

US Sovereign Default Risk in a Higher Interest Rate Environment

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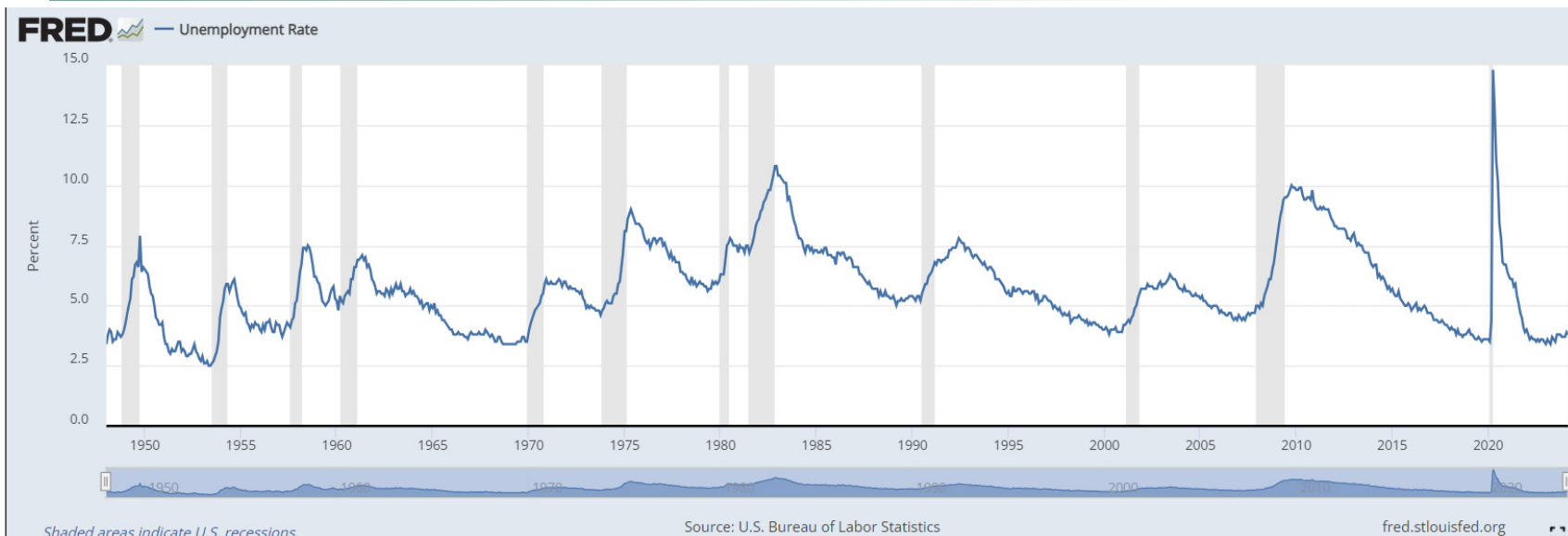
Agenda

- Defining forces of the recent economic environment and the perceived challenges it poses to US sovereign debt credit standing
- The outline of the data used and methodology
- How sovereign borrowers are different from individual and business borrowers
- Forecasts simulation results
- Analyzing different scenarios
- Summary

The Defining Economic Forces of the last 5 Years

- A global pandemic that has depressed natural economic activity and employment to an extent to a level not seen since the Great Depression
- The government and monetary authorities were compelled to respond with unprecedented levels of fiscal and monetary stimulus
- In the aftermath of the pandemic disruptions to supply chain and disbalances between money supply and supply of goods and services caused significantly elevated inflation.
- The Fed's response was to start shrinking its balance sheet and impose other measures to increase borrowing rates, reduce credit, and bring down inflation.
- **The significance for the US Treasury is that it was caught with a massively expanded debt that would then need to be refinanced at higher rates**

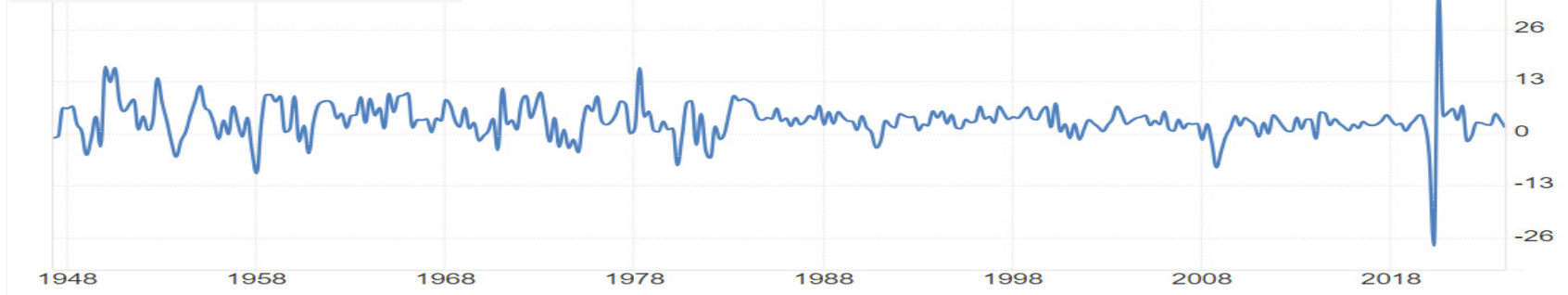
Economic Forces (cont'd)



3Y 5Y 10Y MAX Compare + Export API

TRADING ECONOMICS

United States GDP Growth Rate

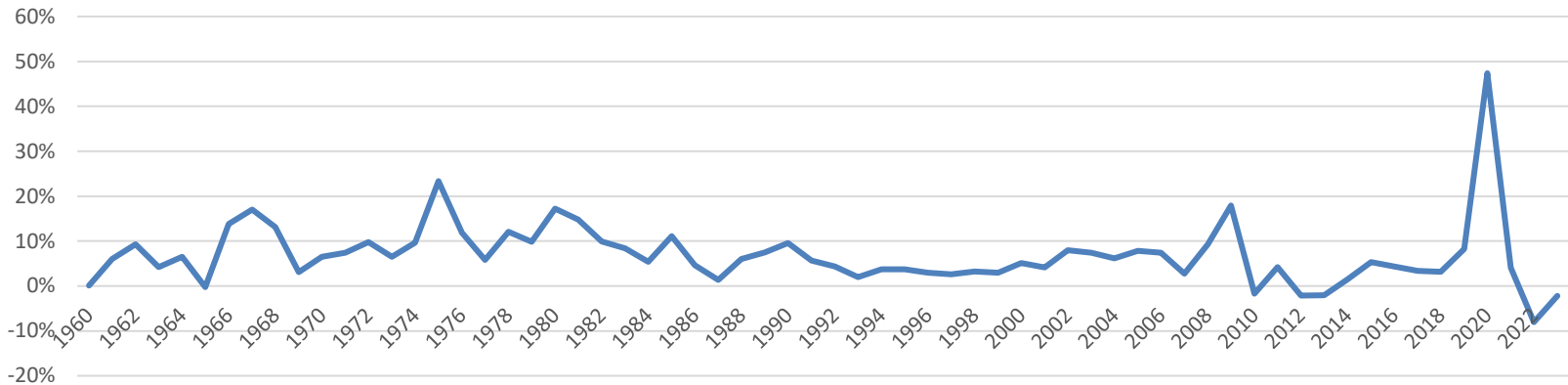


U.S. Bureau of Economic Analysis

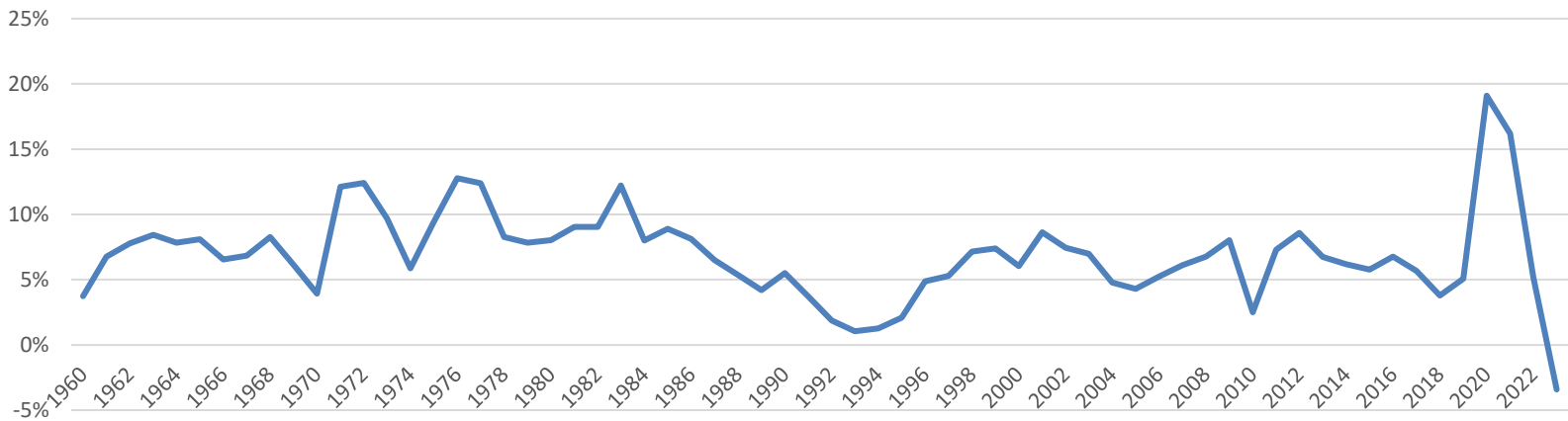
Value Chg Chg%

Economic Forces (cont'd)

YOY % Increase In Government Spending (Source: White House OMB)



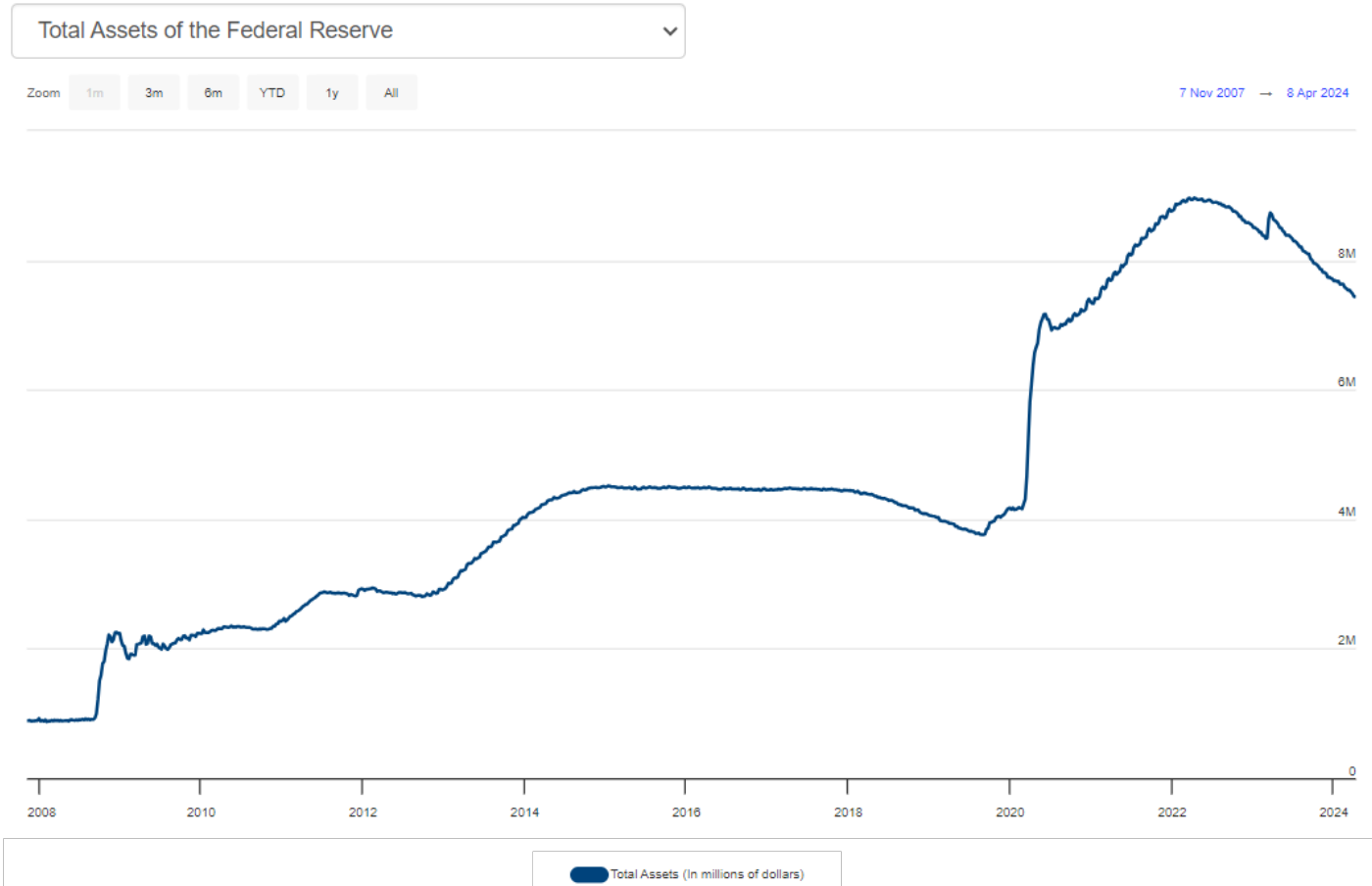
YOY % Change in Money Supply M2 - Source FRED



Economic Forces (cont'd)

Recent balance sheet trends

Choose one of the 5 charts.



Northfield's Work in Sovereign Credit

- We developed our first dedicated sovereign credit default model in 2012.
- Our original paper on this topic received the Professional Risk Management International Association award New Frontiers in Risk Management in 2013
- The paper was first reproduced as a monograph by the Society of Actuaries in the same year
- A revised version of the work became a textbook chapter "Finance Meets Macroeconomics: A Structural Model of Sovereign Credit Risk" in "Contingent Claims Analysis in Corporate Finance", World Scientific, 2019.
- In short, the model is based on the premise that price of credit risk can be thought of that of a put option and can be computed if one is able to estimate the value of the sovereign fiscal asset and its volatility.

From the “Q”-world to the “P”-world

- Option pricing – whether arbitrage-based or martingale-based – rests on the notion of risk neutrality. In it, the price of the option is the present value of the average of some future outcomes sourced from an augmented (risk-neutral) probability distribution, as opposed to the “real world” probability distribution.
- This framework produces useful results for finding connections between the risk factor exposures of the stock market of a country and those of its publicly traded sovereign debt, or the size of its credit spread, but the probabilities of default (PD) estimated by such a model are, as the name implies, “risk-neutral”, not real-world PDs.
- The current economic environment has raised questions about the real-world prospects of default by the US government. To address these concerns, we need an explicit model of real-world PD. It is very much related to the risk-neutral model in terms of input data used and economic rationale, but the mechanics of estimation are such that they avoid the risk-neutral mark-to-market assumption.

Methodology

- We use data from the World Bank Database, FRED, and the White House Office of Management of the Budget
- The data items that are inputs to the model are histories of receipts and outlays by the federal government, level of government debt, money supply, government reserves.
- First, based on history we forecast the annual growth of the sovereign government fiscal revenues and their annual volatility.
- Then we perform an extremely robust simulation of the cumulative value of fiscal asset future value of the course of 60 years.
- Simultaneously, we forecasts the level of future obligations over the same time horizons (described next)

Methodology (cont'd)

- We consider three types of obligations:
 - Existing debt and its accrued interest,
 - Future debt and interest arising from funding forecasted budget deficits
 - Mandatory spending
- The trends in the three variables are extrapolated using historical growth rates.
- With respect to existing government debt and debt arising from future borrowing we consider two versions employed in two separate analyses:
 - The face value of debt plus accrued interest over the time horizon
 - Only the accrued interest over the time horizon
- The rationale for this distinct treatment is described next.

Sovereign Debt in Popular Culture



Sovereign Debt in Reality

- How is Sovereign Debt different from debt of individuals and debt of companies?
- By definition, no jurisdiction can force a *sovereign* government to sell assets to satisfy liabilities. Therefore, all credit analysis eventually should rely on naturally occurring cash inflows and outflows in the course of a country's governance.
- In contrast, for individual borrowers, the value of their assets vs. the value of their liabilities has a very direct impact on their lives. E.g. if a household must sell say their house in case their income deteriorates below the debt service.
- Corporate debt is similar that in case of not servicing their debt they can be forced by a court to liquidate their assets to satisfy liabilities. *Therefore, for both companies and individuals credit standing the market value of their assets matters.*

Sovereign Debt in Reality (cont'd)

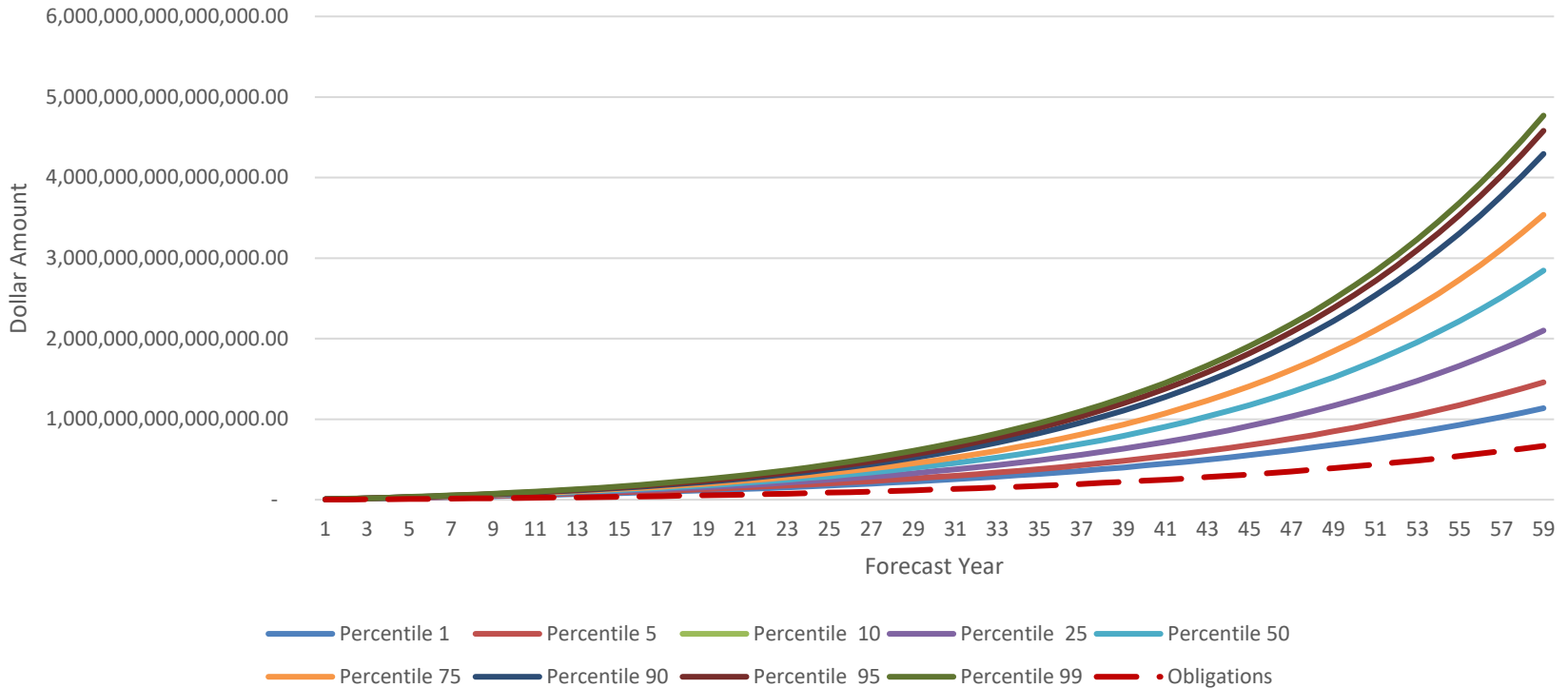
- In terms of economic use Sovereign debt is much more of an analogue to a “corporate preferred share” rather than “corporate debt”
- With such a stake, every investor will be able to redeem the principal of the value of the share as long as there are other investors that are willing to step in and refinance the amount the first investor redeems.
- As long as there are other investors that are willing to step in...
- This will depend on the credibility of the government to pay interest on its debt. This will create a virtuous cycle meaning that the face amount will be redeemable as well for the second investor.
- *Therefore, the main focus of the credit analysis should be on the ability of the government to pay interest.*

Key Model Input Variables

- Federal Debt Interest Rate: 5%
- Expected Annual Growth of Mandatory Expenditure: 6.9%
- Expected Annual Growth of Fiscal Asset Cash Flow: 6.3%
- Annual Standard Deviation of Fiscal Asset Cash Flow: 7.1%
- Expected Annual Growth in Deficits: 3%

Sovereign Interest Payments vs. Fiscal Income

Interest Coverage by US Fiscal Asset Cumulative Cash Flows

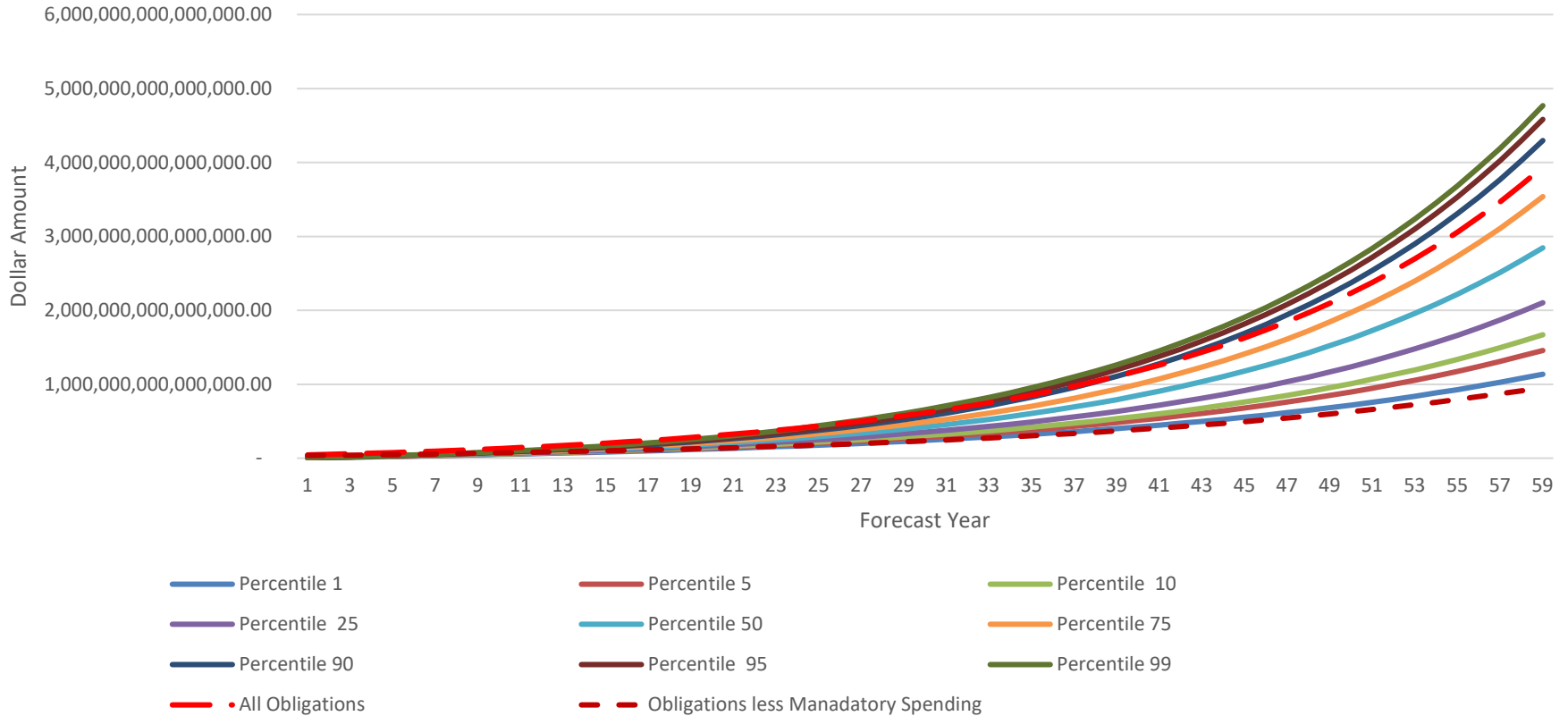


Interest Payments vs. Fiscal Income (cont'd)

- The probability of the US government to not meet interest payment liabilities as projected is close to zero
- This entails that investors will not be deterred to invest in US sovereign debt because there is low likelihood for losing a steady stream of coupon payments in the long run and therefore there will be other investors willing to refinance when the current debt expires, which also eliminates principal default risk.
- Just as a case in point it also warrants interest what will happen to the coverage of the full set of obligations – principal, accrued interest, and mandatory expenditure.
- The results of this are demonstrated next.

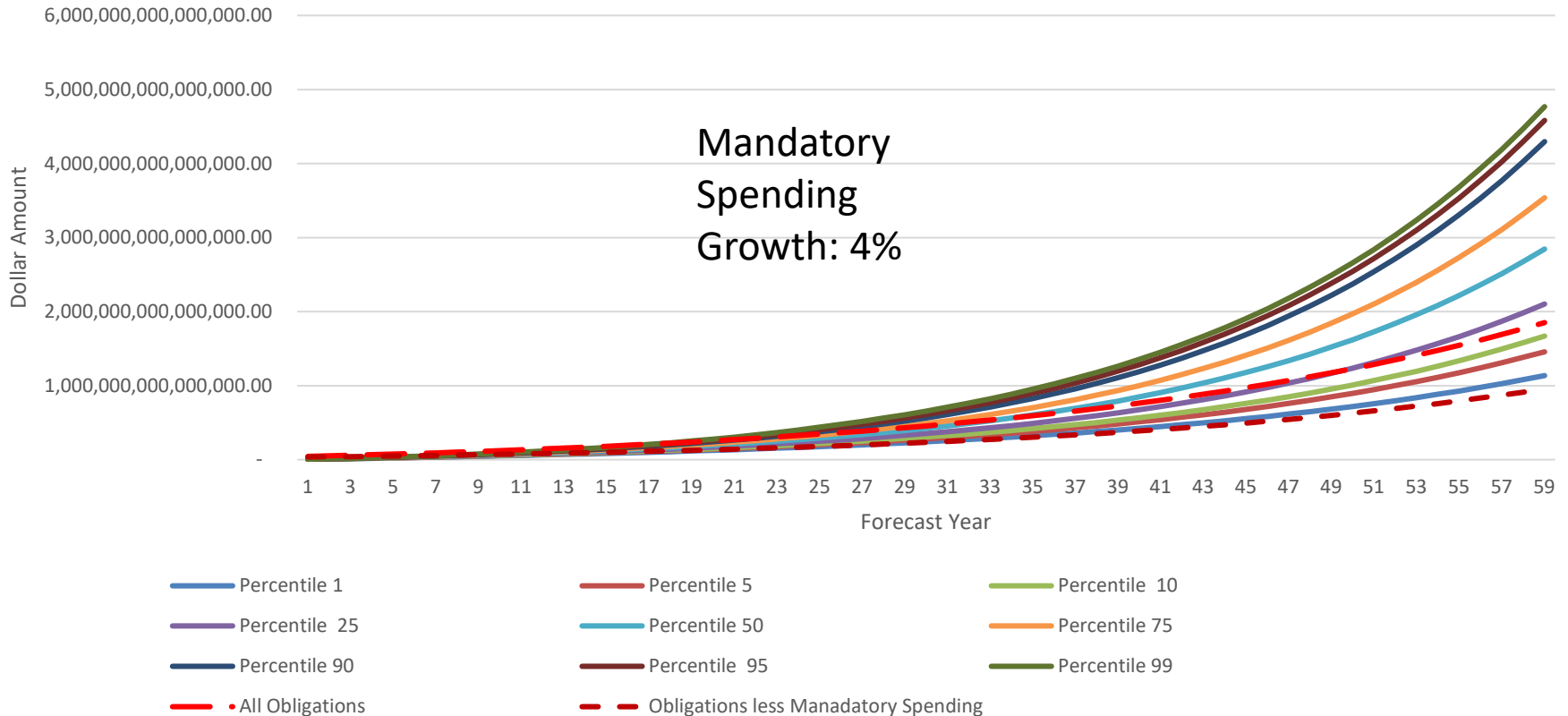
All Sovereign Obligations vs. Fiscal Income

All Obligations vs. US Fiscal Asset Cumulative Cash Flows



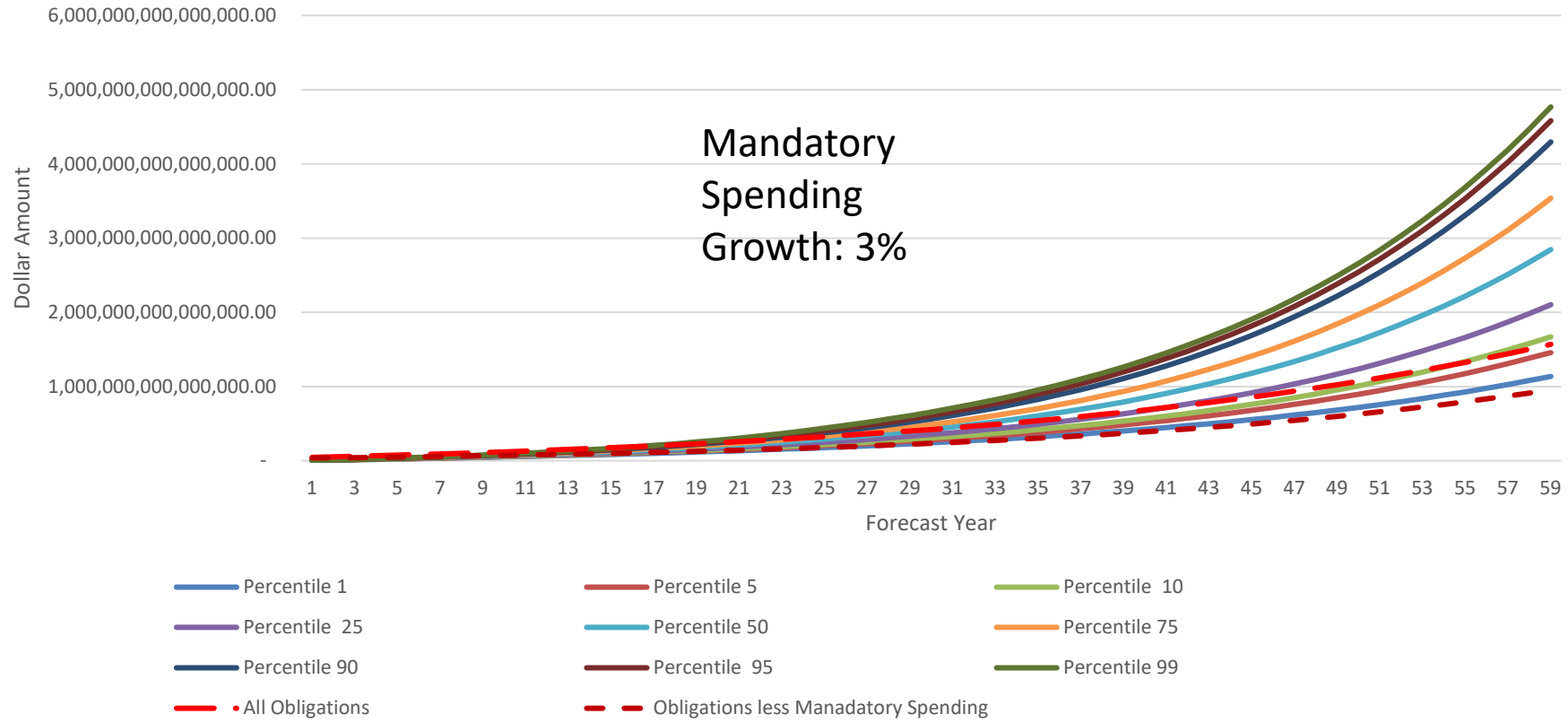
All Obligations vs. Fiscal Income (cont'd)

All Obligations vs. US Fiscal Asset Cumulative Cash Flows



All Obligations vs. Fiscal Income (cont'd)

All Obligations vs. US Fiscal Asset Cumulative Cash Flows



All Obligations vs. Fiscal Income (cont'd)

- At the current rate of growth (6.9% annually) of mandatory expenditure clearly there is more than 75% probability of shortfall of the cumulative fiscal asset cashflow under *total* obligations
- However, there is close to zero probability for a shortfall on the *total debt* obligations – principal and interest
- At lower rates of growth of mandatory expenditure – 4% and 3% annually – the probability of shortfall on total obligations falls significantly to less than 25% and 10% respectively
- The major portion of mandatory spending is on Social Security and Medicare. At the current rate of growth of the retiring population in the US, it will be hard to achieve lower rates of growth than 6%.

Conclusions

- The economic developments of the last five years expose the United States to challenging circumstances with respect to the size and cost of its debt
- A paradigm shift in credit analysis is required to truly understand the economic role of investments in government debt. It centers much more on ongoing cash flow surpluses and shortfalls rather than the market value of the underlying assets and the debt itself. This is in distinction to other type of debt – corporate and individual.
- Robust simulation technology available through Northfield allows to forecast the interaction of all key input variables in an elaborate analysis that results in estimates in the probability and severity of default.
- Our analysis shows that there are no concerns on the sustainability of the servicing of the US sovereign debt, although additional safeguards can be achieved through legislative means.

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