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**Making the P/E Ratio a Truly Dynamic Valuation Metric: Gordon-Shapiro vs. Potential Payback Period (PPP)  
  
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Abstract**  
  
The traditional Price-to-Earnings (P/E) ratio is widely used but remains static, overlooking growth, discounting, and risk. This article compares two models that address these limitations: the Gordon-Shapiro Model and the Potential Payback Period (PPP), a dynamic valuation framework initiated by the author. While the former projects dividends or earnings over an infinite horizon and requires that growth be lower than the discount rate (g < r), the PPP adopts a finite-horizon, logarithmic structure valid even when g ≥ r. By linking valuation to discounted earnings recovery, the PPP generalizes the raw P/E ratio and converges to it when g = r = 0, highlighting its universality and versatility.

**Keywords**

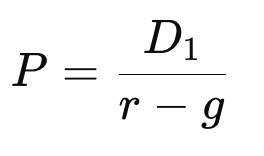
Price-to-Earnings (P/E) Ratio; Gordon-Shapiro Model; Gordon Growth Model (GGM); Potential Payback Period (PPP); Growing Discounted Earnings; Dynamic Stock Valuation

## **1. Introduction**

The Price-to-Earnings (P/E) ratio is among the most utilized metrics in fundamental equity analysis. Simple in form and intuitive in use, the P/E ratio estimates how many years of current earnings are required to recoup the price paid for a stock. However, its static nature—failing to account for earnings growth, discounting, or risk—makes it increasingly inadequate in dynamic financial environments.

## This paper compares two methodologies that aim to transform the P/E ratio into a truly dynamic valuation tool: the classic Gordon-Shapiro model (or Gordon Growth Model, GGM), and the more recent Potential Payback Period (PPP), a forward-looking, time-based framework initiated by the author. Both models adjust the P/E by incorporating earnings growth and the time value of money, but only the PPP offers a unified, flexible, and mathematically continuous solution across a range of real-world scenarios. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **2. The Gordon-Shapiro Model: A First Step Toward a Dynamic P/E**

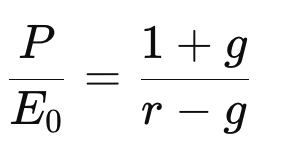
The Gordon Growth Model evaluates the price of a stock as the present value of an infinite stream of dividends growing at a constant rate:



Where:

* PPP: Price of the stock
* D**1**​: Dividend expected next year
* r: Discount rate (cost of equity)
* g: Constant growth rate of dividends.

Assuming full earnings payout (i.e., D**1** =E**1**​), and that earnings grow at rate g such that   
E**1** = E**0** (1+g), we obtain the **growth-adjusted P/E ratio**:

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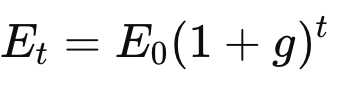
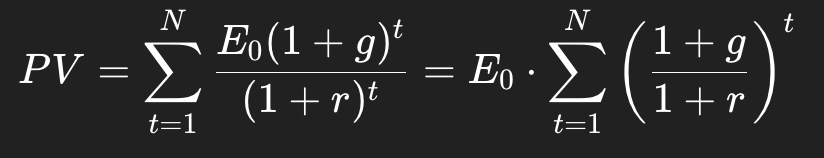
This formulation introduces both growth and discounting, but it carries several limitations:

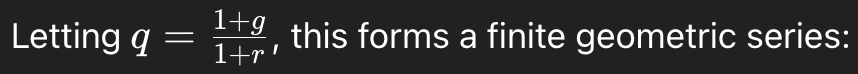
* It requires **g < r**, or the formula diverges.
* It assumes **perpetual constant growth**, which is rarely realistic.
* It lacks a **time-bound interpretation** (i.e., no payback horizon).
* It provides a valuation level, but not a recovery timeframe.

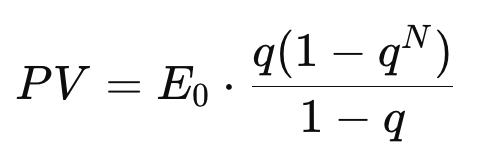
## **3. The Potential Payback Period (PPP): A More Flexible Dynamic Framework**

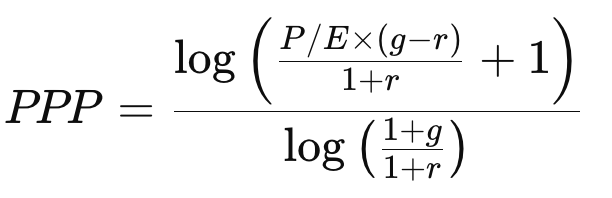
The Potential Payback Period (PPP) offers an alternative framework that answers a practical question: **“How many years of discounted earnings are required to recover the price paid for a stock?”**

### 3.1. Conceptual Foundation

Assuming full earnings distribution and geometric growth, future earnings are modeled as:  
  
  
Discounting these at rate r, the present value of earnings over N years becomes:  
  






Setting this equal to the stock price P, one solves for N, the **potential payback period**. Since an explicit algebraic solution for N is difficult, the model simplifies the relationship using logarithmic transformations, yielding:  
  


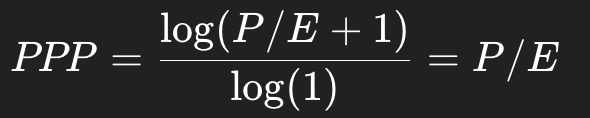
Where:

* P/E: Current Price-to-Earnings ratio
* g: Earnings growth rate
* r: Discount rate (risk-adjusted via CAPM)

### 3.2. Advantages of the PPP

The PPP thus provides a time-based, forward-looking metric that reflects both **earning power** and **valuation risk**, making it suitable for modern investment analysis.

## **4. Mathematical Continuity: Convergence to the P/E Ratio**

A critical strength of the PPP is that it **reduces to the P/E ratio under static conditions**, confirming its role as a generalization. When growth g = 0 and discount rate r = 0, the formula simplifies as follows:  
  


This convergence can be rigorously shown using L’Hôpital’s Rule and demonstrates that the PPP includes the static P/E ratio as a limiting case. It confirms that:

* **P/E is a special case of the PPP** in a world with no growth and no discounting.
* The PPP is not an alternative to the P/E — it **subsumes** it.
* The PPP retains consistency with traditional valuation metrics while expanding their scope.

## **5. Conclusion**

Both the Gordon-Shapiro Model and the Potential Payback Period (PPP) aim to convert the static P/E ratio into a dynamic valuation tool by introducing growth and discounting. While the GGM was an important early innovation, it suffers from key theoretical limitations, particularly the requirement that **g < r** and the assumption of constant perpetual growth.

The PPP overcomes these restrictions with a **logarithmic, time-based framework** that adapts to real-world scenarios, accommodates variable growth, and delivers a clear recovery interpretation. That it reduces to the P/E ratio under static conditions confirms the PPP’s coherence and generality.

As such, the PPP offers a unified valuation methodology that redefines the P/E ratio in dynamic, forward-looking terms — and invites further empirical validation and application across sectors, regions, and market cycles.

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