36)	
Note:	*p**p***p<0.01	

REGRESSION FOR COMMERCIAL REAL ESTATE PRICE INDEX

# Market Volatility Index

	Dependent variable (+/- SE):
	Market Volatility Index
Constant	-244.581 (+/- 136.574)
	p = 0.107
SP500 Stock Price Index	-0.164 (+/- 0.027)
	p = 0.0002***
Moody's AAA Curve	-252.246 (+/- 31.289)
	p = 0.00003 <sup>***</sup>
Real GDP growth	8.792 (+/- 1.839)
	p = 0.001***
Nominal GDP growth	-6.262 (+/- 1.563)
	p = 0.004***
Real disposable income growth	-37.097 (+/- 3.428)
	p = 0.00001 <sup>***</sup>
Nominal disposable income growth	34.824 (+/- 3.218)
	p = 0.00001 <sup>***</sup>
Unemployment Rate	-24.790 (+/- 3.675)
	p = 0.0001***
CPI Inflation Rate	-26.482 (+/- 2.574)
	p = 0.00001 <sup>***</sup>
BBB corporate yield	68.373 (+/- 8.502)
	p = 0.00003 <sup>***</sup>
30-year Mortgate Rate	68.682 (+/- 12.241)
	p = 0.0004***
Prime Rate	-218.997 (+/- 30.159)
	p = 0.00005 <sup>***</sup>
Dow Total Stock Market Index	-0.005 (+/- 0.001)
	p = 0.00001 <sup>***</sup>
Home Price Index	4.538 (+/- 0.582)
	p = 0.00003 <sup>***</sup>
US Avg Retail Gasoline Price (\$-gal; all grades, all formulations)	38.603 (+/- 6.511)
	p = 0.0003***
30-year Treasury Yield	810.922 (+/- 197.076)
	p = 0.003***
LN_30-year Treasury Yield	-1,070.081 (+/- 238.152)
	p = 0.002***

#### REGRESSION FOR MARKET VOLATILITY INDEX

10-year Treasury Yield	474.464 (+/- 69.611)
	p = 0.0001***
1-month Treasury Yield	465.576 (+/- 53.638)
	p = 0.00002***
LN_1-month Treasury Yield	-27.705 (+/- 3.287)
	p = 0.00002***
5-year Treasury Yield	-167.157 (+/- 28.972)
	p = 0.0003***
6-month Treasury Yield	-467.528 (+/- 69.290)
	p = 0.0001***
LN_6-month Treasury Yield	61.676 (+/- 8.578)
	p = 0.0001***
LN_3-year Treasury Yield	-131.021 (+/- 18.107)
	p = 0.00005***
1-year Treasury Yield	214.980 (+/- 51.849)
	p = 0.003***
3-year Treasury Yield_2	-50.998 (+/- 10.398)
	p = 0.001***
6-month Treasury Yield_2	33.895 (+/- 7.084)
	p = 0.001***
3-month Treasury Yield_2	-23.890 (+/- 5.150)
	p = 0.002***
7-year Treasury Yield_2	104.164 (+/- 15.749)
	p = 0.0001***
10-year Treasury Yield_2	-114.950 (+/- 17.923)
	p = 0.0002***
30-year Treasury Yield_2	-72.655 (+/- 18.276)
	p = 0.004***
Observations	40
R <sup>2</sup>	0.988
Adjusted R <sup>2</sup>	0.946
Residual Std. Error	3.009 (df = 9)
F Statistic	23.873 <sup>***</sup> (df = 30; 9)
Note:	*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 "2022 Stress Test Scenarios" (found at https://www.federalreserve.gov/newsevents/pressreleases/files/bcreg20220210a1.pdf) are listed. Please note that shaded attributes are not discussed within this report.

Table 16: Data values and Referenced Sources	Table 16:	Data	Values	and	Referenced	Sources
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Attribute	Referenced Source <sup>76</sup>		
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 [BAMLCOA4CBBBEY], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/BAMLCOA4CBBBEY <sup>77</sup>		

<sup>76</sup> Per https://www.federalreserve.gov/newsevents/pressreleases/files/bcreg20190213a1.pdf

<sup>&</sup>lt;sup>77</sup> 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) <sup>78</sup> .
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) <sup>79</sup> .
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.

<sup>78</sup> 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

<sup>&</sup>lt;sup>79</sup> 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/2023-Table\_1A\_Historic\_Domestic.csv and https://www.federalreserve.gov/supervisionreg/files/2023-Table\_1B\_Historic\_International.csv (shown below, as of March 2023) by clicking the links marked "2023

Historical Domestic (CSV)" and "2023 Historical International (CSV)"<sup>80</sup>.



Since the CCAR dataset is only released annually (through 1Q2023 as of this writing), and Capitalytics provides quarterly updates to its forecasts, the CCAR dataset is supplemented by the data sources

<sup>&</sup>lt;sup>80</sup> 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) 1Q2023.

Table 17: S	upplementary	Data S	Sources	for	Data	Attributes
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Attribute	Supplementary Data Source			
Real GDP growth	Bureau of Economic Analysis (NIPA table 1.1.6, line 1)			
Nominal GDP growth	Bureau of Economic Analysis (NIPA table 1.1.5, line 1)			
Real disposable income growth	Bureau of Economic Analysis (NIPA table 2.1, line 27, and NIPA table 1.1.4, line 2)			
Nominal disposable income growth	Bureau of Economic Analysis (NIPA table 2.1, line 27)			
Unemployment rate	Bureau of Labor Statistics (series LNS14000000)			
CPI inflation rate	Bureau of Labor Statistics (series CUSR0000SA0)			
3-month Treasury yield	Quarterly average of 3-month Treasury bill secondary market rate on a discount basis, H.15 Release			
5-year Treasury yield	Federal Reserve Economic Research website (https://fred.stlouisfed.org/series/GS5), with "Quarterly" frequency and "Average" aggregation method			
10-year Treasury yield	Federal Reserve Economic Research website (https://fred.stlouisfed.org/series/GS10), with "Quarterly" frequency and "Average" aggregation method			
BBB corporate yield	Federal Reserve Economic Research website (https://fred.stlouisfed.org/series/BAMLCOA4CBBBEY), with "Quarterly" frequency and "Average" aggregation method			
Mortgage rate	Federal Reserve Economic Research website (https://fred.stlouisfed.org/series/MORTGAGE30US), with "Quarterly" frequency and "Average" aggregation method			
Prime rate	Federal Reserve Economic Research website (https://fred.stlouisfed.org/series/MPRIME), with "Quarterly" frequency and "Average" aggregation method			
Dow Jones Total Stock Market Index (end-of-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	End-of-quarter rates from the H.10 Release, Foreign Exchange
Exchange Rate (USD/Euro)	Rates, Federal Reserve Board.
Developing Asia Beal GDP	The nominal GDP-weighted aggregate of the Real GDP growth
Growth	for China, India, South Korea, Hong Kong Special
	Administrative Region, and Taiwan per OECD
	The nominal GDP-weighted aggregate of the inflation rate for
Developing Asia Inflation	China, India, South Korea, Hong Kong Special Administrative
	Region, and Taiwan per OECD
Developing Asia bilateral dollar	End-of-quarter rates from the H.10 Release, Foreign Exchange
exchange rate (F/USD, index)	Rates, Federal Reserve Board.
Japan Beal 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	End-of-quarter rates from the H.10 Release, Foreign Exchange
Rate (Yen/USD)	Rates, Federal Reserve Board.
UK Beal 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	End-of-quarter rates from the H.10 Release, Foreign Exchange
(USD/Pound)	Rates, Federal Reserve Board.

While all data that is required for the Annual Stress Tests is available from at https://www.federalreserve.gov/supervisionreg/files/2022-table\_1a\_historic\_domestic.csv and https://www.federalreserve.gov/supervisionreg/files/2022-table\_1b\_historic\_international.csv, Capitalytics provides 13 additional metrics per the information in the following table. These values are available from the point at which they are collected (which varies from metric to metric) through (and including) 1Q2022.

Table 17: Supplementary Data Attributes and Sources

Attribute	Capitalytics' Source
1-month Treasury yield	https://fred.stlouisfed.org/series/dgs1mo
6-month Treasury yield	https://fred.stlouisfed.org/series/dgs6mo
1-year Treasury yield	https://fred.stlouisfed.org/series/dgs1
3-year Treasury yield	https://fred.stlouisfed.org/series/dgs3
7-year Treasury yield	https://fred.stlouisfed.org/series/dgs7
20-year Treasury yield	https://fred.stlouisfed.org/series/dgs20

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30-year Treasury yield	https://fred.stlouisfed.org/series/dgs30
US Average Retail Gasoline Price (\$/gal; all grades, all formulations)	https://fred.stlouisfed.org/series/gasallm
S&P 500 Stock Price Index	https://fred.stlouisfed.org/series/sp500
Primary Credit	https://fred.stlouisfed.org/series/FEDFUNDS
Moody's AAA Rate	https://fred.stlouisfed.org/series/aaa
Moody's BAA Rate	https://fred.stlouisfed.org/series/baa
Dow Jones Total Industrial Average	https://fred.stlouisfed.org/series/djia

## Appendix B: Methodologies

Capitalytics uses non-structured macroeconomic forecasting techniques in order to prepare its clients for what trends and relationships drive certain metrics, and what values those metrics may take on in the coming months.

## Section I: General Forecasting Methodology

Generally, the most effective overall forecasting techniques have been found to be a hybridization of multiple other techniques. Capitalytics uses several forecasting schemes, and aggregates the results, as part of its analysis methodology. This section describes the process that is executed for generating these results.

For each metric, four distinct forecasts are produced.

1. The first forecast uses the full quarterly history of the metric as an input to an additive exponential smoothing representation. The process that is executed is that provided by R's<sup>81</sup> "forecast" package<sup>82</sup>; specifically, the "ets" function (see p.39 of https://cran.r-project.org/web/packages/forecast/forecast.pdf)<sup>83</sup> 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)</pre>

The results of this call are shown above each dataset, including the representation type returned (as described later this section), the initial values that are used by the software, the optimal smoothing parameters estimated, and the  $n+1^{st}$  forecasted value given the first n values of the metric's sequence (the "fitted" values)<sup>84</sup>, 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

<sup>&</sup>lt;sup>81</sup> As of this writing, v.4.1.2 of the "R" language is available at <u>https://cran.r-project.org/</u>.

<sup>&</sup>lt;sup>82</sup> As of this writing, v.8.16 of the forecast package is available at <u>https://CRAN.R-project.org/package=forecast</u>.

<sup>&</sup>lt;sup>83</sup> 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.

<sup>&</sup>lt;sup>84</sup> 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)<sup>85</sup>.
- 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 guarter 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))</pre>
       > sp_ts
          Qtr1
                    0tr2
                               0tr3
                                         0tr4
                130.6591 1250.5201 998.4077
2008
2009 812.0470 799.5264 927.5045 1041.3728
       > m<-ets(sp_ts,model='ZZZ',opt.crit=c('mae'),additive.only=TRUE)</pre>
       > dsp_ts<-diff(sp_ts)</pre>
       > dsp_ts
            Qtr1
                        Qtr2
                                     Qtr3
                                                  0tr4
                              1119.860980 -252.112424
2008
2009 -186.360685 -12.520593 127.978126 113.868293
       > m<-ets(dsp_ts,model='ZZZ',opt.crit=c('mae'),additive.only=TRUE</pre>
```

- 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 31<sup>st</sup>), four sequences of numbers are now created, with annual forecasts now being produced for each sequence using the same procedures as previously outlined. The final sequence appropriately interleaves the forecasted data-points.
- 4. The fourth forecast builds three sequences of values based the history of the metric to an observed point:
  - the slope of the "best fitting" line (based on minimizing the total absolute error) using the immediately preceding 2 years of values<sup>86</sup>;
  - 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

<sup>&</sup>lt;sup>85</sup> It bears noting that a lower value for the "score" indicates better accuracy of an algorithm.

<sup>&</sup>lt;sup>86</sup> The value for this slope is calculated using Microsoft Excel's SLOPE function, with the first argument being the appropriate number of preceding values for the metric, and the second argument being the same number of corresponding "end-of-quarter" dates.

estimate for an "economic cycle") would allow for a much more slowly moving change in average window for a counterbalance.

Using these datasets independently, we are able to use our previous procedure to generate forecasts for each slope, and then average the results on a quarterly basis. Multiplying the average slope by the duration of the following quarter (in days) provides an estimate for the change in the metric's value during that following quarter, just as in our second forecast. Obviously, this technique requires at least eight years of data to pass before being able to produce any data. However, in order to err on the side of conservatism, we generally allow a sequence to "mature" for two to four years before believing that its initial transience has become less significant and its results are trustworthy. If a dataset does not have enough data to complete one of these analyses, the analysis is dropped. In other words, if the metric does not have +/-11 years of data available, the 8-year slopes cannot be reliably calculated, and the average slope is only based on the 2- & 4-year slopes<sup>87</sup>.

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  $0 \le \alpha \le 1$ , and estimates future values of  $\hat{y}$  given a history of values denoted as  $y_t$ . The  $\varepsilon_{T+1}$  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.

$$\hat{y}_{\scriptscriptstyle T^{+1}\mid \scriptscriptstyle T} = \alpha y_{\scriptscriptstyle T} + \alpha (1{-}\alpha) y_{\scriptscriptstyle T^{-1}} + \alpha (1{-}\alpha)^2 y_{\scriptscriptstyle T^{-2}} + \dots + \epsilon_{\scriptscriptstyle T^{+1}}$$

<sup>&</sup>lt;sup>87</sup> 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  $\alpha$  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.

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	

 Table 18: Mathematical Methods Associated with Trend & Seasonal Components

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 "Im" function, we estimate the next quarter's values for each variable in terms of the preceding set of variables' values. These regressions are built using the immediately preceding 57 sets of variables' values.

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

Trend		Seasonal	
	N	Α	Μ
Ν	$\hat{y}_{t+h t} = \ell_t$ $\ell_t = lpha y_t + (1-lpha)\ell_{t-1}$	$\begin{split} \hat{y}_{t+h t} &= \ell_t + s_{t-m+h_m^+} \\ \ell_t &= \alpha(y_t - s_{t-m}) + (1-\alpha)\ell_{t-1} \\ s_t &= \gamma(y_t - \ell_{t-1}) + (1-\gamma)s_{t-m} \end{split}$	$egin{aligned} \hat{y}_{t+h t} &= \ell_t s_{t-m+h_m^+} \ \ell_t &= lpha(y_t/s_{t-m}) + (1-lpha)\ell_{t-1} \ s_t &= \gamma(y_t/\ell_{t-1}) + (1-\gamma)s_{t-m} \end{aligned}$
Α	$\hat{y}_{t+h t} = \ell_t + hb_t$ $\ell_t = lpha y_t + (1-lpha)(\ell_{t-1} + b_{t-1})$ $b_t = eta^*(\ell_t - \ell_{t-1}) + (1-eta^*)b_{t-1}$	$\begin{split} \hat{y}_{t+h t} &= \ell_t + hb_t + s_{t-m+h_m^+} \\ \ell_t &= \alpha(y_t - s_{t-m}) + (1-\alpha)(\ell_{t-1} + b_{t-1}) \\ b_t &= \beta^*(\ell_t - \ell_{t-1}) + (1-\beta^*)b_{t-1} \\ s_t &= \gamma(y_t - \ell_{t-1} - b_{t-1}) + (1-\gamma)s_{t-m} \end{split}$	$\begin{split} \hat{y}_{t+h t} &= (\ell_t + hb_t)s_{t-m+h_m^+} \\ \ell_t &= \alpha(y_t/s_{t-m}) + (1-\alpha)(\ell_{t-1} + b_{t-1}) \\ b_t &= \beta^*(\ell_t - \ell_{t-1}) + (1-\beta^*)b_{t-1} \\ s_t &= \gamma(y_t/(\ell_{t-1} + b_{t-1})) + (1-\gamma)s_{t-m} \end{split}$
$\mathbf{A}_{\mathbf{d}}$	$\hat{y}_{t+h t} = \ell_t + \phi_h b_t$ $\ell_t = lpha y_t + (1-lpha)(\ell_{t-1} + \phi b_{t-1})$ $b_t = eta^*(\ell_t - \ell_{t-1}) + (1-eta^*)\phi b_{t-1}$	$\begin{split} \hat{y}_{t+h t} &= \ell_t + \phi_h b_t + s_{t-m+h_m^+} \\ \ell_t &= \alpha(y_t - s_{t-m}) + (1-\alpha)(\ell_{t-1} + \phi_{b_{t-1}}) \\ b_t &= \beta^*(\ell_t - \ell_{t-1}) + (1-\beta^*)\phi_{b_{t-1}} \\ s_t &= \gamma(y_t - \ell_{t-1} - \phi_{b_{t-1}}) + (1-\gamma)s_{t-m} \end{split}$	$\begin{split} \hat{y}_{t+h t} &= (\ell_t + \phi_h b_t) s_{t-m+h_m^+} \\ \ell_t &= \alpha(y_t/s_{t-m}) + (1-\alpha)(\ell_{t-1} + \phi b_{t-1}) \\ b_t &= \beta^*(\ell_t - \ell_{t-1}) + (1-\beta^*)\phi b_{t-1} \\ s_t &= \gamma(y_t/(\ell_{t-1} + \phi b_{t-1})) + (1-\gamma)s_{t-m} \end{split}$
М	$egin{aligned} \hat{y}_{t+h t} &= \ell_t b_t^h \ \ell_t &= lpha y_t + (1-lpha) \ell_{t-1} b_{t-1} \ b_t &= eta^* (\ell_t / \ell_{t-1}) + (1-eta^*) b_{t-1} \end{aligned}$	$\begin{split} \hat{y}_{t+h t} &= \ell_t b_t^h + s_{t-m+h_m^+} \\ \ell_t &= \alpha (y_t - s_{t-m}) + (1-\alpha)\ell_{t-1}b_{t-1} \\ b_t &= \beta^* (\ell_t/\ell_{t-1}) + (1-\beta^*)b_{t-1} \\ s_t &= \gamma (y_t - \ell_{t-1}b_{t-1}) + (1-\gamma)s_{t-m} \end{split}$	$\begin{split} \hat{y}_{t+h t} &= \ell_t b_t^h s_{t-m+h_m^+} \\ \ell_t &= \alpha(y_t/s_{t-m}) + (1-\alpha)\ell_{t-1}b_{t-1} \\ b_t &= \beta^*(\ell_t/\ell_{t-1}) + (1-\beta^*)b_{t-1} \\ s_t &= \gamma(y_t/(\ell_{t-1}b_{t-1})) + (1-\gamma)s_{t-m} \end{split}$
$\mathbf{M}_{\mathbf{d}}$	$\begin{split} \hat{y}_{t+h t} &= \ell_t b_t^{\phi_h} \\ \ell_t &= \alpha y_t + (1-\alpha)\ell_{t-1}b_{t-1}^{\phi} \\ b_t &= \beta^*(\ell_t/\ell_{t-1}) + (1-\beta^*)b_{t-1}^{\phi} \end{split}$	$\begin{split} \hat{y}_{t+h t} &= \ell_t b_t^{\phi_h} + s_{t-m+h_m^+} \\ \ell_t &= \alpha(y_t - s_{t-m}) + (1-\alpha)\ell_{t-1}b_{t-1}^{\phi} \\ b_t &= \beta^*(\ell_t/\ell_{t-1}) + (1-\beta^*)b_{t-1}^{\phi} \\ s_t &= \gamma(y_t - \ell_{t-1}b_{t-1}^{\phi}) + (1-\gamma)s_{t-m} \end{split}$	$\begin{split} \hat{y}_{t+h t} &= \ell_t b_t^{\phi_h} s_{t-m+h_m^+} \\ \ell_t &= \alpha(y_t/s_{t-m}) + (1-\alpha)\ell_{t-1} b_{t-1}^{\phi} \\ b_t &= \beta^* (\ell_t/\ell_{t-1}) + (1-\beta^*) b_{t-1}^{\phi} \\ s_t &= \gamma(y_t/(\ell_{t-1} b_{t-1}^{\phi})) + (1-\gamma) s_{t-m} \end{split}$

## 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 4Q2023 Image: Correlation Factors found as of 4Q2023

Variable 1	Variable 2	Correlation
	Annualized US Inflation Rate (all items, all urban	
S&P 500 Stock Price Index	areas)	0.685854
S&P 500 Stock Price Index	Down Jones Total Stock Market Index	0.977417
S&P 500 Stock Price Index	US Nat'l Residential Home Price Index	0.950409
S&P 500 Stock Price Index	US Nat'l Commercia Real Estate Index	0.96678
Cost of Federal Funds	Moody's AAA Yield	0.794157
Cost of Federal Funds	Moody's BAA Yield	0.738826
Cost of Federal Funds	BofA BBB Corporate Yield	0.760317
Cost of Federal Funds	30-year Fixed Mortgage Rate	0.87299
Cost of Federal Funds	US Prime Rate	0.996514
Cost of Federal Funds	30-year Treasury Yield	0.78045
Cost of Federal Funds	20-year Treasury Yield	0.783175
Cost of Federal Funds	10-year Treasury Yield	0.847502
Cost of Federal Funds	1-month Treasury Yield	0.993495
Cost of Federal Funds	7-year Treasury Yield	0.889022
Cost of Federal Funds	3-month Treasury Yield	0.995482
Cost of Federal Funds	5-year Treasury Yield	0.916993
Cost of Federal Funds	6-month Treasury Yield	0.992434
Cost of Federal Funds	3-year Treasury Yield	0.95249
Cost of Federal Funds	1-year Treasury Yield	0.985533
Moody's AAA Yield	Moody's BAA Yield	0.979355
Moody's AAA Yield	BofA BBB Corporate Yield	0.948881
Moody's AAA Yield	30-year Fixed Mortgage Rate	0.974239
Moody's AAA Yield	US Prime Rate	0.775264
Moody's AAA Yield	Down Jones Total Stock Market Index	-0.798585
Moody's AAA Yield	US Nat'l Residential Home Price Index	-0.815998
Moody's AAA Yield	US Nat'l Commercia Real Estate Index	-0.849697
Moody's AAA Yield	Average Retail Gasoline Price (all grades)	-0.719002
Moody's AAA Yield	30-year Treasury Yield	0.985296
Moody's AAA Yield	20-year Treasury Yield	0.983718
Moody's AAA Yield	10-year Treasury Yield	0.984694
Moody's AAA Yield	7-year Treasury Yield	0.96443
Moody's AAA Yield	3-month Treasury Yield	0.791892
Moody's AAA Yield	5-year Treasury Yield	0.942427
Moody's AAA Yield	6-month Treasury Yield	0.796893
Moody's AAA Yield	3-year Treasury Yield	0.895152
Moody's AAA Yield	1-year Treasury Yield	0.81593
Moody's BAA Yield	BofA BBB Corporate Yield	0.984661
Moody's BAA Yield	30-year Fixed Mortgage Rate	0.948261
Moody's BAA Yield	US Prime Rate	0.719239
Moody's BAA Yield	Down Jones Total Stock Market Index	-0.813963
Moody's BAA Yield	US Nat'l Residential Home Price Index	-0.800154
Moody's BAA Yield	US Nat'l Commercia Real Estate Index	-0.824434
Moody's BAA Yield	Average Retail Gasoline Price (all grades)	-0.680422
Moody's BAA Yield	30-year Treasury Yield	0.949169
Moody's BAA Yield	20-year Treasury Yield	0.933472
Moody's BAA Yield	10-year Treasury Yield	0.948494
Moody's BAA Yield	7-year Treasury Yield	0.917335
Moody's BAA Yield	3-month Treasury Yield	0.734545
Moody's BAA Yield	5-year Treasury Yield	0.892631

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Moody's BAA Yield	6-month Treasury Yield	0.740819
Moody's BAA Yield	3-year Treasury Yield	0.840549
Moody's BAA Yield	1-year Treasury Yield	0.759837
Real GDP Growth Rate	Nominal GDP Growth Rate	0.961803
Real Disposable Income Growth Rate	Nominal Disposable Income Growth Rate	0.972829
BofA BBB Corporate Yield	30-year Fixed Mortgage Rate	0.939938
BofA BBB Corporate Yield	US Prime Rate	0.742232
BofA BBB Corporate Yield	Down Jones Total Stock Market Index	-0.744153
BofA BBB Corporate Yield	US Nat'l Residential Home Price Index	-0.722829
BofA BBB Corporate Yield	US Nat'l Commercia Real Estate Index	-0.735839
BofA BBB Corporate Yield	Average Retail Gasoline Price (all grades)	-0.615145
BofA BBB Corporate Yield	30-year Treasury Yield	0.906443
BofA BBB Corporate Yield	20-year Treasury Yield	0.886139
BofA BBB Corporate Yield	10-year Treasury Yield	0.925725
BofA BBB Corporate Yield	7-year Treasury Yield	0.902374
BofA BBB Corporate Yield	3-month Treasury Yield	0.757255
BofA BBB Corporate Yield	5-year Treasury Yield	0.886614
BofA BBB Corporate Yield	6-month Treasury Yield	0.765226
BofA BBB Corporate Yield	3-year Treasury Yield	0.846606
BofA BBB Corporate Yield	1-year Treasury Yield	0.781562
30-year Fixed Mortgage Rate	US Prime Rate	0.856439
30-year Fixed Mortgage Rate	Down Jones Total Stock Market Index	-0.691088
30-year Fixed Mortgage Rate	US Nat'l Residential Home Price Index	-0.694734
30-year Fixed Mortgage Rate	US Nat'l Commercia Real Estate Index	-0.73942
30-year Fixed Mortgage Rate	Average Retail Gasoline Price (all grades)	-0.666111
30-year Fixed Mortgage Rate	30-year Treasury Yield	0.965275
30-year Fixed Mortgage Rate	20-year Treasury Yield	0.970566
30-year Fixed Mortgage Rate	10-year Treasury Yield	0.988032
30-year Fixed Mortgage Rate	1-month Treasury Yield	0.701973
30-year Fixed Mortgage Rate	7-year Treasury Yield	0.9865
30-year Fixed Mortgage Rate	3-month Treasury Yield	0.878389
30-year Fixed Mortgage Rate	5-year Treasury Yield	0.980116
30-year Fixed Mortgage Rate	6-month Treasury Yield	0.885033
30-year Fixed Mortgage Rate	3-year Treasury Yield	0.954717
30-year Fixed Mortgage Rate	1-year Treasury Yield	0.901099
US Prime Rate	30-year Treasury Yield	0.757626
US Prime Rate	20-year Treasury Yield	0.773877
US Prime Rate	10-year Treasury Yield	0.829289
US Prime Rate	1-month Treasury Yield	0.992143
US Prime Rate	7-year Treasury Yield	0.872747
US Prime Rate	3-month Treasury Yield	0.992052
US Prime Rate	5-year Treasury Yield	0.902783
US Prime Rate	6-month Treasury Yield	0.989196
US Prime Rate	3-year Treasury Yield	0.942475
US Prime Rate	1-year Treasury Yield	0.98146
Down Jones Total Stock Market Index	US Nat I Residential Home Price Index	0.91339/
Down Jones Total Stock Market Index		0.927015
Down Jones Total Stock Market Index	20 year Treasury Yield	-0.794835
Down Jones Total Stock Market Index	20-year Treasury Yield	-0./3385/
Down Jones Total Stock Market Index	Tu-year Treasury Yield	-0./30915
Down Jones Total Stock Market Index	-year Trocsury Yield	-0.0///24
US Nat'l Posidontial Home Price Index	J-year filedsury field	-0.050945
US Nat'l Residential Home Price Index	OS INAL I COMMERCIA REALESLALE INDEX	0.700606
US Nat'l Residential Home Price Index	20 yoar Troasury Viold	0.200000
US Nat'l Residential Home Price Index	20-year Treasury Teld	-0.800470
US Nat'l Residential Home Price Index	20-year measury neid	-0.752655
US Nat'l Residential Home Price Index	zu-year Treasury Helu 7 year Treasury Viold	0.751074
US Nat'l Residential Home Price Index	-year Treasury Tield	-0.704492
US Nat'l Commercia Real Estate Index	Average Retail Gasoline Price (all grades)	0.000011
US Nat'l Commercia Real Estate Index	30-year Treasury Vield	-0.852/01
US Nat'l Commercia Real Estate Index	20-year Treasury Yield	-0.8131/7
US Nat'l Commercia Real Estate Index	10-year Treasury Yield	-0 795818
os nati commercia near Estate muex	To year measury meru	0.755010
## MACROECONOMIC FORECASTS, 4Q2023 - FINAL VERSION

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