The NGDP Growth Derived Stock Valuation Model: A Brief Introduction

Michael Sandifer

Exact Macro Market Monitor Blog
exactmacro.substack.com

September 02, 2024

Abstract

This paper introduces the NGDP Growth Derived Stock Valuation Model, an alternative to the traditional Gordon Growth model, specifically designed to address the limitations of relying on the discount rate in environments with near-zero or negative nominal interest rates. By focusing on expected nominal GDP (NGDP) growth as the primary independent variable, the model ties market valuations directly to economic growth expectations. The model is particularly useful in explaining periods of economic stagnation, such as Japan's lost decades and the EU's post-Great Recession recovery, where both NGDP and actual earnings followed lower growth trajectories. The paper provides a detailed justification for the model, walks through its derivation, and discusses its applications. An appendix includes the full mathematical derivation, ensuring both accessibility and rigor.

Introduction

In the ever-evolving field of economic theory and financial markets, traditional models like the Gordon Growth model have long served as foundational tools for understanding stock prices. However, in periods of economic stagnation—such as Japan's lost decades or the European Union's sluggish recovery after the Great Recession—these models often fail to provide accurate insights. The primary shortcoming lies in their reliance on the discount rate (r), which becomes problematic in environments where nominal interest rates are near zero or even negative. To address these limitations, I have developed an alternative model, the NGDP Growth Derived Stock Valuation Model, which emphasizes the role of expected nominal GDP (NGDP) growth in determining stock market valuations. This article introduces this new model, justifies its formulation, and walks through its derivation.

The Limitations of the Gordon Growth Model

The Gordon Growth model is a widely used method for determining the fair value of stocks, based on the relationship between dividends, growth rates, and discount rates. However, the model's heavy reliance on the discount rate presents significant issues in certain economic environments. For instance, during Japan's lost decades and the EU's post-Great Recession recovery, nominal interest rates were near zero or even negative, yet stock prices languished alongside stagnant economic growth. The traditional Gordon Growth model struggles to account for these scenarios where the cost of capital is low, but growth prospects remain bleak.

The Need for a New Approach

To better capture the dynamics of such periods, I formulated the NGDP Growth Derived Stock Valuation Model, which replaces the discount rate with the expected NGDP growth as the primary independent variable. This approach directly ties market valuations to the overall economic growth trajectory, providing a more accurate and contextually appropriate framework for understanding stock prices, particularly in low-interest-rate environments.

The NGDP Growth Derived Stock Valuation Model

The model is expressed as follows:

$$P = \left(\frac{E}{G}\right)\left(\frac{G + \Delta G}{G}\right)$$

$$P = \frac{E \cdot (G + \Delta G)}{G^2}$$

Where:

- P is the price of the S&P 500 index.
- E is expected earnings.
- G is the expected NGDP growth rate.
- ΔG represents the change in the expected NGDP growth rate.

Justification for the Model

1. **Focus on NGDP Growth**: By centering the model around NGDP growth, it directly ties market valuations to a comprehensive measure of economic activity. NGDP captures both real economic growth and inflation, providing a holistic view of economic performance that is closely linked to corporate earnings.

2. **Smoothing Earnings Volatility**: Actual earnings are often more volatile than NGDP, making them unreliable as a proxy for earnings expectations, especially during significant economic shifts. The model adjusts expected earnings to smooth out this volatility, ensuring that stock prices reflect more stable long-term growth expectations.

3. **Addressing Historical Anomalies**: The model effectively accounts for periods of economic stagnation, such as Japan's lost decades and the EU's post-Great Recession recovery. During these periods, both NGDP and actual earnings were on permanently lower growth trajectories, and traditional models failed to capture the corresponding impact on stock prices. This model provides a more accurate representation of how weak growth expectations can lead to sustained market stagnation.

Application of the Model

The NGDP Growth Derived Stock Valuation Model is particularly useful for analyzing periods of economic stagnation where traditional models might fail. By focusing on expected NGDP growth, the model explains why stock prices can remain depressed even when interest rates are low or negative, as seen in Japan and the EU. The model also aligns with historical data, showing that actual earnings during these periods followed the same lower growth trajectory as NGDP, validating the model's assumptions and predictions.

Conclusion

The NGDP Growth Derived Stock Valuation Model offers a robust alternative to the traditional Gordon Growth model, particularly in environments where growth expectations are the primary drivers of market behavior. By focusing on expected NGDP growth and adjusting earnings expectations accordingly, the model provides a more accurate and comprehensive framework for understanding stock prices in a wide range of economic conditions. As such, it is a valuable tool for both analysts and policymakers seeking to understand and navigate complex market dynamics.

Appendix: Full Derivation of the NGDP Growth Derived Stock Valuation Model

Step 1: Net Present Value of the S&P 500 The price of the S&P 500 index P can be expressed as the net present value (NPV) of expected future earnings:

$$P = \sum_{t=1}^{\infty} \frac{E_t}{(1+r)^t}$$

Where:

- E_t is the expected earnings in period t.
- r is the discount rate, which includes the risk-free rate and a risk premium.

Step 2: Substitute Expected Earnings into the NPV Formula Assume that expected earnings E_t grow at the expected NGDP growth rate G:

$$E_t = E_0 \cdot (1+G)^t$$

Substitute this into the NPV formula:

$$P = E_0 \cdot \sum_{t=1}^{\infty} \left(\frac{1+G}{1+r} \right)^t$$

Step 3: Simplify the Geometric Series
The sum is a geometric series, which can be simplified as:

$$P = E_0 \cdot \frac{\frac{1+G}{1+r}}{1 - \frac{1+G}{1+r}}$$

Simplifying further:

$$P = \frac{E_0 \cdot (1+G)}{r-G}$$

Step 4: Analyze the Impact of a General Change in Expected NGDP Growth
Now, consider a general change in the expected NGDP growth rate from G_{old} to G_{new}. The new price P_{new} would be:

$$P_{\text{new}} = \frac{E_0 \cdot (1+G_{\text{new}})}{r - G_{\text{new}}}$$

The change in the S&P 500 index, expressed as a ratio, would then be:

$$\frac{P_{\text{new}}}{P_{\text{old}}} = \frac{\frac{E_0 \cdot (1+G_{\text{new}})}{r-G_{\text{new}}}}{\frac{E_0 \cdot (1+G_{\text{old}})}{r-G_{\text{old}}}}$$

Simplifying this ratio:

$$\frac{P_{\text{new}}}{P_{\text{old}}} = \frac{(1+G_{\text{new}}) \cdot (r-G_{\text{old}})}{(1+G_{\text{old}}) \cdot (r-G_{\text{new}})}$$

Step 5: Relationship Between S&P 500 and NGDP Growth To express the change in expected NGDP growth rate in terms of the change in the S&P 500 index, we rearrange the above equation:

$$\frac{1+G_{\text{new}}}{1+G_{\text{old}}} = \frac{\frac{P_{\text{new}}}{P_{\text{old}}} \cdot (r - G_{\text{new}})}{r - G_{\text{old}}}$$

This equation relates the proportional change in the S&P 500 index to the proportional change in the expected NGDP growth rate.

Step 6: Interpretation

- **If the S&P 500 increases**: If $P_{\text{new}} > P_{\text{old}}$, this indicates that the market expects a higher future NGDP growth rate, assuming the discount rate r remains relatively stable.
- **If the S&P 500 decreases**: Conversely, if $P_{\text{new}} < P_{\text{old}}$, this implies that the market expects a lower future NGDP growth rate.

Conclusion

The general relationship derived here allows us to understand how changes in the S&P 500 index reflect changes in expected NGDP growth rates. The key takeaway is that the proportional change in the S&P 500 is related to the proportional change in expected NGDP growth, adjusted by the discount rate. This relationship captures the sensitivity of the S&P 500 to changes in economic expectations, with the exact proportionality depending on the levels of the discount rate and the growth rates involved.