Macroeconomic Forecasts, 4Q2024 Domestic Metrics



Prepared by: Capitalytics, LLC P. O. Box 381162 Birmingham, AL 35242

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## Summary

The Federal Reserve Board of Governors do not do anything without a good reason. Since September, 2024, the Fed has dropped the Federal Funds rate by 50 bps (September 18, 2024), 25bps (November 7, 2024), and another 25bps (December 18, 2024). The last time the Fed cut rates at three consecutive meetings was in 2008, during the Great Recession, and before that was during the 2001 dot.com bubble. Note that the Fed cut rates twice (although quite dramatically) during the 2020 COVID recession. It has not been since 1998 where the Federal Reserve cut rates this quickly or this deeply (100 bps) without a corresponding recession.

Does this mean that there is a recession underway (or in the near future)? Perhaps. Is the Fed's policy more representative of a "soft landing" rather than a "hard landing" or economic recession? Again, perhaps.

As we will show, the economy is, by most statistical measurements, on very solid footing. However, some cracks have started to show and it is likely that the Fed's recent moves have been in response to those 'cracks' and were put in place to avoid an economic recession. These cracks, as we see it, can be categorized as the following: 1) General Inflation, 2) Housing Inflation, 3) Employment, 4) GDP and Wages.





## Potential Issues: 'Cracks in the Ice'

## 1. General Inflation & Cost of Living

We believe that, because the out-of-pocket costs of some goods and services (food and housing, in particular) are higher than pre-pandemic levels, consumers are still worried about inflation. The average consumer is likely to confuse the cost of goods and the change in the cost of goods. Even though "inflation" is now quite low (per Figure 2), consumers still see high prices and attach an "inflation" label to the current state of the economy. The average price of homes is not coming back to pre-pandemic levels and it is unlikely that some groceries prices will see pre-pandemic levels as well. The Fed' is not going to change the perception of consumers that the economy is in an inflationary state. (See Figure 3.)

Figure 2: National Overall Rate of Inflation







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

## 1.1. CPI Inflation

The rate of inflation has not been driven down to the Fed's 2% target level. In fact, the recent movement in CPI has indicated that prices are starting to creep back up. The Fed is taking a chance by expanding money supply while CPI inflation is increasing. The good news here is that food and energy prices are quite stable.





## 1.2. Inflation: Fuel

The current price of a gallon of regular gas is approximately \$0.09 cheaper than one year ago. This is consistent with the overall trend in prices and inflation. The inflation rate minus food and energy (see Figure 2) is higher than the rate of inflation that includes fuel and food.

Table 1: Average Gas Pr	rices (per Gallon) in US,	as of Dec. 23, 2024
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	Regular	Mid- Grade	Premium	Diesel	E85
Current Avg.	\$3.042	\$3.513	\$3.867	\$3.500	\$2.487
Yesterday Avg.	\$3.042	\$3.523	\$3.873	\$3.509	\$2.484
Week Ago Avg.	\$3.024	\$3.498	\$3.850	\$3.496	\$2.454
Month Ago Avg.	\$3.058	\$3.536	\$3.887	\$3.538	\$2.464
Year Ago Avg.	\$3.128	\$3.588	\$3.923	\$4.029	\$2.469

Source: https://gasprices.aaa.com





Source: Authors' calculation

## 1.3. Inflation: Food

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



Figure 6: US National Food Price Inflation (at Home), 2010-Present

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

Figure 7 Inflation: Price of Food Away from Home





Figure 8: US National Food Price: Average Price Per 1 Dozen Eggs (US Cities 2015 – Present)



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

Figure 9: US National Food Price: 1 Gallon of Milk (US Cities 2015 – Present)

S



*Figure 10: US National Price Inflation: Year-over-Year Change in Price of 1 Gallon Milk* 

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

## 2. Housing Prices and Housing Inflation

Since early in the pandemic, the US has seen an upward trend in the price of single-family housing units. The median price of houses spiked in early Summer 2022 and then fell through early Summer 2023. This relief was short lived; the median price of housing is continuing to increase. We believe that this is primarily driven by relatively low supply – the inventory of housing has decreased quite a bit since the pandemic and active home listings have not yet reached pre-pandemic levels.

Mortgage rates have also not decreased as the Federal Funds target rate is falling. This has caused a bit of hand-wringing from the average consumer and some "explaining" by other parts of the market. In short, the market for loanable fund for mortgages is driven by slightly different elements than the market for funds between banks. Banks are still a bit stingy with respect to funds – a decrease in the supply of funds is keeping mortgage rates high<sup>1</sup>. When banks 'price in' future expectations (which is what the Fed is doing when it is making interest-rate moves), the banks are anticipating that the future will be a little stronger than it is now – suggesting that consumers can pay a little bit more for their funds.

This action-reaction by the financial sector is leaving many consumers feeling that they can't catch a break.

<sup>&</sup>lt;sup>1</sup> https://www.nasdaq.com/articles/fed-keeps-cutting-rates-so-why-arent-mortgage-rates-going-down



Figure 11: US National Residential Housing Inventory (Active Listings), 2015 – Present

Figure 12: US National Home Price Inflation Case-Shiller, 2009-Present



Figure 13: Median Sales Price



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





## 3. Unemployment and Labor Force Participation: "Nobody Wants to Work"

This past summer, the economy saw 27 consecutive months of sub-4% unemployment, matching the record set between November, 1967 and January, 1970. Since then, however, we've seen a steady (albeit small) increase in the unemployment rate. Labor force participation has plateaued at rates below pre-COVID levels – particularly for those of white males, white females, and black females.



#### Figure 15: US National Unemployment Rate





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



Figure 17: US Employment to Population Ratio (%)



Figure 18: Labor Force Participation Rate by Gender and Race

## 4. GDP and Earnings (Wages) are Acceptable, but "Not Good Enough"

Real GDP of the United States is still quite strong. However, the Fed is maintaining its GDP growth forecast of between 2.0% and 2.5% annually. This is clearly NOT in recession territory. However, 2% growth (where the Fed's forecast was sitting until its most recent rate cut) is not strong enough to outpace target inflation. Even if wages were to grow at 2.5%, the real buying power would start to drop, as inflation is trending closer to 3% annually.





Figure 20: Q/Q % Change in Real GDP



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

## 4.1. Inflation & Real Wages

Figure 21 and Figure 22 show national overall average real wages (for both annual compensation and hourly wages). We suspect that one of the underlying reasons consumers are expressing an increase in pessimism regarding the economy is that real wages have trended down since mid-2022. Although real wages are slightly higher than they were prior to the pandemic, the myopic nature of most consumers' consideration of their wages and wealth suggest that they aren't happy with the small gains that have occurred.





Real Compensation of Employees Received

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



#### Figure 22: Real Hourly Wages (Nationwide)

## Disruptive ("Black Swan") Events

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

- 1. Biological Events: The world has seen a number of new "Influenza-Like Illnesses" (ILI), with the latest now directly affecting virtually every country on the global in a crippling fashion.
  - A. SARS (2002 & 2004)
  - B. "Swine flu" (H1N1, 2009)
  - C. "Avian flu" (H5N1 in 1997; H7N9 in 2013; H5N6 in 2014; H5N8 in 2016)
  - D. COVID-19 (2019-2022), with several different strains

While questions during the handling of the COVID-19 emergency have shone a light on the globe's ability to address a new pathogen under pressure, any answer is still a function of the contagiousness of the pathogen. Depending on how quickly a new pathogen spreads, along with its incubation period and symptoms, could mean the difference between survival and massive devastation. "Avian flu" (strain H5N1) has been recently reported as being found in a human in Louisiana<sup>2</sup>.

- Disinformation Campaigns: A staple of international conflicts (both military and otherwise), organized campaigns based on disinformation or propaganda have been around for hundreds of years. In the recent past, the U.S. has made allegations against foreign governments that there has been interference in federal elections (and caused social unrest) by using freely available social networks<sup>3</sup>.
- 3. Disruptive Malware and Ransomware: Over the past five years, sophisticated attacks on businesses have (literally) become a business for some entities, foreign and domestic. "Ransomware" is the latest version of malware that "... [locks and encrypts] a victim's computer or device data, then demand a ransom to restore access."<sup>4</sup> In software security company Semperis' 2024 Ransomware Risk Report, 83% of 900 survey respondents reported being targeted in the past year<sup>5</sup>, with an average cost of about \$5M per breach globally<sup>6</sup>.
- 4. Societal Unrest, including Domestic Social Changes and Terrorism: Since 2020, we saw many social protests turn violent on both ends of the political spectrum. Without warning, these movements have caused rapid and unexpected upheavals in social climates, and upended assumptions on which financial decisions were made. As these questions have been explored socially and officially, the discussions have led to questions of how deep the disdain in the

<sup>3</sup> See, e.g., https://www.cnn.com/2024/10/30/europe/russian-disinformation-harris-walz-us-election-intl/index.html and

<sup>&</sup>lt;sup>2</sup> https://www.nbcnews.com/health/health-news/h5n1-bird-flu-mutations-human-transmission-cdc-rcna185554 and https://www.nytimes.com/2025/01/02/us/politics/bird-flu-biden-trump.html

https://www.nytimes.com/2024/07/09/business/russian-bots-artificial-intelligence-propaganda.html

<sup>&</sup>lt;sup>4</sup> See https://us.norton.com/internetsecurity-malware-ransomware-5-dos-and-donts.html

<sup>&</sup>lt;sup>5</sup> https://www.forbes.com/sites/heatherwishartsmith/2024/12/09/the-persistent-ransomware-threat-2024-trends-and-high-profile-attacks/

<sup>&</sup>lt;sup>6</sup> https://assets.sophos.com/X24WTUEQ/at/9brgj5n44hqvgsp5f5bqcps/sophos-state-of-ransomware-2024-wp.pdf

country remains on both sides of the political fence, and what societal and legislative impacts these investigations may carry.<sup>7</sup>

- 5. Unanticipated Changes in Leadership: Donald Trump is currently 78 years old, and is currently the oldest President-Elect in the history of the United States. Given his age, his polarizing opinions, and the fact that there were two attempted assassinations against him during his campaign during 2024, one should consider the possibility of him not being able to serve out his Presidential term (which begins in January of 2025)<sup>8</sup>. While the rules for succession are clear in the event that he is not able to complete his term, the confusion surrounding any event that calls for succession always inject some ambiguity. Further, despite there being a fully Republican- dominated Congress as of 2025, positions on all issues are never perfectly aligned, allowing for discord if/when a leadership change does occur.
- 6. Supply Chain Disruptions: Several straits and canals are considered major trade bottlenecks because they are crucial waterways that connect different continents, meaning any disruptions in their operations can significantly impact global trade flows, causing delays and price fluctuations. Some most key bottlenecks are the Panama Canal, the Suez Canal, the Strait of Hormuz, the Strait of Malacca, the Turkish Straits (Bosporus and Dardanelles), and the English Channel. A blockage of the Suez Canal by the tanker Ever Given in March 2021 highlighted the fragility of key bottlenecks in trade<sup>9</sup>; these waterways are also subject to weather, geopolitical influences, and other issues<sup>10</sup>. Further, workers of these waterways and major ports can have significant impacts on these supply chains. Consider that shipyard workers on the U.S. Eastern seaboard and Gulf Coast voted to strike in October 2024; they have subsequently returned to work until January 2025.<sup>11</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>12</sup>. Ecuador, Senegal, and China have canceled or withdrawn their currencies<sup>13</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>14</sup>.
- 8. Global unrest: As we have now seen, Russia's (now stagnant) invasion of the Ukraine has led to a dramatic impact on the energy and grain sectors globally<sup>15</sup>. The impact of the Israel's current conflict(s) (with Hamas, Lebanon, and Iran) has also been speculated as impacting global economies<sup>16</sup>. Speculation regarding Iran's motives entails that Iran is interested in furthering its

<sup>&</sup>lt;sup>7</sup> See https://www.insurancebusinessmag.com/us/risk-management/news/global-civil-unrest-on-the-rise-as-costofliving-crisis-intensifies-449683.aspx

<sup>&</sup>lt;sup>8</sup> https://www.nytimes.com/2024/10/03/health/trump-health-records.html

<sup>&</sup>lt;sup>9</sup> https://www.nytimes.com/2021/07/17/world/middleeast/suez-canal-stuck-ship-ever-given.html

<sup>&</sup>lt;sup>10</sup> https://www.weforum.org/stories/2024/02/worlds-busiest-ocean-shipping-routes-trade.

<sup>&</sup>lt;sup>11</sup> https://www.npr.org/2024/10/03/nx-s1-5139450/dockworkers-port-strike-deal

<sup>12</sup> https://www.atlanticcouncil.org/cbdctracker/

<sup>13</sup> Ibid.

<sup>&</sup>lt;sup>14</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

<sup>&</sup>lt;sup>15</sup> https://www.brookings.edu/articles/how-would-trump-and-harris-handle-the-russia-ukraine-war/

<sup>&</sup>lt;sup>16</sup> https://www.washingtonpost.com/world/2024/09/30/israel-lebanon-hezbollah-hamas-war-news-gaza/ and

https://www.nytimes.com/live/2024/10/01/world/israel-lebanon-hezbollah

nuclear weapons program in order to supply arms to Russia to help with their aforementioned conflict in Ukraine<sup>17</sup>. Regardless, Iran's unwillingness to work with the International Atomic Energy Agency (as called for by a United Nations resolution)<sup>18</sup> is causing concerns that could lead to actions that would significantly alter the U.S. consumer's economic balance, directly and indirectly.

 <sup>&</sup>lt;sup>17</sup> https://www.heritage.org/middle-east/report/iran-inching-toward-nuclear-weapons-breakout-what-does-mean-the-united-states
<sup>18</sup> Per https://www.iaea.org/sites/default/files/24/06/gov2024-39.pdf and https://www.iaea.org/sites/default/files/unsc\_resolution2231-2015.pdf

## Data Analysis

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

Capitalytics provides the results of a rigorous analysis of every variable that is included in our quarterly macroeconomic study. These variables include the following<sup>19</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>19</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 133 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.

Regression (Dependent) Variable	-	Independent Variable <sup>20</sup>	
1-month, 3-month, 6-month, and		1-year Treasury yield	
3-year Treasury yield			
5-year Treasury yield	depends on	3-year Treasury yield <sup>*</sup>	
7-year Treasury yield		5-year Treasury yield <sup>*</sup>	
10-year Treasury yield		7-year Treasury yield <sup>*</sup>	
20-year and 30-year Treasury		10 year Traccury wield*	
yield, and		10-year freasury yield	
30-year Mortgage rate		7-year Treasury yield <sup>*</sup>	
Moody's AAA yield		30-year Mortgage rate <sup>*</sup>	
Prime Rate		1-year Treasury yield	

Table 14: Variable Dependencies

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>20</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

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

In Figure 23, the recent Q/Q percent change of US GDP is shown (denoted as "Actual"), along with the Society of Professional Forecasters' estimates (marked as "SPF"); the outlying values that occurred following the 2008 housing crisis and during the COVID pandemic are obscured in this chart. Real GDP increased by 3.1% (annualized) during 3Q2024<sup>21</sup>; nominal GDP increased by 3.85% (annualized)<sup>22</sup>. We see that the SPF estimates, post-COVID, have been notably lower than those that actually occurred (with one exception, 1Q2024). Real GDP expectations are to barely break 2.0% (annualized) until 3Q2025.



#### Figure 23: % Q/Q change in US GDP

Source: Author's calculations

## Despite the majority of recent press reports, the SPF panel has expected unemployment to turn up, and payrolls to decline through 2024 and 2025<sup>23</sup>. Unemployment was expected to increase to 4.2% (which it

<sup>&</sup>lt;sup>21</sup> https://www.bea.gov/news/2024/gross-domestic-product-state-and-personal-income-state-3rd-quarter-2024

<sup>&</sup>lt;sup>22</sup> https://fred.stlouisfed.org/series/NGDPNSAXDCUSQ

 $<sup>^{23}\</sup> https://www.philadelphiafed.org/-/media/frbp/assets/surveys-and-data/survey-of-professional-forecasters/2024/spfq424.pdf$ 

has, as of the BLS' November release<sup>24</sup>), and payrolls were expected to decline by 10% from 1H2024 to YE2024, with another 10% to be shed by 1H2025. It should be noted that the SPF has a history of being right about half of the time, with their projection for real GDP in 2025 being 1.9% to 2.5%, inflation being 2.1% to 2.8%, and unemployment being 4.0% to 4.5%; the SPF mean average forecast error for real GDP is 1.0%, 0.7% for inflation, and 0.5% for unemployment<sup>25</sup>.



#### Figure 24: GDP Quarterly Component Size

We have discussed previously that GDP is comprised of Personal Consumption, Investments, Government Spending, Imports, and Exports. Figure 24 shows the (nominal) quarterly components of each of these areas of the US GDP. With annual inflation running at or below 2% before COVID, then increasing to 9%, before now running  $\pm$  3% since early 2023 (see Figure 25), we are seeing the following quarterly increases in each of the GDP components:

GDP Component	Average quarterly change (since YE2021)	Average % quarterly change (since YE2021)	3Q2024 % change in (nominal) GDP
PCE	+\$238B	+1.25%	+1.3%
Investments	+\$83B	+1.65%	+0.9%
Government Spending	+\$68.4B	+1.43%	+1.86%
Imports	+\$48.3B	+1.22%	+2.53%
Exports	+\$26.6B	+0.86%	+2.09%

These figures show that, while PCE is the largest segment of GDP, its nominal growth is *average* at the moment (with Investments performing *below* par, compared to all growth since 2021). (Referring to Figure 24, we can see the slope of the PCE curve dropping in early 2023.) In contrast, Government

<sup>&</sup>lt;sup>24</sup> https://www.bls.gov/news.release/pdf/empsit.pdf

<sup>&</sup>lt;sup>25</sup> https://www.stlouisfed.org/on-the-economy/2024/dec/professional-forecasters-performance-2025-economic-outlook

Spending, Imports, and Exports (i.e., international trade) are all growing *substantially faster* than recent norms (as a percentage of those categories). Also, it bears repeating that these figures are for *nominal* GDP, with inflation running around 3% for 2024.

We hesitate to believe that GDP will be recovering in the near future: PCE will likely be reserved based on future consumer sentiment (discussed later in this report). The incoming White House administration has stated that they intend to dampen demand for overseas' goods, and it is expected that other countries will respond similarly to US goods. There will be some proactive stockpiling expected during 4Q2024 in order to avoid price increases in conjunction with anticipated tariffs, but demand is expected to be lessened during 1Q2025. During 2025, *we expect for real GDP to be between 2.0% and 2.25% per annum*.



Figure 25: Annualized Monthly Inflation Rates, and Inflation Measured over 12-month Periods

Inflation also contributes to these figures, and (as previously discussed) it has been a challenge for the FOMC to completely bring under control. While the FOMC did recently lower rates, there is a reported sense that the COVID-era inflation has not been completely brought under control, and that interest rates will not be dropped as quickly as was previously believed. (See Figure 26 and Figure 27.) Chairman Powell went so far as to state that it is possible that rates will only drop as much as 50bp during 2025<sup>26</sup>; again, the concerns about policy changes that could be implemented by the incoming White House

<sup>&</sup>lt;sup>26</sup> https://apnews.com/article/federal-reserve-inflation-rates-trump-economy-prices-4abfd4fad49db65cad4a2b5607d9e952

administration which could make inflation harder to control<sup>27</sup> (e.g., potential tariffs against Mexico<sup>28</sup>, Canada, China<sup>29</sup>, and EU countries<sup>30</sup>). President-elect Trump's *planned tariffs have been projected to potentially increase inflation by as much as 1%* if implemented as proposed with 60% tariffs for imported Chinese goods, and as much as 20% tariffs for other origination points<sup>31</sup>.

In Figure 28, we see that nominal hourly wages appear to be steadily increasing across the entire labor force<sup>32</sup>, with an average M/M change appearing to be a 12.14 cents/month increase, and a standard deviation of about 4.5 cents/month since January of 2021 (i.e., post-COVID)<sup>33</sup>. Nominal hourly wages appear to have grown from \$34.87/hour (average) during 2Q2024 to \$35.21/hour (average) during 3Q2021, an increase of 3.9% on an annual basis<sup>34</sup>. The Bureau of Economic Analysis reports that aggregate personal income increased by over \$190B during 3Q2024, an annualized overall increase of 3.2%<sup>35</sup>, reflecting the 0.6% increase in the labor force between the two quarters<sup>36</sup>.

## Figure 26: FOMC "Dot Plot" from September 2024 Board of Governors' Meeting



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

<sup>&</sup>lt;sup>27</sup> See https://www.budget.senate.gov/chairman/newsroom/press/trumps-tariffs-would-boost-inflation-shrink-the-economy-cbo-finds and https://www.cnn.com/2024/12/12/business/trump-toy-prices-tariffs-inflation/index.html

<sup>&</sup>lt;sup>28</sup> https://www.forbes.com/sites/aldoflores-quiroga/2024/12/18/how-trump-tariffs-could-shape-us-mexico-energy-trades-in-2025/

<sup>&</sup>lt;sup>29</sup> https://www.cnn.com/2024/11/25/politics/trump-tariffs-mexico-canada-china/index.html

<sup>&</sup>lt;sup>30</sup> https://www.cnbc.com/2024/12/20/trump-says-european-union-must-buy-us-oil-and-gas-in-trade-ultimatum.html

<sup>&</sup>lt;sup>31</sup> https://think.ing.com/articles/revealed-how-american-consumers-will-bear-the-burden-of-trumps-tariffs/

<sup>&</sup>lt;sup>32</sup> This data originates with the Bureau of Labor Statistics "CES050000003" series, which reflects the average hourly earnings of all private employees on a "gross" basis.

<sup>&</sup>lt;sup>33</sup> https://fred.stlouisfed.org/series/CES050000003

<sup>&</sup>lt;sup>34</sup> Ibid.

<sup>&</sup>lt;sup>35</sup> https://www.bea.gov/news/2024/gross-domestic-product-state-and-personal-income-state-3rd-quarter-2024

<sup>&</sup>lt;sup>36</sup> https://fred.stlouisfed.org/series/LNU01000000



Figure 27: FOMC "Dot Plot" from December 2024 Board of Governors' Meeting

Source: https://www.federalreserve.gov/monetarypolicy/files/fomcprojtabl20241218.pdf

Figure 28: Nominal Hourly Wages (all Industries)



However, it should be noted that hourly wage adjustments over 12-month periods have steadily declined from \$1.70/year to \$1.38/year (over preceding 12-month windows), bottoming at \$1.23/year during the period from August 2023 through July 2024, and rebounding to only \$1.38/year during the

period ending in November 2024<sup>37</sup>. This indicates that, while wages are increasing, their increases are lessening as time passes. Comparing the percent change in CPI levels and wages during the prior 12 months in Figure 29, we see that wages have increased at a higher rate since roughly 1Q2023, but the gap between (loosely speaking) the growth rates of income and expenses is approximately 1%.

Additionally, we present a revised version (when compared to our last report) of Figure 30 below to highlight the private debt load being carried by the population. Further, we present the historical ratio of all consumer debt to disposable income, and the historical ratio of "home debt" (i.e., debt collateralized by residential property, or mortgage and HELOC debt) to disposable income. These figures show how aggregate "home debt" has returned to its managed level of 60% of disposable income, and overall debt is now approximately 82%, the lowest aggregate levels since 2003 (excluding the COVID period).





### Other Commentary

 "Consumer spending is expected to improve in the fourth quarter but, as the S&P Global Chief Economist Satyam Panday explained in his Q1 2025 outlook: 'The days of extraordinary leaps are likely behind us. Since the monthly growth rate of real personal disposable income has been lagging the growth rate of consumer spending the past six months, households' aggregate spending is likely to ease in the coming quarters. ... Cost fatigue, especially from higher costs of nondiscretionary services, is likely to curb growth in consumer discretionary spending, including on holiday shopping. Cost fatigue likely means that value proposition is going to drive spending decisions more in the future...'" (https://www.furnituretoday.com/industry-issue/2025economic-forecast-a-hazy-start-as-unknowns-loom/; Dec. 22, 2024)

<sup>&</sup>lt;sup>37</sup> https://fred.stlouisfed.org/series/CES050000003

*Figure 30: Debt Balance Composition (\$T)* 



Figure 31: Ratio of Debt to Disposable Income



Source: NY Federal Reserve Bank (https://www.newyorkfed.org/microeconomics/hhdc); Federal Reserve Economic Database (https://fred.stlouis.org)

- "In the coming quarters, the Fed's expected rate cuts will make borrowing cheaper, enabling households to take on more debt, and therefore providing breathing room for households to continue spending until 2025. We also expect consumers will be doing some front-loading in late 2024 and 2025 to try to get ahead of tariffs, which we see coming into full force in 2026. Starting that year, the tariffs will impact households' real purchasing power. Consumer spending will also be negatively affected by the broader economic slowdown caused by the tariffs and government spending cuts." (https://www2.deloitte.com/us/en/insights/economy/us-economic-forecast/united-states-outlook-analysis.html; Dec. 13, 2024)
- "The New York Fed said ... that during the third quarter Americans' total disposable income reached \$21.8 trillion and the ratio of total debt balance to income moderated to 82%, below the 86% ratio seen at the end of 2019. ... The bank also noted that the home-borrowing trends are a key reason for the favorable trends in the income to debt burdens ratio, with some 70% of total borrowing linked to housing debt. There, higher underwriting standards coupled with low rates are a positive for the overall implications of borrowing. ... While the report focused on what happened during the third quarter, it's possible some borrowing stress may ease on borrowing going forward given that the Fed, faced with easing inflation pressures, has moved into a cycle of interest rate cuts that could make some types of debt, like credit cards, more manageable. (https://www.reuters.com/markets/us/ny-fed-says-household-debt-up-third-quarter-rising-incomes-ease-debt-burden-2024-11-13/; Nov. 13, 2024)
- "Mortgage balances rose by just \$71 billion, or by 0.57% in Q3 from Q2, the smallest percentage increase since the dip in Q2 2023, and the second smallest since 2018, to \$12.6 trillion, as demand for existing homes in Q3 plunged to the lowest since 1995, while more and more people who could buy are renting, thereby profiting from an arbitrage between two similar products with very different prices." (https://wolfstreet.com/2024/11/14/here-come-the-helocs-mortgages-the-burden-of-housing-debt-serious-delinquencies-and-foreclosures-in-q3-2024/; Nov. 14, 2024)
- "We expect real consumption growth to accelerate to 2.7% in 2025, up from our previous forecast of a slowdown to 2.1%. ... We remain upbeat about the outlook for real disposable incomes. The labor market is likely to remain resilient, while strong productivity growth will keep inflationary pressures muted. With revisions showing the saving rate at a healthy level, the strength of income growth will flow into stronger consumer spending. ... The rise in housing equity, together with falling interest rates, is a key upside risk over the next few years. ... Conflict in the Middle East and the election are the main downside risks to our forecast. Significantly higher oil prices or tariffs on imported goods would hit households' real incomes and cause consumer spending growth to slow.

(https://www.oxfordeconomics.com/resource/the-us-consumer-will-remain-a-pillar-of-strength/; Oct. 11, 2024)

## Employment

## Analysis

Employment has, as many have pointed out, been remarkably resilient since the end of the pandemic; per

Figure 32, much of the country is enjoying low unemployment rates. The US unemployment rate averaged 4.2% during 3Q2024<sup>38</sup> (averaging 161.8M of 169M labor force participants employed during 3Q2024<sup>39</sup>, per Figure 33). While the unemployment rate has crossed upwards through the 4.0% level (that many hold as a barrier of some significance), the main point that is notable to these authors is the return of a substantial portion of the population to the workforce (Figure 34): workforce levels returned to pre-pandemic levels around YE2022, and came very close to 170M during the summer of 2024<sup>40</sup>. Still, as we have pointed out in previous reports, the current-day workforce is still several thousands of workers short of where it would have been had the COVID pandemic not occurred, and both of the Labor Force Participation Rate & the Population-Employment Ratio appear to have stalled (see

## Figure 35 and Figure 36).

Putting the growth of the labor force in perspective, during the period from 2015 through mid-2018 (definitively pre-COVID), the labor force grew by an average of about 126,000 people per month. For the 12-month period during 2022 (post-COVID, but allowing some time for re-employment by some who would have otherwise been out-of-work due to the pandemic), the labor force grew by an average of 188,000 people per month. And for the 12-month period during 2023, the labor force grew by just over 117,000 people per month. Finally, the labor force has barely budged from November 2023 to November 2024, growing by only an average of about 13,250 people per month, retreating from November to April before recovering (as is generally consistent)<sup>41</sup>. This seasonal trend is readily explained, though the recent numbers are curious.





<sup>38</sup> https://fred.stlouisfed.org/series/UNRATE

<sup>&</sup>lt;sup>39</sup> https://fred.stlouisfed.org/series/LNU02000000 and https://fred.stlouisfed.org/series/LNU01000000

<sup>&</sup>lt;sup>40</sup> https://fred.stlouisfed.org/series/LNU01000000

<sup>&</sup>lt;sup>41</sup> https://fred.stlouisfed.org/series/CLF16OV

#### Figure 33: US Unemployment Rate



Figure 34: Level of US Civilian Labor Force



Figure 35: US Labor Force Participation Rate



Figure 36: US Employment to Population Ratio (%)



### Other Commentary

- "According to LinkedIn data, we're expecting to see hiring pick up in several key industries, including defense, energy, and technology. ... The technology job market, in particular, has seen a slow but steady recovery following a significant dip in hiring and remains the strongest industry in terms of year-over-year hiring. We also expect to see hiring remain robust in healthcare, which has been one of the few industries that has weathered the storm particularly well. ... On the flip side, though, other industries may not have that same fortune. We expect a continued stalling in professional services, retail, and government. (https://www.fastcompany.com/91243459/an-economist-explains-where-the-u-s-job-market-isheading-in-2025; Dec. 16, 2024)
- "Goldman Sachs Research predicts US GDP will grow 2.5% on a full-year basis. That compares with 1.9% for the consensus forecast of economists surveyed by Bloomberg. ... Three key policy changes following the Republican sweep in Washington are expected to affect the economy, [David Mericle, chief US economist in Goldman Sachs Research] writes in the team's report, which is titled '2025 US Economic Outlook: New Policies, Similar Path.'
  - "Tariff increases on imports from China and on autos may raise the effective tariff rate by 3 to 4 percentage points.
  - "Tighter policy may lower net immigration to 750,000 per year, moderately below the pre-pandemic average of 1 million per year.
  - "The 2017 tax cuts are expected to be fully extended instead of expiring and there will be modest additional tax cuts."

(https://www.goldmansachs.com/insights/articles/the-us-economy-is-poised-to-beat-expectations-in-2025; Nov. 20, 2024)

 "Similar to last year, retirees are heading back to work due primarily to the increased cost of living, a survey by Resume Builder found. Thirteen percent of retired seniors said they are likely to start working again next year. ... In addition to a higher cost of living, seniors said the top reasons for going back to work were boredom, rising housing costs and paying off non-medical debt. Of those returning to the workforce, the majority said they were either very enthusiastic, or somewhat enthusiastic about going back to work."

(https://www.benefitspro.com/2024/09/19/1-in-8-retirees-plan-to-go-back-to-work-in-2025/?slreturn=20241224174205; Sept. 19, 2024)

## Federal Funds (Primary Credit) Rate

### Analysis

When a depository institution has a shortfall and need for liquidity, it may borrow funds on a short-term basis from the Federal Reserve. The "discount rate" is the interest rate charged to commercial banks and other depository institutions on loans they receive from their regional Federal Reserve Bank's "discount window". The Federal Reserve Banks offer three discount window programs to depository institutions: Primary Credit, Secondary Credit, and Seasonal Credit, each with its own interest rate. Under the Primary Credit program, loans are extended for a very short term (usually overnight) to depository institutions in generally sound financial condition. (Secondary Credit & Seasonal Credit may
be available to institutions that do not meet the "sound financial condition" criteria.) The discount rate charged for primary credit (the primary credit rate) is set above the usual level of short-term market interest rates.

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

Based on the most recent two "dot plots" from the FOMC Board of Governors' meetings (see earlier Figure 26 and Figure 27), we notice that the Governors' beliefs are decidedly more conservative and returning to a stance of less aggressive interest rate cuts. The target federal funds rate was cut to between 4.25% and 4.5% during the FOMC's meeting in December 2024<sup>42</sup>. This cut is in line with Chairman Powell's recent remarks in which he speculated that interest rates may drop by only 50bp during 2025<sup>43</sup>. We believe that this caution -- given the speculated tariffs by the incoming White House administration and Congress, and other changes of economic policy -- is wise, and that **rates will end 2025 around 4.0%**.

Year	September 2024	September 2024	December 2024	December 2024
	median	range	median	range
2025	3.25%-3.5%	2.75%-4.25%	3.75%-4.0%	3.0%-4.5%
			(↑ 50bp from Sept)	(↑ 25bp from Sept)
2026	2.75%-3.0%	2.25%-4.0%	3.5%-3.75%	2.25%-4.0%
			(↑ 75bp from Sept)	(level from Sept)
2027	2.75%-3.0%	2.25%-4.0%	3.0%-3.25%	2.25%-4.0%
			(↑ 25bp from Sept)	(level from Sept)

Table 2: Changes in FOMC Board of Governors' "Dot Plots" (Sept 2024 vs Dec 2024)

In Figure 37, we see the historical and projected relationship between the effective overnight lending rate and the 1-year T-bill yield.

<sup>&</sup>lt;sup>42</sup> https://www.federalreserve.gov/mediacenter/files/FOMCpresconf20241218.pdf
<sup>43</sup> Ibid.



Figure 37: Primary Credit, as a function of 1-year Treasury yield

#### Other Commentary

"Other short-term interest rates will come down at the same pace as the Federal Funds rate. For investors, rates on super-safe money market funds will edge closer to 4%. Rates on consumer loans will improve. Rates on home equity lines of credit are typically connected to the prime rate (now 7.5%), which in turn moves with the Federal Reserve's benchmark rate. Vehicle financing rates are running about 7.0% for six-year loans to borrowers with good credit." (https://www.kiplinger.com/economic-forecasts/interest-rates; Dec. 19, 2024)

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

#### Analysis

The U.S. government raises money to operate the federal government through the sale of U.S. Treasury Securities; these are debt instruments that are offered at fixed interest rates. Rates are expected to rise as maturity durations increase. The interest rates vary from day-to-day, and, when collected across all maturities, may be documented as a line chart (rate versus maturity) called a "yield curve". There are several different types of "Treasuries" (a generic name for "Treasury bonds", "Treasury notes", and "Treasury bills"), and most may be re-sold on the open secondary market.

Initial interest rates offered for Treasury Securities ("yields") are set when the security is initially sold, and may be affected by several factors, including (for example)

- The published target federal funds rate;
- Investor sentiment (i.e., supply and demand);
- Currently outstanding debt levels; and
- Anticipated future events (e.g., investors' beliefs regarding economic growth, inflation, and other geopolitical trends).

As the country has recovered from the COVID pandemic, and the accompanying fiscal troubles, U.S. Treasuries have been priced unusually; as mentioned above, these instruments are usually offered at rates such that lower maturity durations are offered at lower interest rates (which is hand-in-hand with lower perceived risk as of the time of issuance), and higher maturity duration are offered at higher interest rates. When that premise is not held, the yield curve is said to be "inverted", and is generally a precursor to a period of challenging times. The yield curve for U.S. Treasuries has been inverted for several years, but has recently unwound one of its anomalies (a change in the slope of the yield curve as maturities increase) at the shortest end of the yield curve (see Figure 38); note that, since YE2023, an increasing rate has been resolved as instruments' maturities increases has been addressed. We are now seeing rates monotonically declining to the 60-month maturity, at which point they increase until the 240-month maturity.

Now there are two issues: first, the previously mentioned inversion, and, second, rates have generally declined for all maturities since 1Q2024. Again, an inversion reflects the expectation of one of a few relatively near-term outcomes:

- The FOMC dropping the target federal funds rate in the near term;
- Upcoming very low inflation or even deflation in the years ahead; or
- Shrinking term premiums.

Obviously, the rate reductions by the FOMC accounts for the "across the board" drops of rates for U.S. Treasuries this past year. Furthermore, with the current future expectations of the FOMC continuing to reduce rates for at least the next two years, implies that we expect for the short-end of the yield curve to remain elevated until 2026. So, visually, we expect the yield curve to drop vertically, and move from right-to-left, if there are no hindrances to the recovery of the economy.



#### Figure 38: Historical Treasury Yield Curves as a function of time-to-maturity

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

However, now we point out the changes in the yield curve between the end of 3Q2024 and the beginning of December 2024, and again during December 2024. There was a dramatic 50 bp drop during late September 2024, a 25 bp drop during November 2024, and another 25 bp drop during mid-to late-December 2024. Looking at Figure 38, we see that the yield curve has migrated from the red line at

the end of 2Q2024, to dark blue after 3Q2024, to orange at the beginning of December '24, to the grey as of Christmas 2024.<sup>44</sup> We then factor in the change of the FOMC's tone between their September 10m 2024 press conference and their December 19, 2024 press conference, from

"If the economy evolves as expected, the median participant projects that the appropriate level of the federal funds rate will be 4.4 percent at the end of this year and 3.4 percent at the end of 2025."<sup>45</sup>

to

"At today's meeting, the Committee decided to lower the target range for the federal funds rate by 1/4 percentage point, to 4-1/4 to 4-1/2 percent. ... The median participant projects that the appropriate level of the federal funds rate will be 3.9 percent at the end of next year and 3.4 percent at the end of 2026. These median projections are somewhat higher than in September, consistent with the firmer inflation projection."<sup>46</sup>

What hindrances to the economy could occur, and with what likelihood? The main concerns at the moment are continued inflation, and the looming possibility of a drawn-out trade war with other countries. During Chairman Powell's press conference on December 19, 2024, he implied his concerns regarding the inflation that could result from the incoming White House administration's intended tariffs, and seems to be planning for such possibilities. Hence, we attribute the change between the orange and grey lines in Figure 38 to the changes to the target federal funds rate and Chairman Powell's comments.

If President-elect Trump follow through on the most severe tariffs that he has proposed, we believe that inflation will increase by as much as 1% by mid-year 2026, and that borrowing rates will remain no lower than 4.0%, resulting in Treasury yields comparable to those from early December 2024. It is possible that the yield curve could significantly re-invert during this period.

Figure 39 through Figure 47 illustrate the most significant correlations between Treasury yield rates.

<sup>&</sup>lt;sup>44</sup> https://wolfstreet.com/2024/12/21/treasury-yield-curve-un-inverts-entirely-as-long-term-yields-rise-while-short-term-yields-stay-put-no-longer-pricing-in-any-rate-cuts-mortgage-rates-back-above-7/

<sup>&</sup>lt;sup>45</sup> https://www.federalreserve.gov/mediacenter/files/FOMCpresconf20240918.pdf

<sup>&</sup>lt;sup>46</sup> https://www.federalreserve.gov/mediacenter/files/FOMCpresconf20241218.pdf



*Figure 39: 1-month Treasury yield rates, as a function of 1-year Treasury yield rates* 

Figure 40: 3-month Treasury yields, as a function of 1-year Treasury yields



Figure 41: 6-month Treasury yields, as a function of 1-year Treasury yields





Figure 42: 3-year Treasury yields, as a function of 1-year Treasury yields

Source: Authors' calculation

Figure 43: 5-year Treasury yields, as a function of 3-year Treasury yields





Figure 44: 7-year Treasury yields, as a function of 5-year Treasury yields

Figure 45: 10-year Treasury yields, as a function of 7-year Treasury yields





#### *Figure 46: 20-year Treasury yields, as a function of 10-year Treasury yields*



#### Figure 47: 30-year Treasury yields, as a function of 10-year Treasury yields



Source: Authors' calculation

#### Other Commentary

• "[Morningstar Investment Management's chief multi-asset strategist Dominic Pappalardo said] 'The higher bond yields really focus around the lingering concerns of inflation, in my view. These concerns have definitely escalated post-election. There's no doubt that Trump continues to discuss tariffs, things of that nature. It's also quite likely that policy does get enacted because it really only requires White House support for that to happen, so I think that's the main driving force behind the post-election runup in bond yields. ... Additionally, from a macroeconomic view, the higher yields do suggest some belief that we'll avoid recession. If you go back to 2022 and parts of 2023, there was a growing narrative that we were likely to see an economic downturn. That really never materialized. And as such, interest rates have been able to move up or at least remain higher. If we were to start to see weaker economic data, I would expect bond yields to come down accordingly on the heels of that news."" (https://www.morningstar.com/markets/what-higher-bond-yields-mean-markets-2025-2; Dec. 6, 2024)

 "We think the shape of the Treasury yield curve will tell investors all they need to know in 2025. A flat yield curve will be a key gauge of whether the Fed is successfully keeping the economy, inflation, and the labor market in balance. Should the yield curve invert again because short-term yields are rising, it could indicate the market expects the Fed to raise rates to offset growth and inflation pressures. Just as we see the Fed holding rates at 4.25 percent in 2025, we expect the 10-year Treasury yield to trade around similar levels next year, but the range of outcomes is large." (https://www.rbcwealthmanagement.com/en-us/insights/global-insight-2025-outlook-united-states; Dec. 2, 2024)

# 30-year Mortgage Rate & Residential Home Price Index

#### Analysis

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

Owner's equivalent of rent appears to be moderating, post-COVID; assuming an index equal to 100 at YE2018, overall housing costs have increased as shown in Table 3<sup>47</sup>.

Date	Owner's Equivalent	Ann. Rate of	
	Rent (Indexed)	Increase	
1/1/2019	100.0		
1/1/2020	103.3	3.3%	
1/1/2021	105.4	2.0%	
1/1/2022	109.7	4.1%	
1/1/2023	118.2	7.7%	
1/1/2024	125.6	6.2%	
11/1/2024	130.5	4.7%	

Table 3: Owner's Equivalent of Rent

Figure 48 illustrates the US housing inventory over the past five years. While the cyclical pattern of inventory is still intact, the level of inventory is still only about two-thirds that of the peak shown in 2019, which will definitely have an impact on pricing (based on lower availability of properties).

Figure 49 and Figure 50 highlight the change in nationwide median home price (and Y/Y percent change in median home price), peaking at about \$375,000 at mid-year 2024. While prices retreated in 3Q2024, they rebounded slightly in October 2024 in anticipation of year-end moves that will accompany employment related moves; prices also increased by about 8% (annualized) during the same month.

<sup>&</sup>lt;sup>47</sup> https://fred.stlouisfed.org/series/CUSR0000SEHC

#### Figure 48: US Nationwide Housing Inventory



Figure 49: Median US Home Price







The National Association of Realtors predicts that existing home sales will increase (Y/Y) by 9% in 2025, and new home sales will increase by 11%<sup>48</sup>. Freddie Mac reported that existing home sales increased (M/M) by 3.4% in October 2024 to 3.96M homes; this increase in existing home sales was offset by new home sales, which fell by an annual rate of 610,000 homes during the same month. U.S. house prices in September 2024 rose 0.7% M/M and 4.4% since YE2023.

Mortgage rates remained roughly flat during November 2024 at 6.8%<sup>49</sup>, having ranged from 6.1% to 7.44% during 2024<sup>50</sup>. Again, rates are expected to follow mid-duration Treasury yields, meaning that they will be somewhat affected by FOMC interest rate decisions, employment, and market forces. The FOMC's expressed expectation at the moment is to potentially reduce their rates by 50bp during 2025; if they hold to that plan, then the expectation is for mortgage rates to drop by a comparable amount, i.e., between 6.25% and 6.5%. *We expect that mortgage rates will only drop slightly in time for the primary part of the homebuying season.* 

See Figure 51 regarding the correlation between the US 30-year fixed-rate mortgage rates and 7-year Treasury yields.

<sup>&</sup>lt;sup>48</sup> https://www.nar.realtor/magazine/real-estate-news/whats-next-for-the-2025-housing-market

<sup>&</sup>lt;sup>49</sup> https://www.freddiemac.com/research/forecast/20241220-us-economy-remains-robust-with-strong-q3-growth

<sup>&</sup>lt;sup>50</sup> See https://www.nar.realtor/magazine/real-estate-news/whats-next-for-the-2025-housing-market; the 30-year fixed mortgage rate varied from 6.1% to 7.22% during 2024 per FRED at https://fred.stlouisfed.org/series/MORTGAGE30US.



#### Figure 51: US 30-year (fixed rate) mortgage rate, as a function of a 7-year Treasury yield

#### Other Commentary

- "'From an affordability perspective, we think 2025 will look a lot like 2024, with mortgage rates above 6 percent, home price growth easing from recent highs but staying positive, and supply remaining below pre-pandemic levels,' said Mark Palim, Fannie Mae Senior Vice President and Chief Economist. 'Still, heightened mortgage rate volatility may present opportunities for would-be homebuyers to take advantage of temporary lows, and we may see stretches where housing activity is boosted by lower rates but, on average, we expect mortgage rates to remain elevated and a hindrance to activity. While we think conditions on a national basis will remain challenging, we're seeing meaningful regional differences in market conditions, and the homebuying experience as the adage goes will continue to be a local one.'" (https://www.fanniemae.com/newsroom/fannie-mae-news/housing-market-unlikely-thaw-2025-due-affordability-challenges-and-lock-effect; Dec. 16, 2024)
- "The S&P CoreLogic Case-Shiller U.S. National Home Price Index, which measures the price of existing homes across the nation, rose 3.9% in September from a year earlier, down from a 4.3% annual gain in the previous month. On a month-over-month, seasonally adjusted basis, home prices rose 0.3%. A limited supply of existing homes for sale is supporting continued price appreciation, but low housing affordability is weighing on the pace of price gains. Financing costs are likely to stay elevated at around 7% over the next few months, which means that buyers and sellers will both continue to deal with challenging conditions in the housing market." (https://www.kiplinger.com/economic-forecasts/housing; Dec. 6, 2024)
- "Redfin's economists expect there will be more home sales in 2025, largely due to pent-up demand. But some would-be homebuyers will still be priced out, with home prices climbing and mortgage rates remaining near 7%. Rental prices, on the other hand, should stay flat while wages increase, improving affordability for renters." (https://www.redfin.com/news/housing-market-predictions-2025/; Dec. 4, 2025)

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

#### Analysis

Moody's AAA Corporate Bond is an investment bond that acts as an index of the performance of all bonds given an AAA rating by Moody's Investors Service. This corporate bond is also often used as an alternative to the U.S. 10-year Treasury Bill as benchmark indicator rate; as a result, AAA bond rates tend to track with mid-duration Treasury yields. Bonds with lower grades, e.g., Moody's BAA Corporate Bond (which tracks bonds given a BAA rating), tending have higher yields (due to their risk ratings). The ICE BofA BBB US Corporate Index is a trading index compiled by ICE Data Indices, LLC that includes all securities given an investment grade rating BBB by Bank of America.

The yields and related spreads for Moody's AAA & BAA Corporate Bonds; the BofA BBB Corporate Bond; and the traditional 10/2 U.S. Treasury yield spread are shown in Table 4<sup>51</sup>.

Instrument	2Q2024	3Q2024	∆(2Q->3Q)	4Q2024	∆(3Q->4Q)
Moody's AAA Bonds (end of qtr)	5.13%	4.68%	-45bp		
Moody's BAA Bonds (end of qtr)	5.82%	5.42%	-40bp		
BAA-AAA Yield Spread	+69bp	+72bp	+5bp		
BofA BBB Yields (end of qtr)	5.71%	4.97%	-74bp	5.55%	+58bp
2-year Treasury Yield (end of qtr)	4.71%	3.66%	-105bp	4.30%	+64bp
10-year Treasury Yield (end of qtr)	4.36%	3.81%	-55bp	4.52%	+71bp
10 yr-2 yr Yield Spread	-35bp	+15bp	+50bp	+22bp	+7bp

Table 4: Comparison between Moody's Bond Yields, BofA BBB Yields, and U.S. Treasury Yields

Given the "business friendly" attitudes of the incoming Trump administration, we expect that bond yields will decline. Businesses will be given more latitude and accommodations, and less regulatory compliance, which will result in diminished needs for corporate financing.

See Figure 52 and Figure 53 for how Moody's AAA & BAA Corporate Bond yields have historically correlated with other macroeconomic metrics.





<sup>&</sup>lt;sup>51</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/DGS3, and https://fred.stlouisfed.org/series/DGS3, https://fred.stlouisfed



Figure 53: Moody's BAA-grade investment yields, as a function of BofA BBB yields

#### Source: Authors' calculation

#### Other Commentary

- "'We expect demand to moderate somewhat in 2025 given the expectation for rates to remain elevated,' said BMO credit strategist Daniel Krieter. ... He expects this moderation in demand, alongside struggling corporate fundamentals and volatility as Trump takes office, to send credit spreads wider in the new year. Krieter expects investment-grade bond spreads to touch a low of 70 bps in the first quarter of 2025, from 82 bps on Friday, and a peak of 105 bps by the end of next year." (https://www.reuters.com/markets/rates-bonds/bumpy-ride-us-corporate-bondspreads-expected-2025-2024-12-23; Dec 23, 2024)
- "In the bond market we expect yield curves to steepen further in 2025 as central banks' interest rate cuts leave their mark on two-year bond yields in particular. At the end of 2025 we see the Fed Funds rate at 3.75-4.00% and the ECB deposit rate at 2.0%. Corporate bonds should remain attractive in 2025 due to their high current interest yield and overall robust economy. However, we do not expect yield spreads to narrow further. We prefer bonds with investment grade status to those without." (https://www.dws.com/en-us/insights/cio-view/cio-view-quarterly/q4-2024/letter-202411/; Nov 22, 2024)

## Prime Rate

#### Analysis

The Prime Rate is a benchmark rate that many banks use for setting consumer credit rates for creditworthy customers. It is generally based on the federal funds rate, and a spread (typically 3%) is dictated by banks as a matter of policy to specify lending rates for mortgages, small business loans, and personal loans<sup>52</sup>. The Prime Rate is currently (as of this writing) 7.5%<sup>53</sup>.

<sup>&</sup>lt;sup>52</sup> https://www.investopedia.com/terms/p/primerate.asp

<sup>53</sup> https://fred.stlouisfed.org/series/DPRIME

We do not expect the relationship between the federal funds rate and the Prime Rate to change in the near future. If the FOMC only reduces the target federal funds rate by 50bp by YE2025, *the Prime Rate will end 2025 at around 7.0%*.

See Figure 54 for the relationship between the Prime Rate and 1-year Treasury yield.



Figure 54: Prime Rate as a function of 1-year Treasury yields

Source: Authors' calculations

#### Other Commentary

"Powell is not yet sure what will be the desired 'neutral' rate ... Expect the Fed to continue cutting its benchmark interest rate until the yield on one-month Treasury bills falls to about 3.5%, and the bank prime rate reaches 6.75%, down from its current 7.5%."
 (https://www.kiplinger.com/economic-forecasts/interest-rates; Dec. 19, 2024)

## US Average Retail Gasoline Price

#### Analysis

The U.S. average retail price for regular unleaded gasoline is approximately \$3.04 per gallon for regular unleaded. The country has escaped the 2024 hurricane season with minimal impact. The biggest concern at the moment is the potential of an oil supply disruption due to the current conflicts in the Middle East. Broadly, Trump has been a loyal supporter of Israel, which is still working to resolve its conflicts with Hama and Hezbollah; Iran is seen as a strong backer of Hezbollah, with the tacit approval of Moscow. Given where Trump left his international policies in 2020, it seems likely Trump would return to his previous stance of "maximum pressure" on Iran, and apply greater sanctions against the country. In summary, it isn't clear in which direction global oil prices will head in 2025; forces exist that could drive per-barrel prices in either direction.

Secondarily, we notice that crude oil has historically been a strong indicator of inflation domestically; they have traditionally gone "hand-in-hand" (see Figure 55). However, per Figure 56, that relationship appears to be deteriorating. Whereas there was once a 0.661 correlation coefficient between the two,

there is now only a correlation coefficient of 0.4. COVID travel patterns, which have reverted to pre-COVID terms even now, are expected to have a significant effect on this relationship.



*Figure 55: Relationship between Inflation and Y/Y % change in Brent Crude Price (2010-2020)* 

Source: Authors' calculation, and Federal Reserve Economic Database (https://fred.stlouis.org)

#### Other Commentary

- "As long as crude oil prices remain near their recent level of about \$70 per barrel, the prices at gas stations should tick down or hold fairly stable. That's what we expect for oil, barring some sort of geopolitical crisis that curbs oil production in the Middle East or another oil-rich region of the world. However, as spring nears, look for gasoline prices to start rising again, as refiners prepare for the start of the spring and summer travel season. A major price spike is unlikely as long as oil prices behave, but expect today's \$3 gas to rise into the low to mid-\$3 range when warm weather returns." (https://www.kiplinger.com/economic-forecasts/energy; Dec. 12, 2024)
- "Crude oil prices fell slightly in November following a ceasefire between Israel and Hezbollah in Lebanon. The ceasefire removed some of the risk premium present in oil prices, which had reflected the potential for attached on oil infrastructure and a disruption to oil supplies. In addition, signs of weakening global oil demand growth, primarily centered on slowing oil demand growth in China, continued to weight on prices." (https://www.eia.gov/outlooks/steo/report/global\_oil.php, Dec. 10, 2024)



Figure 56: Relationship between Inflation and Y/Y % change in Brent Crude Price (2015-Present)

Source: Authors' calculation, and Federal Reserve Economic Database (https://fred.stlouis.org)

# Commercial Real Estate Price Index

Commercial real estate (CRE) has been in a quandary since the COVID pandemic. First, office space has been under-utilized. Many businesses survived the pandemic with workers "working from home" (WFH); the approach was so successful that workers are now resistant to "return to the office" (RTO) per mandates by management. This trend is leaving offices with empty shells of leased office space, and senior leadership threatening workers with termination if they do not return<sup>54</sup>.

Landlords are diligently watching the moves of the FOMC for interest rate reductions, and are considering whether refinancing options are feasible, given that they are also seeing tenants either negotiate new terms, or abandon leased office space altogether. Given the glut of square footage in some markets, this is a beneficial strategy for lessors.

With tenants not paying for office space, lenders and investors in bonds associated with office buildings are starting to see payments impacted. US office-backed delinquencies spiked in November 2024, per Bloomberg, with more than 10% of loans on office buildings in arrears<sup>55</sup>; the US CMBS delinquency rate rose to 6.57% in December 2024<sup>56</sup>. Appraisals sink as rental income drops, and servicing debt is becoming more expensive. Senior debt of even some AAA rated bonds that are backed by premium office building income (only a single building in some cases<sup>57</sup>, as opposed to a portfolio of buildings) are not receiving all of their expected interest in some markets (e.g., NYC, Atlanta, Chicago, and Los Angeles)<sup>58</sup>. Figure 57 shows the delinquency rates of CRE loans, all loans, and all business loans; we see therein that delinquencies on CRE loans are very close to, if not exceeding, the overall delinquency rate for commercial banks.

<sup>&</sup>lt;sup>54</sup> https://www.wsj.com/real-estate/commercial/back-to-office-workers-landlords-e5e15663

<sup>&</sup>lt;sup>55</sup> https://www.bloomberg.com/news/features/2024-12-18/commercial-real-estate-can-no-longer-ignore-its-problems

<sup>&</sup>lt;sup>56</sup> https://www.trepp.com/trepptalk/cmbs-delinquency-rate-surges-in-december-2024

<sup>&</sup>lt;sup>57</sup> See https://privatecapitalinvestors.com/the-growth-of-single-asset-single-borrower-sasb-cmbs-transforming-commercial-real-estate-financing/

<sup>&</sup>lt;sup>58</sup> https://www.newsmax.com/finance/streettalk/bonds-commercial-real/2024/10/29/id/1185830/



#### Figure 57: Delinquency Rates of CRE Loans, All Loans, and Business Loans

Second, COVID also gave another "boost" to e-commerce, which has supported the transformation of the retail space market. New construction of retail space declined by almost 50% between 2022 and 2023 due to increased financing and construction costs, and reduced capital availability<sup>59</sup>; further, over 18 million square feet of retail space were decommissioned during 2024<sup>60</sup>. The reduction in new construction is key to preserving rent levels in remaining desirable retail locations. Per CBRE, retail activity – particularly retailer leasing – will gravitate to markets with population and job growth and infrastructure improvements, e.g., Phoenix, Austin, Dallas, Nashville and Charlotte<sup>61</sup>.

The decline of retail and office space has led to opportunities for

- rented residential<sup>62</sup> (a recognized area of need since prior to COVID<sup>63</sup>),
- data centers (fueled by demand for "artificial intelligence" services)<sup>64</sup>, and
- industrial space<sup>65</sup> (supported by increased seasonal hiring for transportation and warehousing positions<sup>66</sup>).

Figure 58 highlights the relationship between residential and commercial prices.

 <sup>&</sup>lt;sup>59</sup> https://www.forbes.com/sites/brinsnelling/2024/01/18/the-trends-reshaping-retail-real-estate-in-2024
 <sup>60</sup> Ibid.

<sup>&</sup>lt;sup>61</sup> https://www.cbre.com/press-releases/investment-recovery-to-gain-momentum-despite-interest-rates-remaining-higher-for-longer and https://www.forbes.com/sites/jeffsteele/2024/12/26/commercial-real-estate-trends-to-watch-for-in-2025/

<sup>&</sup>lt;sup>62</sup> https://www.wsj.com/real-estate/commercial/office-conversions-find-new-life-after-property-values-plunge-ada4722f

<sup>&</sup>lt;sup>63</sup> https://www.credaily.com/newsletters/strong-apartment-demand-holds-as-record-supply-hits-50-year-high

<sup>&</sup>lt;sup>64</sup> See https://www.us.jll.com/en/trends-and-insights/investor/big-questions-real-estate-is-asking-in-2025 and

https://www.cbre.com/insights/books/us-real-estate-market-outlook-2025/data-centers

<sup>&</sup>lt;sup>65</sup> https://www2.deloitte.com/us/en/insights/industry/financial-services/commercial-real-estate-outlook.html

<sup>&</sup>lt;sup>66</sup> https://www.retaildive.com/news/retail-hiring-down-november-challenger-gray-christmas/736139/



#### Figure 58: Residential Home Price Index as a function of the Commercial Real Estate Index

#### Other Commentary

 "The projects are breathing new life into iconic properties that no longer work as office buildings. The Flatiron Building in New York will be redeveloped into condominiums. In Cincinnati, the owner of the Union Central Life Insurance Building is converting it into more than 280 units of housing with a rooftop pool, health club and commercial space." (https://www.wsj.com/real-estate/commercial/office-conversions-find-new-life-after-propertyvalues-plunge-ada4722f; Nov. 26, 2024)

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

#### Analysis

The Dow Jones U.S. Total Market Index (DWCF) is a market-capitalization-weighted index that represents the top 95% of the U.S. stock market based on market capitalization. Per Table 5, ...

Period	Index Range <sup>67</sup>	Trading Days	Avg points/day
4Q2023 (10/1/2023-12/31/2023)	42788.69 → 47787.47	61	+81.9
1Q2024 (1/1/2024-3/31/2024)	47787.47 → 52402.86	61	+75.7
2Q2024 (4/1/2024-6/30/2024)	52402.86 <del>→</del> 53905.94	63	+23.9
3Q2024 (7/1/2024-9/30/2024)	53905.94 → 56496.47	64	+40.5
4Q2024 (10/1/2024-12/31/2024)	56496.47 → 58399.25	61	+31.2

Table 5: Approximate	Quarterly	Milestones	for the	Dow-Jones	Total Market Index
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<sup>&</sup>lt;sup>67</sup> Index values found at https://www.marketwatch.com/investing/index/dwcf

We see the Standard & Poor's 500 Index ("SP500") in Table 6; the S&P 500 is an index of 500 very large, publicly traded companies in the U.S. The performance of the S&P 500 mirrors that of the DWCF, with the returns of the two indexes appearing quite comparable.

Period	Index Range <sup>68</sup>	Trading Days	Avg points/day
4Q2023 (10/1/2023-12/31/2023)	4288.05 → 4769.83	61	+7.90
1Q2024 (1/1/2024-3/31/2024)	4769.83 → 5254.35	61	+7.94
2Q2024 (4/1/2024-6/30/2024)	5254.35 → 5459.65	63	+3.26
3Q2024 (7/1/2024-9/30/2024)	5459.65 → 5708.75	64	+3.89
4Q2024 (10/1/2024-12/31/2024)	5708.75 → 5881.63	61	+2.83

Table 6: Approximate Quarterly Milestones for the Standard and Poor's 500 ("SP500") Index

The VIX was up at the end of 3Q2024 to 16.3, and to 17.35 as of YE2024, which is frankly befuddling to these authors. Given the potential volatility of the incoming US President, the direction of the economy, and the potential for several other factors to upend the economy, we are beginning to be concerned about the usefulness of the VIX as a measure of the strength of the market.

#### Figure 59: SP500 as a function of the Dow-Jones Total Market Index



<sup>&</sup>lt;sup>68</sup> Index values found at https://www.marketwatch.com/investing/index/spx

# **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 4Q2015 and 3Q2024, inclusive.

Variable	Min Abs. Error	Average Error	Max Abs. Error
Real GDP Growth	185.3%	**	***
Nominal GDP Growth	711.7%	**	***
Real Disposable Income Growth	1000.0%	***	***
Nominal Disposable Income Growth	***	***	***
Inflation	0.0%	***	***
Unemployment Rate	282.5%	**	***
1-month Treasury Yield	358.1%	**	***
3-month Treasury Yield	0.0%	**	***
6-month Treasury Yield	0.6%	-2.5%	457.0%
1-year Treasury Yield	233.7%	**	***
3-year Treasury Yield	7.1%	94.8%	***
5-year Treasury Yield	751.9%	***	***
7-year Treasury Yield	5.9%	57.0%	272.4%
10-year Treasury Yield	0.3%	-2.5%	125.1%
20-year Treasury Yield	0.8%	-3.4%	65.5%
30-year Treasury Yield	0.7%	-10.0%	37.2%
30-year Mortgage Rate	20.6%	-41.6%	85.2%
Moody's AAA Curve	0.2%	1.8%	29.7%
Moody's BAA Curve	0.4%	-1.9%	31.2%
BBB Corporate Yield	0.6%	-14.2%	60.0%
Prime Rate	12.0%	-332.5%	815.6%
US Average Retail Gasoline Price	0.2%	-1.6%	34.1%
Cost of Federal Funds	44.8%	**	***
Dow Jones Total Stock Market Index	518.5%	***	***
S&P 500 Stock Price Index	167.5%	542.6%	962.1%
Commercial Real Estate Price Index	265.9%	854.8%	***
Residential Home Price Index	5.2%	-10.3%	88.2%
Market Volatility Index	3.4%	296.5%	733.6%

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

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

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

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

	Dependent variable (+/- SE):
	Real GDP growth
Constant	226.962 (+/- 33.318)
	p = 0.00000 <sup>***</sup>
Nominal disposable income growth	0.109 (+/- 0.028)
	p = 0.001***
Unemployment Rate	-6.110 (+/- 0.559)
	p = 0.000***
LN_30-year Treasury Yield	26.408 (+/- 8.048)
	p = 0.004***
20-year Treasury Yield	-769.834 (+/- 84.036)
	p = 0.000***
LN_20-year Treasury Yield	1,023.451 (+/- 98.679)
	p = 0.000***
10-year Treasury Yield	133.274 (+/- 18.878)
	p = 0.00000 <sup>***</sup>
LN_10-year Treasury Yield	-364.419 (+/- 30.125)
	p = 0.000 <sup>***</sup>
7-year Treasury Yield	370.453 (+/- 51.804)
	p = 0.00000***
LN_7-year Treasury Yield	-125.197 (+/- 31.260)
	p = 0.001***
3-month Treasury Yield	5.918 (+/- 1.462)
	p = 0.0005 <sup>***</sup>
3-year Treasury Yield	-80.155 (+/- 9.455)
	p = 0.000***
3-year Treasury Yield_2	16.813 (+/- 2.131)
	p = 0.00000***
6-month Treasury Yield_2	-1.431 (+/- 0.350)
	p = 0.0005 <sup>***</sup>
7-year Treasury Yield_2	-58.711 (+/- 7.434)
	p = 0.00000 <sup>***</sup>
20-year Treasury Yield_2	66.381 (+/- 8.445)
	p = 0.00000***
Observations	40

**REGRESSION FOR REAL GDP GROWTH** 

R <sup>2</sup>	0.973
Adjusted R <sup>2</sup>	0.956
Residual Std. Error	1.563 (df = 24)
F Statistic	57.056 <sup>***</sup> (df = 15; 24)
Note:	*p<0.1; **p< 0.05; ***p<0.01

	Dependent variable (+/- SE):
	Nominal GDP growth
Constant	-67.248 (+/- 11.318)
	p = 0.00001***
SP500 Stock Price Index	0.005 (+/- 0.001)
	p = 0.0001 <sup>***</sup>
Real disposable income growth	0.120 (+/- 0.041)
	p = 0.008***
Unemployment Rate	-8.179 (+/- 0.597)
	p = 0.000***
30-year Mortgate Rate	-13.803 (+/- 3.059)
	p = 0.0002***
US Avg Retail Gasoline Price (\$-gal; all grades, all formulations)	5.493 (+/- 1.633)
	p = 0.003 <sup>***</sup>
30-year Treasury Yield	-146.433 (+/- 19.504)
	p = 0.00000***
LN_30-year Treasury Yield	481.652 (+/- 49.450)
	p = 0.000***
10-year Treasury Yield	162.977 (+/- 12.282)
	p = 0.000***
LN_10-year Treasury Yield	-422.567 (+/- 28.598)
	p = 0.000***
LN_7-year Treasury Yield	87.928 (+/- 13.168)
	p = 0.00000***
3-month Treasury Yield	42.513 (+/- 8.912)
	p = 0.0001***
6-month Treasury Yield	-55.146 (+/- 9.463)
	p = 0.00001***
6-month Treasury Yield_2	6.361 (+/- 0.879)
	p = 0.00000***
3-month Treasury Yield_2	-5.128 (+/- 0.980)
	p = 0.00003 <sup>***</sup>
7-year Treasury Yield_2	-5.172 (+/- 1.214)
	p = 0.0003***
Observations	40
R <sup>2</sup>	0.963
Adjusted R <sup>2</sup>	0.941

## REGRESSION FOR NOMINAL GDP GROWTH

F Statistic	42.161 <sup>***</sup> (df = 15; 24)	
Residual Std. Error	2.067 (df = 24)	

Note:

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

	Dependent variable (+/- SE):
	Real disposable income growth
Constant	227.013 (+/- 41.105)
	p = 0.00001 <sup>***</sup>
Nominal GDP growth	1.850 (+/- 0.477)
	p = 0.001***
Unemployment Rate	23.061 (+/- 4.068)
	p = 0.00001***
Dow Total Stock Market Index	-0.003 (+/- 0.001)
	p = 0.00001 <sup>***</sup>
30-year Treasury Yield	620.392 (+/- 126.187)
	p = 0.00005 <sup>***</sup>
LN_30-year Treasury Yield	-1,891.300 (+/- 343.004)
	p = 0.00001 <sup>***</sup>
10-year Treasury Yield	-505.770 (+/- 103.348)
	p = 0.00005 <sup>***</sup>
LN_10-year Treasury Yield	1,187.459 (+/- 199.443)
	p = 0.00001***
1-month Treasury Yield	-24.748 (+/- 6.552)
	p = 0.001***
LN_6-month Treasury Yield	19.806 (+/- 4.272)
	p = 0.0001***
3-year Treasury Yield	146.045 (+/- 31.665)
	p = 0.0001***
LN_3-year Treasury Yield	-144.929 (+/- 22.125)
	p = 0.00000 <sup>***</sup>
1-year Treasury Yield_2	-20.408 (+/- 5.012)
	p = 0.0004***
6-month Treasury Yield_2	19.124 (+/- 4.583)
	p = 0.0003***
Observations	40
R <sup>2</sup>	0.788
Adjusted R <sup>2</sup>	0.682
Residual Std. Error	7.235 (df = 26)
F Statistic	7.430 <sup>***</sup> (df = 13; 26)
Note:	*p<0.1; **p< 0.05; ***p<0.01

REGRESSION FOR REAL DISPOSABLE INCOME GROWTH

	Dependent variable (+/- SE):
	Nominal disposable income growth
Constant	1,414.069 (+/- 39.504)
	p = 0.00000 <sup>***</sup>
SP500 Stock Price Index	0.007 (+/- 0.001)
	p = 0.0005***
US Fed Reserve O-N Loan Rate	150.805 (+/- 8.787)
	p = 0.00002***
Moody's AAA Curve	-56.275 (+/- 4.262)
	p = 0.00005***
Moody's BAA Curve	59.433 (+/- 2.058)
	p = 0.00000 <sup>***</sup>
Real GDP growth	-25.295 (+/- 0.429)
	p = 0.00000 <sup>***</sup>
Nominal GDP growth	25.540 (+/- 0.440)
	p = 0.00000 <sup>***</sup>
CPI Inflation Rate	-7.297 (+/- 0.273)
	p = 0.00001***
30-year Mortgate Rate	54.978 (+/- 3.075)
	p = 0.00002***
Prime Rate	-155.240 (+/- 8.888)
	p = 0.00002***
Home Price Index	-1.478 (+/- 0.057)
	p = 0.00001***
Commercial Real Estate Price Index	-1.416 (+/- 0.045)
	p = 0.00000 <sup>***</sup>
Market Volatility Index	2.394 (+/- 0.433)
	p = 0.003***
LN_Market Volatility Index	-38.684 (+/- 6.949)
	p = 0.003***
US Avg Retail Gasoline Price (\$-gal; all grades, all formulations	·) -4.705 (+/- 0.837)
	p = 0.003***
30-year Treasury Yield	745.841 (+/- 24.826)
	p = 0.00000 <sup>***</sup>
LN_30-year Treasury Yield	-3,153.942 (+/- 69.190)
	p = 0.00000***
20-year Treasury Yield	482.645 (+/- 16.978)

## REGRESSION FOR NOMINAL DISPOSABLE INCOME GROWTH

	p = 0.00001***
LN_20-year Treasury Yield	-463.577 (+/- 33.888)
	p = 0.00004***
10-year Treasury Yield	-396.178 (+/- 18.692)
	p = 0.00001***
LN_10-year Treasury Yield	1,367.095 (+/- 40.518)
	p = 0.00000***
1-month Treasury Yield	-161.463 (+/- 7.831)
	p = 0.00001***
LN_1-month Treasury Yield	4.046 (+/- 0.899)
	p = 0.007***
7-year Treasury Yield	116.846 (+/- 25.426)
	p = 0.006***
LN_7-year Treasury Yield	-567.415 (+/- 41.761)
	p = 0.00004***
5-year Treasury Yield	-623.590 (+/- 22.171)
	p = 0.00001***
LN_5-year Treasury Yield	945.739 (+/- 42.138)
	p = 0.00001***
6-month Treasury Yield	302.281 (+/- 6.556)
	p = 0.00000***
LN_6-month Treasury Yield	16.247 (+/- 1.459)
	p = 0.0002***
3-year Treasury Yield	391.031 (+/- 14.875)
	p = 0.00001***
LN_3-year Treasury Yield	-431.073 (+/- 13.690)
	p = 0.00000***
1-year Treasury Yield	-139.391 (+/- 9.812)
	p = 0.00004***
3-year Treasury Yield_2	-22.132 (+/- 0.720)
	p = 0.00000***
1-month Treasury Yield_2	4.312 (+/- 0.380)
	p = 0.0001***
Market Volatility Index_2	-0.029 (+/- 0.003)
	p = 0.0002***
Observations	40
R <sup>2</sup>	1.000
Adjusted R <sup>2</sup>	0.998
Residual Std. Error	0.589 (df = 5)

F Statistic

Note:

538.466<sup>\*\*\*</sup> (df = 34; 5)

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

	Dependent variable (+/- SE	
	CPI Inflation Rate	
Constant	95.012 (+/- 5.956)	
	p = 0.00000 <sup>***</sup>	
Moody's BAA Curve	13.101 (+/- 0.691)	
	p = 0.000***	
Real GDP growth	-2.168 (+/- 0.112)	
	p = 0.000***	
Nominal GDP growth	2.039 (+/- 0.108)	
	p = 0.000***	
Real disposable income growth	-0.470 (+/- 0.057)	
	p = 0.00002 <sup>***</sup>	
Nominal disposable income growth	0.358 (+/- 0.056)	
	p = 0.0002 <sup>***</sup>	
BBB corporate yield	-9.733 (+/- 0.570)	
	p = 0.00000 <sup>***</sup>	
30-year Mortgate Rate	3.260 (+/- 0.386)	
	p = 0.00002***	
Home Price Index	-0.165 (+/- 0.009)	
	p = 0.00000 <sup>***</sup>	
Commercial Real Estate Price Index	-0.037 (+/- 0.004)	
	p = 0.00001***	
Market Volatility Index	0.048 (+/- 0.009)	
	p = 0.001***	
US Avg Retail Gasoline Price (\$-gal; all grades, all formulations)	-1.761 (+/- 0.178)	
	p = 0.00001***	
LN_30-year Treasury Yield	-131.131 (+/- 7.237)	
	p = 0.00000***	
20-year Treasury Yield	-94.760 (+/- 8.902)	
	p = 0.00001***	
LN_20-year Treasury Yield	100.600 (+/- 14.218)	
	p = 0.0001 <sup>***</sup>	
10-year Treasury Yield	77.876 (+/- 4.034)	
	p = 0.000***	
1-month Treasury Yield	-13.271 (+/- 0.816)	
	p = 0.00000***	
LN 1-month Treasury Yield	1.156 (+/- 0.139)	

## **REGRESSION FOR CPI INFLATION RATE**

	p = 0.00002***
7-year Treasury Yield	22.633 (+/- 4.877)
	p = 0.002***
LN_7-year Treasury Yield	-51.856 (+/- 9.395)
	p = 0.0004***
3-month Treasury Yield	12.065 (+/- 1.030)
	p = 0.00000***
5-year Treasury Yield	-44.090 (+/- 4.418)
	p = 0.00001***
LN_5-year Treasury Yield	71.200 (+/- 8.205)
	p = 0.00002***
LN_6-month Treasury Yield	4.074 (+/- 0.488)
	p = 0.00002***
3-year Treasury Yield	16.217 (+/- 1.311)
	p = 0.00000***
LN_3-year Treasury Yield	-24.378 (+/- 2.186)
	p = 0.00001***
LN_1-year Treasury Yield	-4.577 (+/- 0.561)
	p = 0.00002***
3-month Treasury Yield_2	0.653 (+/- 0.055)
	p = 0.00000***
10-year Treasury Yield_2	-13.543 (+/- 0.710)
	p = 0.000***
20-year Treasury Yield_2	16.180 (+/- 0.982)
	p = 0.00000***
Market Volatility Index_2	-0.001 (+/- 0.0001)
	p = 0.00000***
Observations	40
R <sup>2</sup>	1.000
Adjusted R <sup>2</sup>	0.999
Residual Std. Error	0.104 (df = 9)
F Statistic	950.169 <sup>***</sup> (df = 30; 9)

Note:

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

# Unemployment Rate

	Dependent variable (+/- SE):
	Unemployment Rate
Constant	-2.211 (+/- 0.714)
	p = 0.006***
Nominal GDP growth	-0.106 (+/- 0.005)
	p = 0.000***
Real disposable income growth	0.018 (+/- 0.003)
	p = 0.00000 <sup>***</sup>
30-year Mortgate Rate	-1.774 (+/- 0.274)
	p = 0.00001 <sup>***</sup>
Dow Total Stock Market Index	0.00004 (+/- 0.00001)
	p = 0.0003 <sup>***</sup>
30-year Treasury Yield	-24.703 (+/- 2.150)
	p = 0.000***
LN_30-year Treasury Yield	64.903 (+/- 5.487)
	p = 0.000***
20-year Treasury Yield	4.270 (+/- 0.933)
	p = 0.0002 <sup>***</sup>
10-year Treasury Yield	26.064 (+/- 2.349)
	p = 0.000***
LN_10-year Treasury Yield	-58.824 (+/- 3.805)
	p = 0.000***
1-month Treasury Yield	0.983 (+/- 0.288)
	p = 0.003***
7-year Treasury Yield	-11.400 (+/- 2.049)
	p = 0.00002***
LN_7-year Treasury Yield	17.292 (+/- 2.033)
	p = 0.00000 <sup>***</sup>
5-year Treasury Yield	7.187 (+/- 1.295)
	p = 0.00002 <sup>***</sup>
6-month Treasury Yield	-1.478 (+/- 0.434)
	p = 0.003***
3-year Treasury Yield	-4.449 (+/- 0.756)
	p = 0.00001***
3-year Treasury Yield_2	0.851 (+/- 0.121)
	p = 0.00000***

## REGRESSION FOR UNEMPLOYMENT RATE

5-year Treasury Yield_2	-0.959 (+/- 0.186)
	p = 0.00004***
Observations	40
R <sup>2</sup>	0.996
Adjusted R <sup>2</sup>	0.992
Residual Std. Error	0.152 (df = 22)
F Statistic	292.511 <sup>***</sup> (df = 17; 22)
Note:	*p<0.1; **p< 0.05; ***p<0.01

Treasury Yields (1, 3,	& 6-month; 1,	3, 5, 7, 10, 20,	& 30-year series)
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	Dependent variable (+/- SE):
	1-month Treasury Yield
Constant	-8.009 (+/- 2.077)
	p = 0.001***
Moody's AAA Curve	-2.380 (+/- 0.668)
	p = 0.002 <sup>***</sup>
Real GDP growth	0.307 (+/- 0.051)
	p = 0.00001***
Nominal GDP growth	-0.282 (+/- 0.046)
	p = 0.00001***
30-year Mortgate Rate	1.460 (+/- 0.402)
	p = 0.002 <sup>***</sup>
Dow Total Stock Market Index	0.0001 (+/- 0.00001)
	p = 0.0001***
Commercial Real Estate Price Index	0.015 (+/- 0.005)
	p = 0.010 <sup>***</sup>
LN_30-year Treasury Yield	16.241 (+/- 3.552)
	p = 0.0001***
20-year Treasury Yield	-6.594 (+/- 1.470)
	p = 0.0002 <sup>***</sup>
10-year Treasury Yield	4.633 (+/- 1.123)
	p = 0.0004***
LN_10-year Treasury Yield	-4.566 (+/- 1.462)
	p = 0.005 <sup>***</sup>
Market Volatility Index_2	0.0002 (+/- 0.0001)
	p = 0.005***
Observations	40
R <sup>2</sup>	0.980
Adjusted R <sup>2</sup>	0.973
Residual Std. Error	0.318 (df = 28)
F Statistic	126.826 <sup>***</sup> (df = 11; 28)
Note:	*p<0.1; **p< 0.05; ***p<0.01

**REGRESSION FOR 1-MONTH TREASURY YIELD** 

	Dependent variable (+/- SE):
	3-month Treasury Yield
Constant	-18.179 (+/- 3.156)
	p = 0.00001 <sup>***</sup>
Moody's AAA Curve	-2.000 (+/- 0.499)
	p = 0.0005 <sup>***</sup>
Real GDP growth	0.269 (+/- 0.046)
	p = 0.00001***
Nominal GDP growth	-0.237 (+/- 0.042)
	p = 0.00001 <sup>***</sup>
Dow Total Stock Market Index	0.0001 (+/- 0.00001)
	p = 0.001***
Commercial Real Estate Price Index	0.025 (+/- 0.004)
	p = 0.00000 <sup>***</sup>
LN_30-year Treasury Yield	20.874 (+/- 3.536)
	p = 0.00001 <sup>***</sup>
20-year Treasury Yield	14.653 (+/- 2.716)
	p = 0.00001 <sup>***</sup>
LN_20-year Treasury Yield	-38.681 (+/- 5.641)
	p = 0.00000 <sup>***</sup>
LN_7-year Treasury Yield	4.211 (+/- 0.599)
	p = 0.00000 <sup>***</sup>
20-year Treasury Yield_2	-1.070 (+/- 0.259)
	p = 0.0003***
Market Volatility Index_2	0.0002 (+/- 0.0001)
	p = 0.002***
Observations	40
R <sup>2</sup>	0.984
Adjusted R <sup>2</sup>	0.977
Residual Std. Error	0.284 (df = 28)
F Statistic	154.646 <sup>***</sup> (df = 11; 28)
Note:	*p<0.1; **p< 0.05; ***p<0.01

**REGRESSION FOR 3-MONTH TREASURY YIELD** 

	Dependent variable (+/- SE):
	6-month Treasury Yield
Constant	0.821 (+/- 0.742)
	p = 0.277
Moody's AAA Curve	-2.406 (+/- 0.317)
	p = 0.000 <sup>***</sup>
Real GDP growth	0.174 (+/- 0.035)
	p = 0.00002***
Nominal GDP growth	-0.161 (+/- 0.032)
	p = 0.00002***
30-year Mortgate Rate	1.428 (+/- 0.163)
	p = 0.000 <sup>***</sup>
10-year Treasury Yield	1.644 (+/- 0.337)
	p = 0.00003 <sup>***</sup>
Observations	40
R <sup>2</sup>	0.967
Adjusted R <sup>2</sup>	0.962
Residual Std. Error	0.370 (df = 34)
F Statistic	198.242 <sup>***</sup> (df = 5; 34)
Note:	*p<0.1; **p< 0.05; ***p<0.01

**REGRESSION FOR 6-MONTH TREASURY YIELD**
	Dependent variable (+/- SE):
	1-year Treasury Yield
Constant	-5.638 (+/- 1.298)
	p = 0.0002***
SP500 Stock Price Index	0.0003 (+/- 0.0001)
	p = 0.005 <sup>***</sup>
Moody's AAA Curve	-1.553 (+/- 0.424)
	p = 0.001***
Real GDP growth	0.134 (+/- 0.034)
	p = 0.0005 <sup>***</sup>
Nominal GDP growth	-0.126 (+/- 0.030)
	p = 0.0003***
30-year Mortgate Rate	1.513 (+/- 0.267)
	p = 0.00001***
Commercial Real Estate Price Index	0.012 (+/- 0.004)
	p = 0.002***
LN_30-year Treasury Yield	9.566 (+/- 2.182)
	p = 0.0002 <sup>***</sup>
20-year Treasury Yield	-5.594 (+/- 0.863)
	p = 0.00000 <sup>***</sup>
10-year Treasury Yield	4.203 (+/- 0.712)
	p = 0.00001 <sup>***</sup>
LN_10-year Treasury Yield	-2.692 (+/- 0.922)
	p = 0.007***
Observations	40
R <sup>2</sup>	0.989
Adjusted R <sup>2</sup>	0.986
Residual Std. Error	0.212 (df = 29)
F Statistic	271.385 <sup>***</sup> (df = 10; 29)
Note:	*p<0.1; **p< 0.05; ***p<0.01

**REGRESSION FOR 1-YEAR TREASURY YIELD** 

	Dependent variable (+/- SE):
	3-year Treasury Yield
Constant	-4.628 (+/- 1.396)
	p = 0.003 <sup>***</sup>
Moody's BAA Curve	-1.019 (+/- 0.181)
	p = 0.00001 <sup>***</sup>
Nominal GDP growth	-0.016 (+/- 0.005)
	p = 0.002***
Unemployment Rate	-0.316 (+/- 0.044)
	p = 0.00000***
BBB corporate yield	1.063 (+/- 0.189)
	p = 0.00001***
20-year Treasury Yield	10.561 (+/- 2.036)
	p = 0.00002***
LN_20-year Treasury Yield	-14.968 (+/- 2.741)
	p = 0.00001***
20-year Treasury Yield_2	-0.733 (+/- 0.171)
	p = 0.0002***
Market Volatility Index_2	-0.0001 (+/- 0.00003)
	p = 0.006***
Observations	40
R <sup>2</sup>	0.990
Adjusted R <sup>2</sup>	0.988
Residual Std. Error	0.155 (df = 31)
F Statistic	396.705 <sup>***</sup> (df = 8; 31)
Note:	*p<0.1; **p< 0.05; ***p<0.01

**REGRESSION FOR 3-YEAR TREASURY YIELD** 

Dependent variable (+/- SE,	
	5-year Treasury Yield
Constant	-11.808 (+/- 2.122)
	p = 0.00001***
Real GDP growth	-0.024 (+/- 0.006)
	p = 0.0002***
Unemployment Rate	-0.361 (+/- 0.044)
	p = 0.000 <sup>***</sup>
30-year Treasury Yield	20.570 (+/- 3.114)
	p = 0.00000 <sup>***</sup>
LN_30-year Treasury Yield	-29.526 (+/- 4.352)
	p = 0.00000 <sup>***</sup>
30-year Treasury Yield_2	-1.509 (+/- 0.267)
	p = 0.00001***
Observations	40
R <sup>2</sup>	0.967
Adjusted R <sup>2</sup>	0.962
Residual Std. Error	0.235 (df = 34)
F Statistic	200.540 <sup>***</sup> (df = 5; 34)
Note:	*p<0.1; **p< 0.05; ***p<0.01

**REGRESSION FOR 5-YEAR TREASURY YIELD** 

	Dependent variable (+/- SE):
	7-year Treasury Yield
Constant	1.519 (+/- 0.731)
	p = 0.046**
Unemployment Rate	-0.109 (+/- 0.020)
	p = 0.00001***
BBB corporate yield	0.737 (+/- 0.073)
	p = 0.000 <sup>***</sup>
Prime Rate	-0.457 (+/- 0.156)
	p = 0.007 <sup>***</sup>
Dow Total Stock Market Index	0.0001 (+/- 0.00001)
	p = 0.00001***
Home Price Index	-0.013 (+/- 0.003)
	p = 0.0001***
6-month Treasury Yield	0.588 (+/- 0.177)
	p = 0.003***
Observations	40
R <sup>2</sup>	0.977
Adjusted R <sup>2</sup>	0.973
Residual Std. Error	0.181 (df = 33)
F Statistic	233.227 <sup>***</sup> (df = 6; 33)
Note:	*p<0.1; **p< 0.05; ***p<0.01

**REGRESSION FOR 7-YEAR TREASURY YIELD** 

	Dependent variable (+/- SE):
	10-year Treasury Yield
Constant	3.933 (+/- 0.394)
	p = 0.000 <sup>***</sup>
Unemployment Rate	-0.142 (+/- 0.027)
	p = 0.00001***
Commercial Real Estate Price Index	-0.009 (+/- 0.001)
	p = 0.00000 <sup>***</sup>
1-month Treasury Yield	-2.098 (+/- 0.297)
	p = 0.00000 <sup>***</sup>
6-month Treasury Yield	2.946 (+/- 0.428)
	p = 0.00000 <sup>***</sup>
LN_6-month Treasury Yield	-0.394 (+/- 0.103)
	p = 0.001 <sup>***</sup>
6-month Treasury Yield_2	-0.215 (+/- 0.060)
	p = 0.002 <sup>***</sup>
1-month Treasury Yield_2	0.212 (+/- 0.044)
	p = 0.00004 <sup>***</sup>
Observations	40
R <sup>2</sup>	0.960
Adjusted R <sup>2</sup>	0.951
Residual Std. Error	0.223 (df = 32)
F Statistic	110.269 <sup>***</sup> (df = 7; 32)
Note:	*p<0.1; **p< 0.05; ***p<0.01

REGRESSION FOR 10-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	20-year Treasury Yield
Constant	0.305 (+/- 0.194)
	p = 0.126
US Fed Reserve O-N Loan Rate	2.506 (+/- 0.458)
	p = 0.00001***
Real GDP growth	0.182 (+/- 0.038)
	p = 0.00005 <sup>***</sup>
Nominal GDP growth	-0.181 (+/- 0.039)
	p = 0.0001***
CPI Inflation Rate	0.112 (+/- 0.031)
	p = 0.002 <sup>***</sup>
1-month Treasury Yield	-2.647 (+/- 0.428)
	p = 0.00000 <sup>***</sup>
3-year Treasury Yield	1.410 (+/- 0.095)
	p = 0.000***
LN_1-year Treasury Yield	-0.546 (+/- 0.081)
	p = 0.00000 <sup>***</sup>
3-month Treasury Yield_2	-0.165 (+/- 0.041)
	p = 0.0004 <sup>***</sup>
1-month Treasury Yield_2	0.160 (+/- 0.035)
	p = 0.0001 <sup>***</sup>
Observations	40
R <sup>2</sup>	0.982
Adjusted R <sup>2</sup>	0.976
Residual Std. Error	0.146 (df = 30)
F Statistic	178.774 <sup>***</sup> (df = 9; 30)
Note:	*p<0.1; **p< 0.05; ***p<0.01

REGRESSION FOR 20-YEAR TREASURY YIELD

	Dependent variable (+/- SE):
	30-year Treasury Yield
Constant	1.529 (+/- 0.216)
	p = 0.00000***
BBB corporate yield	0.147 (+/- 0.049)
	p = 0.006 <sup>***</sup>
Home Price Index	-0.003 (+/- 0.001)
	p = 0.001***
LN_5-year Treasury Yield	2.645 (+/- 0.282)
	p = 0.000 <sup>***</sup>
LN_6-month Treasury Yield	0.185 (+/- 0.052)
	p = 0.002 <sup>***</sup>
3-year Treasury Yield	0.497 (+/- 0.144)
	p = 0.002 <sup>***</sup>
LN_3-year Treasury Yield	-1.928 (+/- 0.238)
	p = 0.000 <sup>***</sup>
1-year Treasury Yield	-0.377 (+/- 0.108)
	p = 0.002 <sup>***</sup>
1-month Treasury Yield_2	0.042 (+/- 0.005)
	p = 0.000 <sup>***</sup>
Observations	40
R <sup>2</sup>	0.988
Adjusted R <sup>2</sup>	0.985
Residual Std. Error	0.101 (df = 31)
F Statistic	317.167 <sup>***</sup> (df = 8; 31)
Note:	*p<0.1; **p< 0.05; ***p<0.01

**REGRESSION FOR 30-YEAR TREASURY YIELD** 

## 30-year Mortgage Rate

	Dependent variable (+/- SE):
	30-year Mortgate Rate
Constant	3.421 (+/- 0.311)
	p = 0.000 <sup>***</sup>
SP500 Stock Price Index	-0.001 (+/- 0.0001)
	p = 0.00001 <sup>***</sup>
Home Price Index	0.023 (+/- 0.003)
	p = 0.00000***
Commercial Real Estate Price Index	-0.014 (+/- 0.002)
	p = 0.00000***
LN_6-month Treasury Yield	-0.754 (+/- 0.140)
	p = 0.00001***
1-year Treasury Yield	0.645 (+/- 0.060)
	p = 0.000 <sup>***</sup>
LN_1-year Treasury Yield	0.790 (+/- 0.161)
	p = 0.00003***
Observations	40
R <sup>2</sup>	0.984
Adjusted R <sup>2</sup>	0.982
Residual Std. Error	0.181 (df = 33)
F Statistic	348.294 <sup>***</sup> (df = 6; 33)
Note:	*p<0.1; **p< 0.05; ***p<0.01

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

### Moody's AAA & BAA Rates

	Dependent variable (+/- SE):
	Moody's AAA Curve
Constant	3.489 (+/- 0.159)
	p = 0.000***
Dow Total Stock Market Index	-0.00003 (+/- 0.00000)
	p = 0.000***
1-month Treasury Yield	-0.816 (+/- 0.231)
	p = 0.002***
6-month Treasury Yield	2.300 (+/- 0.688)
	p = 0.003***
3-year Treasury Yield	1.588 (+/- 0.186)
	p = 0.000***
1-year Treasury Yield	-2.781 (+/- 0.650)
	p = 0.0002***
1-month Treasury Yield_2	0.081 (+/- 0.013)
	p = 0.00000 <sup>***</sup>
Observations	40
R <sup>2</sup>	0.957
Adjusted R <sup>2</sup>	0.950
Residual Std. Error	0.178 (df = 33)
F Statistic	123.431 <sup>***</sup> (df = 6; 33)
Note:	*p<0.1; **p< 0.05; ***p<0.01

#### REGRESSION FOR MOODY'S AAA CURVE

	Dependent variable (+/- SE):
	Moody's BAA Curve
Constant	3.903 (+/- 0.414)
	p = 0.000 <sup>***</sup>
Unemployment Rate	0.151 (+/- 0.045)
	p = 0.002 <sup>***</sup>
Dow Total Stock Market Index	-0.00003 (+/- 0.00001)
	p = 0.00002***
LN_7-year Treasury Yield	1.214 (+/- 0.196)
	p = 0.00000***
3-month Treasury Yield_2	0.045 (+/- 0.010)
	p = 0.00004 <sup>***</sup>
Observations	40
R <sup>2</sup>	0.902
Adjusted R <sup>2</sup>	0.890
Residual Std. Error	0.276 (df = 35)
F Statistic	80.171 <sup>***</sup> (df = 4; 35)
Note:	*p<0.1; **p< 0.05; ***p<0.01

REGRESSION FOR MOODY'S BAA CURVE

### BBB Corporate Yield

	Dependent variable (+/- SE):
	BBB corporate yield
Constant	0.050 (+/- 0.495)
	p = 0.920
Real GDP growth	0.089 (+/- 0.017)
	p = 0.00002***
Nominal GDP growth	-0.077 (+/- 0.016)
	p = 0.00004 <sup>***</sup>
Unemployment Rate	0.188 (+/- 0.042)
	p = 0.0002***
LN_Market Volatility Index	<ul><li>0.371 (+/- 0.080)</li></ul>
	p = 0.0001***
30-year Treasury Yield	1.644 (+/- 0.287)
	p = 0.00001 <sup>***</sup>
7-year Treasury Yield	-3.520 (+/- 0.531)
	p = 0.00000***
LN_7-year Treasury Yield	2.109 (+/- 0.419)
	p = 0.00003 <sup>***</sup>
3-month Treasury Yield	-0.844 (+/- 0.100)
	p = 0.000 <sup>***</sup>
3-year Treasury Yield	2.525 (+/- 0.266)
	p = 0.000 <sup>***</sup>
6-month Treasury Yield_2	0.075 (+/- 0.015)
	p = 0.00002***
Observations	40
R <sup>2</sup>	0.987
Adjusted R <sup>2</sup>	0.983
Residual Std. Error	0.143 (df = 29)
F Statistic	220.533 <sup>***</sup> (df = 10; 29)
Note:	*p<0.1; **p< 0.05; ***p<0.01

### REGRESSION FOR BBB CORPORATE YIELD

### Prime Rate

	Dependent variable (+/- SE):
	Prime Rate
Constant	-13.409 (+/- 3.453)
	p = 0.001***
Moody's AAA Curve	-2.052 (+/- 0.545)
	p = 0.001***
Real GDP growth	0.298 (+/- 0.050)
	p = 0.00001 <sup>***</sup>
Nominal GDP growth	-0.263 (+/- 0.046)
	p = 0.00001 <sup>***</sup>
Dow Total Stock Market Index	0.0001 (+/- 0.00002)
	p = 0.001***
Commercial Real Estate Price Index	0.025 (+/- 0.004)
	p = 0.00000 <sup>***</sup>
LN_30-year Treasury Yield	21.808 (+/- 3.869)
	p = 0.00001***
20-year Treasury Yield	12.188 (+/- 2.972)
	p = 0.0004***
LN_20-year Treasury Yield	-35.817 (+/- 6.173)
	p = 0.00001***
LN_7-year Treasury Yield	3.907 (+/- 0.655)
	p = 0.00001***
20-year Treasury Yield_2	-0.862 (+/- 0.283)
	p = 0.005 <sup>***</sup>
Market Volatility Index_2	0.0002 (+/- 0.0001)
	p = 0.003***
Observations	40
R <sup>2</sup>	0.980
Adjusted R <sup>2</sup>	0.972
Residual Std. Error	0.311 (df = 28)
F Statistic	122.068 <sup>***</sup> (df = 11; 28)
Note:	*p<0.1; **p< 0.05; ***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	1.655 (+/- 0.572)
	p = 0.007***
Moody's AAA Curve	1.326 (+/- 0.377)
	p = 0.002***
BBB corporate yield	-0.571 (+/- 0.160)
	p = 0.002***
LN_3-year Treasury Yield	0.524 (+/- 0.155)
	p = 0.002***
LN_1-year Treasury Yield	-0.239 (+/- 0.085)
	p = 0.009***
20-year Treasury Yield_2	0.662 (+/- 0.061)
	p = 0.000***
30-year Treasury Yield_2	-0.801 (+/- 0.092)
	p = 0.000***
Observations	40
R <sup>2</sup>	0.914
Adjusted R <sup>2</sup>	0.899
Residual Std. Error	0.198 (df = 33)
F Statistic	58.687 <sup>***</sup> (df = 6; 33)
Note:	*p<0.1; **p< 0.05; ***p<0.01

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

## US Federal Reserve Overnight Lending Rate

	Dependent variable (+/- SE):
	US Fed Reserve O-N Loan Rate
Constant	-16.607 (+/- 3.350)
	p = 0.00004 <sup>***</sup>
Moody's AAA Curve	-2.212 (+/- 0.529)
	p = 0.0003***
Real GDP growth	0.285 (+/- 0.049)
	p = 0.00001 <sup>***</sup>
Nominal GDP growth	-0.251 (+/- 0.045)
	p = 0.00001 <sup>***</sup>
Dow Total Stock Market Index	0.0001 (+/- 0.00001)
	p = 0.001***
Commercial Real Estate Price Index	0.025 (+/- 0.004)
	p = 0.00000 <sup>***</sup>
LN_30-year Treasury Yield	23.078 (+/- 3.753)
	p = 0.00001 <sup>***</sup>
20-year Treasury Yield	12.707 (+/- 2.883)
	p = 0.0002***
LN_20-year Treasury Yield	-37.896 (+/- 5.988)
	p = 0.00000 <sup>***</sup>
LN_7-year Treasury Yield	4.260 (+/- 0.636)
	p = 0.00000 <sup>***</sup>
20-year Treasury Yield_2	-0.894 (+/- 0.275)
	p = 0.003***
Market Volatility Index_2	0.0002 (+/- 0.0001)
	p = 0.002***
Observations	40
R <sup>2</sup>	0.981
Adjusted R <sup>2</sup>	0.973
Residual Std. Error	0.302 (df = 28)
F Statistic	129.661 <sup>***</sup> (df = 11; 28)
Note:	*p<0.1; **p< 0.05; ***p<0.01

#### REGRESSION FOR US FED RESERVE O-N LOAN RATE

Dependent variable (+/- SE		
	Dow Total Stock Market Index	
Constant	57,138.940 (+/- 4,193.281)	
	p = 0.000***	
US Fed Reserve O-N Loan Rate	-16,891.360 (+/- 2,470.944)	
	p = 0.00001 <sup>***</sup>	
Moody's BAA Curve	16,101.680 (+/- 3,236.129)	
	p = 0.0002 <sup>***</sup>	
Real GDP growth	-1,829.176 (+/- 425.358)	
	p = 0.001***	
Nominal GDP growth	2,158.931 (+/- 383.021)	
	p = 0.00005 <sup>***</sup>	
Real disposable income growth	-191.799 (+/- 20.551)	
	p = 0.00000 <sup>***</sup>	
Unemployment Rate	4,184.340 (+/- 625.496)	
	p = 0.00001***	
CPI Inflation Rate	-1,215.433 (+/- 274.008)	
	p = 0.0005 <sup>***</sup>	
BBB corporate yield	-14,346.030 (+/- 3,237.395)	
	p = 0.0005 <sup>***</sup>	
30-year Mortgate Rate	10,078.080 (+/- 1,498.683)	
	p = 0.00001***	
Market Volatility Index	-136.475 (+/- 19.459)	
	p = 0.00001***	
30-year Treasury Yield	120,267.700 (+/- 16,712.430)	
	p = 0.00001***	
LN_30-year Treasury Yield	-444,861.600 (+/- 41,806.510)	
	p = 0.00000 <sup>***</sup>	
10-year Treasury Yield	-87,475.310 (+/- 12,547.010)	
	p = 0.00001***	
LN_10-year Treasury Yield	267,229.200 (+/- 26,056.150)	
	p = 0.00000 <sup>***</sup>	
3-month Treasury Yield	44,063.320 (+/- 8,043.746)	
	p = 0.0001***	
LN_5-year Treasury Yield	-28,045.590 (+/- 4,663.323)	
	p = 0.00003***	

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

6-month Treasury Yield	-70,274.030 (+/- 14,379.210)		
	p = 0.0002***		
LN_6-month Treasury Yield	11,047.010 (+/- 1,764.194)		
	p = 0.00002 <sup>***</sup>		
1-year Treasury Yield	54,075.230 (+/- 11,159.490)		
	p = 0.0003***		
LN_1-year Treasury Yield	-13,787.610 (+/- 2,506.391)		
	p = 0.0001***		
1-year Treasury Yield_2	-13,686.750 (+/- 1,859.122)		
	p = 0.00001***		
3-year Treasury Yield_2	3,037.140 (+/- 605.720)		
	p = 0.0002***		
6-month Treasury Yield_2	14,750.210 (+/- 2,323.714)		
	p = 0.00002 <sup>***</sup>		
3-month Treasury Yield_2	-4,082.980 (+/- 975.971)		
	p = 0.001***		
Observations	40		
R <sup>2</sup>	0.998		
Adjusted R <sup>2</sup>	0.995		
Residual Std. Error	763.893 (df = 15)		
F Statistic	309.269 <sup>***</sup> (df = 24; 15)		
Note:	*p<0.1; **p< 0.05; ***p<0.01		

	Dependent variable (+/- SE):
	SP500 Stock Price Index
Constant	-652.467 (+/- 1,103.974)
	p = 0.559
LN_30-year Treasury Yield	-17,403.990 (+/- 1,303.596)
	p = 0.000***
20-year Treasury Yield	17,599.050 (+/- 1,574.405)
	p = 0.000***
5-year Treasury Yield	-9,919.194 (+/- 1,242.214)
	p = 0.000***
LN_5-year Treasury Yield	3,302.249 (+/- 562.470)
	p = 0.00001***
LN_1-year Treasury Yield	750.656 (+/- 159.349)
	p = 0.0001***
6-month Treasury Yield_2	-482.762 (+/- 68.485)
	p = 0.00000 <sup>***</sup>
5-year Treasury Yield_2	1,606.445 (+/- 226.658)
	p = 0.00000 <sup>***</sup>
3-month Treasury Yield_2	473.514 (+/- 61.533)
	p = 0.000***
20-year Treasury Yield_2	-2,005.027 (+/- 240.305)
	p = 0.000***
Observations	40
R <sup>2</sup>	0.950
Adjusted R <sup>2</sup>	0.935
Residual Std. Error	275.417 (df = 30)
F Statistic	63.215 <sup>***</sup> (df = 9; 30)
Note:	*p<0.1; **p< 0.05; ***p<0.01

REGRESSION FOR SP500 STOCK PRICE INDEX

### House and Commercial Real Estate Price Indexes

	Dependent variable (+/- SE):
	Home Price Index
Constant	228.781 (+/- 40.964)
	p = 0.00002***
Real GDP growth	-3.644 (+/- 1.230)
	p = 0.007***
Nominal GDP growth	3.438 (+/- 1.126)
	p = 0.006***
30-year Treasury Yield	-197.795 (+/- 25.497)
	p = 0.00000***
LN_20-year Treasury Yield	657.416 (+/- 85.176)
	p = 0.00000 <sup>***</sup>
1-month Treasury Yield	-101.403 (+/- 14.095)
	p = 0.00000 <sup>***</sup>
7-year Treasury Yield	664.123 (+/- 169.598)
	p = 0.001***
LN_7-year Treasury Yield	-969.519 (+/- 141.114)
	p = 0.00000 <sup>***</sup>
3-month Treasury Yield	104.530 (+/- 16.142)
	p = 0.00001***
5-year Treasury Yield	-590.054 (+/- 129.526)
	p = 0.0002 <sup>***</sup>
LN_5-year Treasury Yield	593.241 (+/- 87.870)
	p = 0.00000****
LN_6-month Treasury Yield	31.893 (+/- 8.552)
	p = 0.002***
LN_1-year Treasury Yield	-37.501 (+/- 11.704)
	p = 0.004***
6-month Treasury Yield_2	-9.671 (+/- 1.913)
	p = 0.00005***
5-year Treasury Yield_2	81.457 (+/- 21.284)
	p = 0.001
7-year Treasury Yield_2	-76.317 (+/- 25.363)
	p = 0.007
1-month Treasury Yield_2	12.325 (+/- 1.896)
	p = 0.00001

**REGRESSION FOR HOME PRICE INDEX** 

## MACROECONOMIC FORECASTS, 4Q2024 - FINAL VERSION

Observations	40
R <sup>2</sup>	0.993
Adjusted R <sup>2</sup>	0.988
Residual Std. Error	5.576 (df = 23)
F Statistic	206.870 <sup>***</sup> (df = 16; 23)

Note:

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

	Dependent variable (+/- SE):
	Commercial Real Estate Price Index
Constant	734.168 (+/- 42.116)
	p = 0.000***
US Fed Reserve O-N Loan Rate	102.133 (+/- 15.677)
	p = 0.00005 <sup>***</sup>
Real GDP growth	-11.750 (+/- 0.844)
	p = 0.00000***
Nominal GDP growth	12.213 (+/- 0.856)
	p = 0.00000***
Real disposable income growth	5.816 (+/- 0.815)
	p = 0.00002***
Nominal disposable income growth	-6.005 (+/- 0.794)
	p = 0.00002***
BBB corporate yield	11.349 (+/- 2.249)
	p = 0.0004***
30-year Mortgate Rate	41.336 (+/- 3.587)
	p = 0.00000 <sup>***</sup>
Prime Rate	-116.364 (+/- 13.781)
	p = 0.00001***
30-year Treasury Yield	681.507 (+/- 34.153)
	p = 0.000***
LN_30-year Treasury Yield	-2,111.866 (+/- 87.525)
	p = 0.000***
10-year Treasury Yield	-251.442 (+/- 23.048)
	p = 0.00000 <sup>***</sup>
LN_10-year Treasury Yield	797.176 (+/- 35.411)
	p = 0.000***
1-month Treasury Yield	-52.862 (+/- 10.221)
	p = 0.0004***
LN_7-year Treasury Yield	-204.108 (+/- 46.708)
	p = 0.002***
3-month Treasury Yield	-47.118 (+/- 11.799)
	p = 0.003***
5-year Treasury Yield	-357.976 (+/- 49.449)
	p = 0.00002***
LN_5-year Treasury Yield	488.181 (+/- 89.711)

REGRESSION FOR COMMERCIAL REAL ESTATE PRICE INDEX

	p = 0.00004 <sup>***</sup>
LN 3-year Treasury Yield	-283.601 (+/- 38.984)
_ / /	p = 0.00002***
1-year Treasury Yield	-82.509 (+/- 19.466)
	p = 0.002***
LN_1-year Treasury Yield	28.858 (+/- 5.135)
	p = 0.0002***
1-year Treasury Yield_2	6.733 (+/- 1.528)
	p = 0.002***
3-year Treasury Yield_2	-32.085 (+/- 3.879)
	p = 0.00001***
3-month Treasury Yield_2	-4.201 (+/- 0.892)
	p = 0.001***
7-year Treasury Yield_2	18.826 (+/- 4.227)
	p = 0.001***
Market Volatility Index_2	-0.007 (+/- 0.0004)
	p = 0.000***
Observations	40
R <sup>2</sup>	1.000
Adjusted R <sup>2</sup>	0.998
Residual Std. Error	1.549 (df = 11)
F Statistic	877.148 <sup>***</sup> (df = 28; 11)
Note:	*p<0.1; **p< 0.05; ***p<0.01

## Market Volatility Index

	Dependent variable (+/- SE):
	Market Volatility Index
Constant	40.718 (+/- 6.226)
	p = 0.00000 <sup>***</sup>
BBB corporate yield	11.867 (+/- 3.339)
	p = 0.002 <sup>***</sup>
LN_30-year Treasury Yield	-61.482 (+/- 12.134)
	p = 0.00002***
Observations	40
R <sup>2</sup>	0.456
Adjusted R <sup>2</sup>	0.427
Residual Std. Error	9.832 (df = 37)
F Statistic	15.533 <sup>***</sup> (df = 2; 37)
Note:	*p<0.1; **p< 0.05; ***p<0.01

### REGRESSION FOR MARKET VOLATILITY INDEX

### Appendix A: Data Sources

The following table lists the attributes provided by Capitalytics as part of its macro-economic forecast service. The sources for data that are defined by the document "2024 Stress Test Scenarios" (found at https://www.federalreserve.gov/publications/files/2024-stress-test-scenarios-20240215.pdf) are listed. Please note that shaded attributes are not discussed within this report.

Tahlo	16.	Data	Values	and	Referenced	Sources
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Attribute	Referenced Source <sup>69</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>70</sup>	

<sup>69</sup> Per https://www.federalreserve.gov/newsevents/pressreleases/files/bcreg20190213a1.pdf

<sup>&</sup>lt;sup>70</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>71</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>72</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>71</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>72</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/2024-Table\_2A\_Historic\_Domestic.csv and https://www.federalreserve.gov/supervisionreg/files/2024-Table\_2B\_Historic\_International.csv (shown below, as of April 2024) by clicking the links marked "2024 Historical Domestic (CSV)" and "2024 Historical International (CSV)"<sup>73</sup>.



Since the CCAR dataset is only released annually (through 4Q2023 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>73</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) 3Q2024.

Table 17: Supplementary	Data	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.	
LIK Beal GDP Growth	Quarterly average of monthly series for "United Kingdom GDP	
	Growth Rate" per tradingeconomics.com	
	Quarterly average of monthly series for "United Kingdom	
or mation	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/2024-Table\_2A\_Historic\_Domestic.csv and https://www.federalreserve.gov/supervisionreg/files/2024-Table\_2B\_Historic\_International.csv, Capitalytics provides 13 additional metrics per the information in the following table. These values are available from the point at which they are collected (which varies from metric to metric) through (and including) 3Q2024.

Table 17: Supplementary Data Attributes and Sources

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

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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>74</sup> "forecast" package<sup>75</sup>; specifically, the "ets" function (see p.39 of https://cran.r-project.org/web/packages/forecast/forecast.pdf)<sup>76</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<sup>st</sup> forecasted value given the first n values of the metric's sequence (the "fitted" values)<sup>77</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>74</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>75</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>76</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>77</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>78</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>79</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>78</sup> It bears noting that a lower value for the "score" indicates better accuracy of an algorithm.

<sup>&</sup>lt;sup>79</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>80</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>80</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 7: Correlation Factors found as of 3Q2024 Image: Control of the sector secto

Variable 1	Variable 2	Correlation
S&P 500 Stock Price Index	Cost of Federal Funds	0.600249
S&P 500 Stock Price Index	US Prime Rate	0.613951
S&P 500 Stock Price Index	Dow-Jones Total Stock Market Index	0.97138
S&P 500 Stock Price Index	US Nat'l Residential Home Price Index	0.949642
S&P 500 Stock Price Index	US Nat'l Commercial Real Estate Index	0.862818
S&P 500 Stock Price Index	Average Retail Gasoline Price (all grades)	0.705129
S&P 500 Stock Price Index	1-month Treasury Yield	0.612375
S&P 500 Stock Price Index	3-month Treasury Yield	0.619728
S&P 500 Stock Price Index	6-month Treasury Yield	0.605393
Cost of Federal Funds	Moody's AAA Yield	0.763628
Cost of Federal Funds	Moody's BAA Yield	0.706487
Cost of Federal Funds	BofA BBB Corporate Yield	0.738807
Cost of Federal Funds	US 30-year Fixed Interest Mortgage Rate	0.869768
Cost of Federal Funds	US Prime Rate	0.996337
Cost of Federal Funds	10-year Treasury Yield	0.828186
Cost of Federal Funds	1-month Treasury Yield	0.990813
Cost of Federal Funds	7-year Treasury Yield	0.769058
Cost of Federal Funds	3-month Treasury Yield	0.995449
Cost of Federal Funds	5-year Treasury Yield	0.905401
Cost of Federal Funds	6-month Treasury Yield	0.988489
Cost of Federal Funds	3-year Treasury Yield	0.920138
Cost of Federal Funds	1-year Treasury Yield	0.979128
Moody's AAA Yield	Moody's BAA Yield	0.979263
Moody's AAA Yield	BofA BBB Corporate Yield	0.947999
Moody's AAA Yield	US 30-year Fixed Interest Mortgage Rate	0.961682
Moody's AAA Yield	US Prime Rate	0.739251
Moody's AAA Yield	Dow-Jones Total Stock Market Index	-0.708793
Moody's AAA Yield	US Nat'l Residential Home Price Index	-0.74732
Moody's AAA Yield	US Nat'l Commercial Real Estate Index	-0.821595
Moody's AAA Yield	Average Retail Gasoline Price (all grades)	-0.702211
Moody's AAA Yield	30-year Treasury Yield	0.968308
Moody's AAA Yield	20-year Treasury Yield	0.967982
Moody's AAA Yield	10-year Treasury Yield	0.983268
Moody's AAA Yield	7-year Treasury Yield	0.858268
Moody's AAA Yield	3-month Treasury Yield	0.756015
Moody's AAA Yield	5-year Treasury Yield	0.937189
Moody's AAA Yield	3-year Treasury Yield	0.625264
Moody's BAA Yield	BofA BBB Corporate Yield	0.983491
Moody's BAA Yield	US 30-year Fixed Interest Mortgage Rate	0.934513
Moody's BAA Yield	US Prime Rate	0.68146
Moody's BAA Yield	Dow-Jones Total Stock Market Index	-0.72848
Moody's BAA Yield	US Nat'l Residential Home Price Index	-0.738525
Moody's BAA Yield	US Nat'l Commercial Real Estate Index	-0.800038
Moody's BAA Yield	Average Retail Gasoline Price (all grades)	-0.667816
Moody's BAA Yield	30-year Treasury Yield	0.868742
Moody's BAA Yield	20-year Treasury Yield	0.876733
Moody's BAA Yield	10-year Treasury Yield	0.946511
Moody's BAA Yield	7-year Treasury Yield	0.740021
Moody's BAA Yield	3-month Treasury Yield	0.696758
Moody's BAA Yield	5-year Treasury Yield	0.886391

## MACROECONOMIC FORECASTS, 4Q2024 - FINAL VERSION

Real GDP Growth Rate	Nominal GDP Growth Rate	0.958147
Real Disposable Income Growth Rate	Nominal Disposable Income Growth Rate	0.972051
unemployment_rate	1-year Treasury Yield	-0.608122
BofA BBB Corporate Yield	US 30-year Fixed Interest Mortgage Rate	0.933301
BofA BBB Corporate Yield	US Prime Rate	0.716281
BofA BBB Corporate Yield	Dow-Jones Total Stock Market Index	-0.646392
BofA BBB Corporate Yield	US Nat'l Residential Home Price Index	-0.649397
BofA BBB Corporate Yield	US Nat'l Commercial Real Estate Index	-0.701886
BofA BBB Corporate Yield	30-year Treasury Yield	0.774135
BofA BBB Corporate Yield	20-year Treasury Yield	0.810713
BofA BBB Corporate Yield	10-year Treasury Yield	0.925512
BofA BBB Corporate Yield	7-year Treasury Yield	0.736412
BofA BBB Corporate Yield	3-month Treasury Yield	0.731183
BofA BBB Corporate Yield	5-year Treasury Yield	0.884422
US 30-year Fixed Interest Mortgage Rate	US Prime Rate	0.851387
US 30-year Fixed Interest Mortgage Rate	US Nat'l Commercial Real Estate Index	-0.663575
US 30-year Fixed Interest Mortgage Rate	30-year Treasury Yield	0.87346
US 30-year Fixed Interest Mortgage Rate	20-year Treasury Yield	0.919605
US 30-year Fixed Interest Mortgage Rate	10-year Treasury Yield	0.98237
US 30-year Fixed Interest Mortgage Rate	1-month Treasury Yield	0.740658
US 30-year Fixed Interest Mortgage Rate	7-year Treasury Yield	0.955691
US 30-year Fixed Interest Mortgage Rate	3-month Treasury Yield	0.872891
US 30-year Fixed Interest Mortgage Rate	5-vear Treasury Yield	0.978282
US 30-year Fixed Interest Mortgage Rate	6-month Treasury Yield	0.764048
US 30-year Fixed Interest Mortgage Rate	3-vear Treasury Yield	0.879118
US 30-year Fixed Interest Mortgage Rate	1-year Treasury Yield	0.788233
US Prime Rate	10-year Treasury Yield	0.805461
US Prime Rate	1-month Treasury Yield	0.99064
US Prime Rate	7-vear Treasury Yield	0.75355
US Prime Rate	3-month Treasury Yield	0.99253
US Prime Rate	5-vear Treasury Yield	0.887459
US Prime Rate	6-month Treasury Vield	0.987295
US Prime Rate	3-year Treasury Yield	0 910068
US Prime Rate	1-vear Treasury Yield	0.975963
Dow-Jones Total Stock Market Index	US Nat'l Residential Home Price Index	0.931552
Dow-Jones Total Stock Market Index	US Nat'l Commercial Real Estate Index	0.908065
Dow-Jones Total Stock Market Index	Average Retail Gasoline Price (all grades)	0.609347
Dow-Jones Total Stock Market Index	10-year Treasury Yield	-0 630448
US Nat'l Residential Home Price Index	US Nat'l Commercial Real Estate Index	0.96283
US Nat'l Residential Home Price Index	Average Retail Gasoline Price (all grades)	0 716151
US Nat'l Residential Home Price Index	10-year Treasury Vield	-0 666854
US Nat'l Commercial Real Estate Index	Average Retail Gasoline Price (all grades)	0.746298
US Nat'l Commercial Real Estate Index	10-year Treasury Vield	-0 75/8
US Nat'l Commercial Real Estate Index	5-year Treasury Vield	-0.7548
Average Retail Gasoline Price (all grades)	10-year Treasury Vield	-0 676569
Average Retail Gasoline Price (all grades)	5-vear Treasury Vield	-0 645027
30-year Treasury Vield	20-year Treasury Vield	0.0+3027
30-year Treasury Tield		0.956626
30-year Treasury Vield	To-year Treasury field	0.930020
20 year Treasury Tield	5 year Trocsury Viold	0.003303
20 year Treasury Vield	2 year Trocsury Viold	0.797392
20 yoar Traasury Vield	10 yoar Troasury Viold	0.0301/1
20-year Treasury Viold	To-year Treasury Tield	0.0070054
20-year Treasury Tield	-year Treasury Yield	0.92/335
20-year Treasury Yield	2 year Treasury Vield	0.80399
20-year Treasury Yield	5-year Treasury Yield	0.72845
10-year Treasury Yield		0.020305
	7-year Treasury Yield	0.975647
10-year Treasury Yield		0.827738
10-year Treasury Yield	5-year Treasury Yield	0.9/8/81
10-year Treasury Yield		0.651373
10-year Treasury Yield	3-year Treasury Yield	0.826334
10-year Treasury Yield	1-year Treasury Yield	0.683997
1-month Treasury Yield	/-year Treasury Yield	0.750574
## MACROECONOMIC FORECASTS, 4Q2024 - FINAL VERSION

1-month Treasury Yield	3-month Treasury Yield	0.996072
1-month Treasury Yield	5-year Treasury Yield	0.827733
1-month Treasury Yield	6-month Treasury Yield	0.990502
1-month Treasury Yield	3-year Treasury Yield	0.913909
1-month Treasury Yield	1-year Treasury Yield	0.979643
7-year Treasury Yield	3-month Treasury Yield	0.76271
7-year Treasury Yield	5-year Treasury Yield	0.984837
7-year Treasury Yield	6-month Treasury Yield	0.777239
7-year Treasury Yield	3-year Treasury Yield	0.923568
7-year Treasury Yield	1-year Treasury Yield	0.807706
3-month Treasury Yield	5-year Treasury Yield	0.909701
3-month Treasury Yield	6-month Treasury Yield	0.9969
3-month Treasury Yield	3-year Treasury Yield	0.927637
3-month Treasury Yield	1-year Treasury Yield	0.988809
5-year Treasury Yield	6-month Treasury Yield	0.858041
5-year Treasury Yield	3-year Treasury Yield	0.974014
5-year Treasury Yield	1-year Treasury Yield	0.886297
6-month Treasury Yield	3-year Treasury Yield	0.942735
6-month Treasury Yield	1-year Treasury Yield	0.996657
3-year Treasury Yield	1-year Treasury Yield	0.963258

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